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The PREMIUMS are so moderate that at most ages an assurance of £1,200 or £1,250 may be secured from the first for the same yearly payment which would generally elsewhere assure (with profits) £1,000 only—the difference being equivalent to an immediate and certain "Bonus" of from 20 to 25 per cent.

*The New Business has for many years exceeded a Million.*

(The Expenses are 9 per cent. of Premiums and 6 per cent. of Income.)

### ANNUAL PREMIUMS FOR £100 AT DEATH (WITH PROFITS).

| AGE.                     | 25      | 30     | 35      | 40      | 45     |
|--------------------------|---------|--------|---------|---------|--------|
| * Payable during Life... | £1 18 0 | £2 1 6 | £2 6 10 | £2 14 9 | £3 5 9 |
| Limited to 21 Payments   | 2 12 6  | 2 15 4 | 3 0 2   | 3 7 5   | 3 17 6 |

\* The non-profit rates of other Offices differ little from these Premiums. so that persons who assure with them throw away the prospect of additions from the profits without any compensating advantages.

#### SUMMARY OF NEW BUSINESS IN 1886.

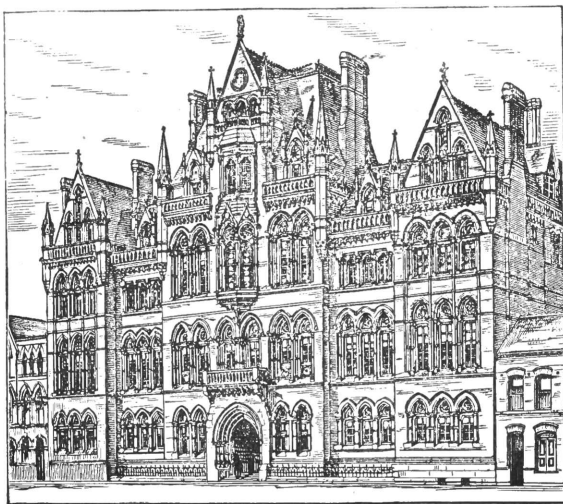
|                                                         |            |
|---------------------------------------------------------|------------|
| New Assurances effected .. .. .                         | £1,020,154 |
| New Premiums (besides £41,332 for Annuities) .. .. .    | £37,629    |
| Total Receipts of the year, including Interest .. .. .  | £745,475   |
| The Realised Funds at 31st December, 1886, were .. .. . | £5,728,162 |
| The Increase during the year has been £341,247 2s. 8d.  |            |

REPORTS, with STATEMENT of PRINCIPLES and PROPOSAL FORMS,  
may be had at the Midland Branch:—

## 95, COLMORE ROW, BIRMINGHAM,

*GEO. A. PANTON, Res. Secretary.*

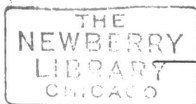
THE MASON SCIENCE COLLEGE,  
BIRMINGHAM.



"PROGRESS THROUGH KNOWLEDGE."

CALENDAR FOR THE SESSION

1887-1888.



BIRMINGHAM :

CORNISH BROTHERS, NEW STREET.

1887.

*m. g.*

## RESIDENCE OF STUDENTS.

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The College does not provide accommodation for residence, but a Register of Lodgings is kept in the Secretary's office for the use of Students.

---

## RAILWAY SEASON TICKET ARRANGEMENTS.

---

Upon production of a certificate, signed by the Secretary, that the bearer is a Student of The Mason Science College, and under 18 years of age, the various Railway Companies will issue Season Tickets at half the usual rates.

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**The Mason Science College Calendar.**  
1887-88.

SEPTEMBER—1887.

|    |    |                                                                                    |
|----|----|------------------------------------------------------------------------------------|
| 1  | Th |                                                                                    |
| 2  | F  |                                                                                    |
| 3  | S  |                                                                                    |
| 4  | S  |                                                                                    |
| 5  | M  |                                                                                    |
| 6  | Tu |                                                                                    |
| 7  | W  | Meeting of House, Education, and Discipline Committee.                             |
| 8  | Th |                                                                                    |
| 9  | F  |                                                                                    |
| 10 | S  |                                                                                    |
| 11 | S  |                                                                                    |
| 12 | M  |                                                                                    |
| 13 | Tu |                                                                                    |
| 14 | W  | Meeting of Council.                                                                |
| 15 | Th |                                                                                    |
| 16 | F  |                                                                                    |
| 17 | S  | Last day for sending in Certificates for B.Sc. Exam.                               |
| 18 | S  |                                                                                    |
| 19 | M  |                                                                                    |
| 20 | Tu |                                                                                    |
| 21 | W  |                                                                                    |
| 22 | Th |                                                                                    |
| 23 | F  |                                                                                    |
| 24 | S  | Last day for sending in Certificates for B.A. Exam.                                |
| 25 | S  |                                                                                    |
| 26 | M  | Examinations for Entrance Scholarships, and for Students under<br>16 years of age. |
| 27 | Tu | <i>Id.</i> _____                                                                   |
| 28 | W  |                                                                                    |
| 29 | Th | <i>MICHAELMAS DAY.</i> Meeting of the Academic Board.                              |
| 30 | F  | Professors attend to confer with Students from 10 to 1.                            |

## OCTOBER—1887.

|    |    |                                                                                                                |
|----|----|----------------------------------------------------------------------------------------------------------------|
| 1  | S  | Opening of College, 1880.                                                                                      |
| 2  | S  |                                                                                                                |
| 3  | M  | WINTER TERM COMMENCES. Meeting of the Students.<br>[Medical Winter Session commences. [Prize Distribution, &c. |
| 4  | Tu | Meeting of French Debating Society.                                                                            |
| 5  | W  | Meeting of House, Education, and Discipline Committee.                                                         |
| 6  | Th |                                                                                                                |
| 7  | F  | Meeting of Students' Union.                                                                                    |
| 8  | S  |                                                                                                                |
| 9  | S  |                                                                                                                |
| 10 | M  |                                                                                                                |
| 11 | Tu | Meeting of Library Committee. Meeting of Poesy Club.                                                           |
| 12 | W  | Meeting of Council.                                                                                            |
| 13 | Th | Meeting of College Physical Society.                                                                           |
| 14 | F  | [Meeting of College Physiological Society.                                                                     |
| 15 | S  | Last day for sending in Certificates for M.B. Exam.                                                            |
| 16 | S  |                                                                                                                |
| 17 | M  | B.Sc. Exam.                                                                                                    |
| 18 | Tu | <i>Id.</i> ———                                                                                                 |
| 19 | W  | <i>Id.</i> ——— Meeting of College Chemical Society.                                                            |
| 20 | Th | <i>Id.</i> ———                                                                                                 |
| 21 | F  | <i>Id.</i> ——— Meeting of Students' Union.                                                                     |
| 22 | S  | <i>Id.</i> ———                                                                                                 |
| 23 | S  |                                                                                                                |
| 24 | M  | <i>Id.</i> ——— B.A. Exam.                                                                                      |
| 25 | Tu | <i>Id.</i> ——— <i>Id.</i> ———                                                                                  |
| 26 | W  | <i>Id.</i> ——— <i>Id.</i> ——— Meeting of College Botanical<br>Society.                                         |
| 27 | Th | <i>Id.</i> ——— <i>Id.</i> ——— Meeting of the Academic<br>Board.                                                |
| 28 | F  | <i>Id.</i> ——— Meeting of Students' Union.                                                                     |
| 29 | S  | <i>Id.</i> ———                                                                                                 |
| 30 | S  |                                                                                                                |
| 31 | M  | <i>Id.</i> ——— M.B. Exam.                                                                                      |

## NOVEMBER—1887.

|    |    |                                                           |                                                                        |                                                   |
|----|----|-----------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------|
| 1  | Tu | B.Sc. Exam.                                               | Meeting of French Debating Society                                     | M.B. Exam.                                        |
| 2  | W  | <i>Id.</i> ———                                            | Meeting of House, Education and Discipline Committee.                  | <i>Id.</i> ———                                    |
| 3  | Th | <i>Id.</i> ———                                            |                                                                        | <i>Id.</i> ———                                    |
| 4  | F  |                                                           |                                                                        |                                                   |
| 5  | S  |                                                           |                                                                        |                                                   |
| 6  | S  |                                                           |                                                                        |                                                   |
| 7  | M  |                                                           |                                                                        |                                                   |
| 8  | Tu | Meeting of Poesy Club.                                    |                                                                        |                                                   |
| 9  | W  | Meeting of Council. Meeting of College Botanical Society. |                                                                        |                                                   |
| 10 | Th | M.B. Exam.                                                | Meeting of College Physical Society.                                   |                                                   |
| 11 | F  | <i>Id.</i> ———                                            | (Meeting of College Physiological Society. Meeting of Students' Union. |                                                   |
| 12 | S  | <i>Id.</i> ———                                            | B.A. and B.Sc. Pass Lists Published.                                   |                                                   |
| 13 | S  |                                                           |                                                                        |                                                   |
| 14 | M  | B.A. Hons.                                                | B.Sc. Hons.                                                            |                                                   |
| 15 | Tu | <i>Id.</i> ———                                            | <i>Id.</i> ———                                                         |                                                   |
| 16 | W  | <i>Id.</i> ———                                            | <i>Id.</i> ———                                                         | Meeting of College Chemical Society.              |
| 17 | Th | <i>Id.</i> ———                                            | <i>Id.</i> ———                                                         | M.B. Exam.                                        |
| 18 | F  | <i>Id.</i> ———                                            | <i>Id.</i> ———                                                         | <i>Id.</i> ——— Meeting of Students' Union.        |
| 19 | S  |                                                           |                                                                        | <i>Id.</i> ———                                    |
| 20 | S  |                                                           |                                                                        |                                                   |
| 21 | M  | B.A. Hons.                                                | B.Sc. Hons.                                                            |                                                   |
| 22 | Tu | <i>Id.</i> ———                                            | <i>Id.</i> ———                                                         | M.B. Pass List Published.                         |
| 23 | W  | <i>Id.</i> ———                                            | <i>Id.</i> ———                                                         | M.B. Hons. Meeting of (College Botanical Society. |
| 24 | Th | <i>Id.</i> ———                                            | <i>Id.</i> ———                                                         | <i>Id.</i> ——— Meeting of the Academic Board.     |
| 25 | F  | <i>Id.</i> ———                                            | <i>Id.</i> ———                                                         | <i>Id.</i> ———                                    |
| 26 | S  |                                                           | <i>Id.</i> ———                                                         |                                                   |
| 27 | S  |                                                           |                                                                        |                                                   |
| 28 | M  |                                                           | <i>Id.</i> ———                                                         | University of London founded, 1836.               |
| 29 | Tu |                                                           | <i>Id.</i> ———                                                         |                                                   |
| 30 | W  |                                                           | <i>Id.</i> ———                                                         |                                                   |

## DECEMBER—1887.

|    |    |                                                                                                  |
|----|----|--------------------------------------------------------------------------------------------------|
| 1  | Th | B.Sc. Hons.                                                                                      |
| 2  | F  | <i>Id.</i> ——— Meeting of Students' Union.                                                       |
| 3  | S  | <i>Id.</i> ———                                                                                   |
| 4  | S  |                                                                                                  |
| 5  | M  | M.D. Exam. M.S. Exam.                                                                            |
| 6  | Tu | <i>Id.</i> ——— <i>Id.</i> ——— B.S. Exam. Meeting of French Debating Society.                     |
| 7  | W  | Meeting of House, Education and Discipline Committee.<br>[Meeting of College Botanical Society.] |
| 8  | Th | M.D. Exam. M.S. Exam. B.S. Exam. Meeting of College Physical Society.                            |
| 9  | F  | <i>Id.</i> ——— <i>Id.</i> ———                                                                    |
| 10 | S  | [Last day for Certificates for January Matriculation.]                                           |
| 11 | S  |                                                                                                  |
| 12 | M  | M.D. Examination.                                                                                |
| 13 | Tu | B.S. Hons. Meeting of Poesy Club.                                                                |
| 14 | W  | Meeting of Council.                                                                              |
| 15 | Th |                                                                                                  |
| 16 | F  | WINTER TERM EXAMINATIONS BEGIN.<br>[Meeting of Students' Union.]                                 |
| 17 | S  | [Notice for Prel. Sci. Examination.]                                                             |
| 18 | S  |                                                                                                  |
| 19 | M  |                                                                                                  |
| 20 | Tu |                                                                                                  |
| 21 | W  | WINTER TERM ENDS.                                                                                |
| 22 | Th | Library closed during all vacations at One o'clock on Saturdays.                                 |
| 23 | F  |                                                                                                  |
| 24 | S  |                                                                                                  |
| 25 | S  | CHRISTMAS DAY.                                                                                   |
| 26 | M  | Bank Holiday.                                                                                    |
| 27 | Tu |                                                                                                  |
| 28 | W  |                                                                                                  |
| 29 | Th |                                                                                                  |
| 30 | F  |                                                                                                  |
| 31 | S  | Last day for Certificates for Int. Med. Exam.                                                    |

## JANUARY—1888.

|    |    |                                                       |                  |                  |
|----|----|-------------------------------------------------------|------------------|------------------|
| 1  | S  |                                                       |                  |                  |
| 2  | M  |                                                       |                  |                  |
| 3  | Tu |                                                       |                  |                  |
| 4  | W  | Meeting of House, Education and Discipline Committee. |                  |                  |
| 5  | Th |                                                       |                  |                  |
| 6  | F  | Registration of Candidates for Matriculation.         |                  |                  |
| 7  | S  | <i>Id.</i> _____                                      |                  |                  |
| 8  | S  |                                                       |                  |                  |
| 9  | M  |                                                       | Matric. Exam.    |                  |
| 10 | Tu | Meeting of Library Committee.                         | <i>Id.</i> _____ |                  |
| 11 | W  | Meeting of Council.                                   | <i>Id.</i> _____ |                  |
| 12 | Th |                                                       | <i>Id.</i> _____ |                  |
| 13 | F  |                                                       | <i>Id.</i> _____ |                  |
| 14 | S  |                                                       |                  |                  |
| 15 | S  |                                                       |                  |                  |
| 16 | M  |                                                       | Prel. Sci.       | Int. Med.        |
| 17 | Tu | SPRING TERM COMMENCES.                                | <i>Id.</i> _____ | <i>Id.</i> _____ |
| 18 | W  |                                                       | <i>Id.</i> _____ | <i>Id.</i> _____ |
| 19 | Th |                                                       |                  |                  |
| 20 | F  |                                                       | <i>Id.</i> _____ |                  |
| 21 | S  |                                                       | <i>Id.</i> _____ |                  |
| 22 | S  |                                                       |                  |                  |
| 23 | M  |                                                       | <i>Id.</i> _____ |                  |
| 24 | Tu |                                                       | <i>Id.</i> _____ |                  |
| 25 | W  | Meeting of Coll. Botanical Society.                   | <i>Id.</i> _____ |                  |
| 26 | Th | Meeting of Academic Board.                            | <i>Id.</i> _____ |                  |
| 27 | F  | [Meeting of College Physical Society.                 |                  |                  |
| 28 | S  |                                                       |                  |                  |
| 29 | S  |                                                       |                  |                  |
| 30 | M  | Matriculation Pass List Published.                    |                  |                  |
| 31 | Tu |                                                       |                  |                  |

## FEBRUARY—1888.

|    |    |                                                                                                                                                                      |
|----|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | W  | Meeting of House, Education, and Discipline Committee.                                                                                                               |
| 2  | Th |                                                                                                                                                                      |
| 3  | F  | Int. Med. Exam.                                                                                                                                                      |
| 4  | S  |                                                                                                                                                                      |
| 5  | S  |                                                                                                                                                                      |
| 6  | M  | Int. Med. Exam. Classified Matric. List Published.                                                                                                                   |
| 7  | Tu | <i>Id.</i> ——— Meeting of French Debating Society.                                                                                                                   |
| 8  | W  | <i>Id.</i> ——— Meeting of Council. Meeting of College<br>Botanical Society. Prel. Sci. List Publ.                                                                    |
| 9  | Th | <i>Id.</i> ——— Meeting of College Physical Society. Meeting<br>of Physiological Society.                                                                             |
| 10 | F  |                                                                                                                                                                      |
| 11 | S  |                                                                                                                                                                      |
| 12 | S  |                                                                                                                                                                      |
| 13 | M  |                                                                                                                                                                      |
| 14 | Tu | Int. Med. Pass List Published. Meeting of Poesy Club.                                                                                                                |
| 15 | W  | <i>ASH WEDNESDAY.</i> Meeting of College Chemical<br>Society.                                                                                                        |
| 16 | Th |                                                                                                                                                                      |
| 17 | F  |                                                                                                                                                                      |
| 18 | S  |                                                                                                                                                                      |
| 19 | S  |                                                                                                                                                                      |
| 20 | M  |                                                                                                                                                                      |
| 21 | Tu |                                                                                                                                                                      |
| 22 | W  | Meeting of Academic Board. Meeting of Coll. Botanical Society.                                                                                                       |
| 23 | Th | Founder's Birthday. College closed. Foundation Stone laid by<br>Founder, 1875. Annual Meeting of Trustees and inspection<br>of the College structure by the Bailiff. |
| 24 | F  |                                                                                                                                                                      |
| 25 | S  |                                                                                                                                                                      |
| 26 | S  |                                                                                                                                                                      |
| 27 | M  |                                                                                                                                                                      |
| 28 | Tu |                                                                                                                                                                      |
| 29 | W  |                                                                                                                                                                      |



## MARCH—1888.

|    |    |                                                                                   |
|----|----|-----------------------------------------------------------------------------------|
| 1  | Th |                                                                                   |
| 2  | F  |                                                                                   |
| 3  | S  |                                                                                   |
| 4  | S  |                                                                                   |
| 5  | M  |                                                                                   |
| 6  | Tu | Meeting of French Debating Society.                                               |
| 7  | W  | Meeting of House, Education, and Discipline Committee.                            |
| 8  | Th | Meeting of College Physical Society. Meeting of College<br>Physiological Society. |
| 9  | F  |                                                                                   |
| 10 | S  |                                                                                   |
| 11 | S  |                                                                                   |
| 12 | M  |                                                                                   |
| 13 | Tu | Meeting of Poesy Club.                                                            |
| 14 | W  | Meeting of Council. Meeting of Coll. Botanical Society.                           |
| 15 | Th |                                                                                   |
| 16 | F  |                                                                                   |
| 17 | S  |                                                                                   |
| 18 | S  |                                                                                   |
| 19 | M  |                                                                                   |
| 20 | Tu |                                                                                   |
| 21 | W  | Meeting of College Chemical Society.                                              |
| 22 | Th |                                                                                   |
| 23 | F  | SPRING TERM EXAMINATIONS BEGIN.                                                   |
| 24 | S  |                                                                                   |
| 25 | S  | LADY DAY.                                                                         |
| 26 | M  |                                                                                   |
| 27 | Tu | Last day for applications for Examinerships, Univ. of London.                     |
| 28 | W  | SPRING TERM ENDS. Meeting of College Botanical Society.                           |
| 29 | Th |                                                                                   |
| 30 | F  | GOOD FRIDAY.                                                                      |
| 31 | S  | Medical Winter Session ends.                                                      |

## APRIL—1888.

|    |    |                                                        |
|----|----|--------------------------------------------------------|
| 1  | §  | <i>EASTER DAY.</i>                                     |
| 2  | M  |                                                        |
| 3  | Tu |                                                        |
| 4  | W  | Meeting of House, Education, and Discipline Committee. |
| 5  | Th |                                                        |
| 6  | F  |                                                        |
| 7  | S  |                                                        |
| 8  | §  |                                                        |
| 9  | M  |                                                        |
| 10 | Tu | Meeting of Library Committee.                          |
| 11 | W  | Meeting of Council.                                    |
| 12 | Th |                                                        |
| 13 | F  |                                                        |
| 14 | S  |                                                        |
| 15 | §  |                                                        |
| 16 | M  |                                                        |
| 17 | Tu |                                                        |
| 18 | W  |                                                        |
| 19 | Th |                                                        |
| 20 | F  |                                                        |
| 21 | S  |                                                        |
| 22 | §  |                                                        |
| 23 | M  |                                                        |
| 24 | Tu | <b>SUMMER TERM COMMENCES.</b>                          |
| 25 | W  | Meeting of College Botanical Society.                  |
| 26 | Th | Meeting of the Academic Board.                         |
| 27 | F  |                                                        |
| 28 | S  |                                                        |
| 29 | §  |                                                        |
| 30 | M  |                                                        |

## MAY—1888.

|    |    |                                                                          |
|----|----|--------------------------------------------------------------------------|
| 1  | Tu | Medical Summer Session commences. Meeting of French De-                  |
| 2  | W  | bating Society.<br>Meeting of House, Education and Discipline Committee. |
| 3  | Th |                                                                          |
| 4  | F  |                                                                          |
| 5  | S  |                                                                          |
| 6  | §  |                                                                          |
| 7  | M  |                                                                          |
| 8  | Tu | Meeting of Poesy Club.                                                   |
| 9  | W  | Meeting of Council. Meeting of College Botanical Society.                |
| 10 | Th | Meeting of College Physical Society. Meeting of College                  |
| 11 | F  | Physiological Society.                                                   |
| 12 | S  |                                                                          |
| 13 | §  |                                                                          |
| 14 | M  |                                                                          |
| 15 | Tu |                                                                          |
| 16 | W  | Meeting of College Chemical Society.                                     |
| 17 | Th |                                                                          |
| 18 | F  | Certifs. for June Matric.                                                |
| 19 | S  |                                                                          |
| 20 | §  | <i>WHIT SUNDAY.</i>                                                      |
| 21 | M  | Whit Monday. College Closed.                                             |
| 22 | Tu |                                                                          |
| 23 | W  | Meeting of College Botanical Society.                                    |
| 24 | Th |                                                                          |
| 25 | F  |                                                                          |
| 26 | S  |                                                                          |
| 27 | §  |                                                                          |
| 28 | M  |                                                                          |
| 29 | Tu |                                                                          |
| 30 | W  |                                                                          |
| 31 | Th | Meeting of the Academic Board.                                           |

## JUNE—1888.

|    |    |                                                                                                 |
|----|----|-------------------------------------------------------------------------------------------------|
| 1  | F  |                                                                                                 |
| 2  | S  |                                                                                                 |
| 3  | S  |                                                                                                 |
| 4  | M  |                                                                                                 |
| 5  | Tu | Meeting of French Debating Society.                                                             |
| 6  | W  | Meeting of House, Education and Discipline Committee.                                           |
| 7  | Th |                                                                                                 |
| 8  | F  |                                                                                                 |
| 9  | S  |                                                                                                 |
| 10 | S  |                                                                                                 |
| 11 | M  |                                                                                                 |
| 12 | Tu | Meeting of Poesy Club.                                                                          |
| 13 | W  | Meeting of Council. Meeting of College Botanical Society.                                       |
| 14 | Th | Meeting of College Physical Society. Meeting of College Physiological Society.                  |
| 15 | F  | Registration of Candidates for Matric. Certifs. for Int. Arts and Sc. and Notice for Prel. Sci. |
| 16 | S  | <i>Id.</i> _____                                                                                |
| 17 | S  |                                                                                                 |
| 18 | M  | Matric. Exam.                                                                                   |
| 19 | Tu | <i>Id.</i> _____                                                                                |
| 20 | W  | <i>Id.</i> _____ Meeting of College Chemical Society.                                           |
| 21 | Th | <i>Id.</i> _____                                                                                |
| 22 | F  | <i>Id.</i> _____                                                                                |
| 23 | S  | Last day for sending in Certifs. for Int. Med. Exam.                                            |
| 24 | S  | MIDSUMMER DAY.                                                                                  |
| 25 | M  | SUMMER TERM EXAMINATIONS BEGIN.                                                                 |
| 26 | Tu |                                                                                                 |
| 27 | W  | Meeting of College Botanical Society.                                                           |
| 28 | Th | Meeting of Academic Board.                                                                      |
| 29 | F  |                                                                                                 |
| 30 | S  |                                                                                                 |

## JULY—1888.

|    |    |                                                                                    |
|----|----|------------------------------------------------------------------------------------|
| 1  | S  |                                                                                    |
| 2  | M  |                                                                                    |
| 3  | Tu |                                                                                    |
| 4  | W  | <b>SUMMER TERM ENDS.</b> Meeting of House, Education,<br>and Discipline Committee. |
| 5  | Th |                                                                                    |
| 6  | F  |                                                                                    |
| 7  | S  |                                                                                    |
| 8  | S  |                                                                                    |
| 9  | M  | Matric. Pass List Publ. Int. Med. Exam.                                            |
| 10 | Tu | Meeting of Library Committee. <i>Id.</i> —————                                     |
| 11 | W  | Meeting of Council. <i>Id.</i> —————                                               |
| 12 | Th |                                                                                    |
| 13 | F  |                                                                                    |
| 14 | S  |                                                                                    |
| 15 | S  |                                                                                    |
| 16 | M  | Classified Matric. List Publ.<br>Int. Arts Ex. Int. Sci. Ex. Prel. Sci. Ex.        |
| 17 | Tu | <i>Id.</i> ————— <i>Id.</i> ————— <i>Id.</i> —————                                 |
| 18 | W  | <i>Id.</i> ————— <i>Id.</i> ————— <i>Id.</i> —————                                 |
| 19 | Th | <i>Id.</i> ————— <i>Id.</i> —————                                                  |
| 20 | F  | Int. Arts Hons. <i>Id.</i> ————— <i>Id.</i> —————                                  |
| 21 | S  | <i>Id.</i> ————— <i>Id.</i> —————                                                  |
| 22 | S  |                                                                                    |
| 23 | M  | Int. Arts Hons. <i>Id.</i> ————— <i>Id.</i> —————                                  |
| 24 | Tu | <i>Id.</i> ————— <i>Id.</i> ————— <i>Id.</i> —————                                 |
| 25 | W  | <i>Id.</i> ————— <i>Id.</i> —————                                                  |
| 26 | Th | Int. Arts and Int. Sci. Hons. <i>Id.</i> —————                                     |
| 27 | F  | Int. Sci. and Prel. Sci. Hons. Int. Med. Exam.                                     |
| 28 | S  | Int. Sci. and Prel. Sci. Hons. Int. Med. Hons.                                     |
| 29 | S  |                                                                                    |
| 30 | M  | Int. Med. Exam. Int. Sci. & Prel. Sci. Hons.                                       |
| 31 | Tu | Med. Sum. Sess. ends. <i>Id.</i> ————— <i>Id.</i> —————                            |

## AUGUST—1888.

|    |    |                                                            |                  |
|----|----|------------------------------------------------------------|------------------|
| 1  | W  | Library closed during this month.                          | Int. Med. Exam.  |
| 2  | Th | Int. Sci. and Prel. Sci. Hons.                             | <i>Id.</i> _____ |
| 3  | F  |                                                            |                  |
| 4  | S  |                                                            |                  |
| 5  | §  |                                                            |                  |
| 6  | M  | Bank Holiday.                                              |                  |
| 7  | Tu | Int. Med. Pass List Published.                             |                  |
| 8  | W  | Int. Arts, Int. Sci., and Prel. Sci. Pass Lists Published. |                  |
| 9  | Th |                                                            |                  |
| 10 | F  |                                                            |                  |
| 11 | S  |                                                            |                  |
| 12 | §  |                                                            |                  |
| 13 | M  |                                                            |                  |
| 14 | Tu |                                                            |                  |
| 15 | W  |                                                            |                  |
| 16 | Th |                                                            |                  |
| 17 | F  |                                                            |                  |
| 18 | S  |                                                            |                  |
| 19 | §  |                                                            |                  |
| 20 | M  |                                                            |                  |
| 21 | Tu |                                                            |                  |
| 22 | W  |                                                            |                  |
| 23 | Th |                                                            |                  |
| 24 | F  |                                                            |                  |
| 25 | S  |                                                            |                  |
| 26 | §  |                                                            |                  |
| 27 | M  |                                                            |                  |
| 28 | Tu |                                                            |                  |
| 29 | W  |                                                            |                  |
| 30 | Th |                                                            |                  |
| 31 | F  |                                                            |                  |

## SEPTEMBER—1888.

|    |    |                                                        |
|----|----|--------------------------------------------------------|
| 1  | S  |                                                        |
| 2  | S  |                                                        |
| 3  | M  |                                                        |
| 4  | Tu |                                                        |
| 5  | W  | Meeting of House, Education, and Discipline Committee. |
| 6  | Th |                                                        |
| 7  | F  |                                                        |
| 8  | S  |                                                        |
| 9  | S  |                                                        |
| 10 | M  |                                                        |
| 11 | Tu |                                                        |
| 12 | W  | Meeting of Council.                                    |
| 13 | Th |                                                        |
| 14 | F  |                                                        |
| 15 | S  | Last day for sending in Certificates for B.Sc. Exam.   |
| 16 | S  |                                                        |
| 17 | M  |                                                        |
| 18 | Tu |                                                        |
| 19 | W  |                                                        |
| 20 | Th |                                                        |
| 21 | F  |                                                        |
| 22 | S  | Last day for sending in Certificates for B.A. Exam.    |
| 23 | S  |                                                        |
| 24 | M  |                                                        |
| 25 | Tu |                                                        |
| 26 | W  |                                                        |
| 27 | Th |                                                        |
| 28 | F  |                                                        |
| 29 | S  | MICHAELMAS DAY.                                        |
| 30 | S  |                                                        |

## OCTOBER—1888.

|    |    |                                                                |
|----|----|----------------------------------------------------------------|
| 1  | M  | Opening of College, 1880.                                      |
| 2  | Tu |                                                                |
| 3  | W  | Meeting of House, Education, and Discipline Committee.         |
| 4  | Th |                                                                |
|    | F  |                                                                |
| 6  | S  |                                                                |
| 7  | S  |                                                                |
| 8  | M  |                                                                |
| 9  | Tu | Meeting of Library Committee.                                  |
| 10 | W  | Meeting of Council.                                            |
| 11 | Th |                                                                |
| 12 | F  |                                                                |
| 13 | S  | Last day for Certifs. for M.B. Exam.                           |
| 14 | S  |                                                                |
| 15 | M  | B.Sc. Examination.                                             |
| 16 | Tu | <i>Id.</i> _____                                               |
| 17 | W  | <i>Id.</i> _____                                               |
| 18 | Th | <i>Id.</i> _____                                               |
| 19 | F  | <i>Id.</i> _____                                               |
| 20 | S  | <i>Id.</i> _____                                               |
| 21 | S  |                                                                |
| 22 | M  | <i>Id.</i> _____ B.A. Exam.                                    |
| 23 | Tu | <i>Id.</i> _____ <i>Id.</i> _____                              |
| 24 | W  | <i>Id.</i> _____ <i>Id.</i> _____                              |
| 25 | Th | <i>Id.</i> _____ <i>Id.</i> _____ { Meeting of Academic Board. |
| 26 | F  | <i>Id.</i> _____                                               |
| 27 | S  | <i>Id.</i> _____                                               |
| 28 | S  |                                                                |
| 29 | M  | <i>Id.</i> _____ M.B. Exam.                                    |
| 30 | Tu | <i>Id.</i> _____ <i>Id.</i> _____                              |
| 31 | W  | <i>Id.</i> _____ <i>Id.</i> _____                              |



## NOVEMBER—1888.

|    |    |                                                             |
|----|----|-------------------------------------------------------------|
| 1  | Th | B.Sc. Exam.      M.B. Exam.                                 |
| 2  | F  |                                                             |
| 3  | S  |                                                             |
| 4  | §  |                                                             |
| 5  | M  |                                                             |
| 6  | Tu |                                                             |
| 7  | W  | Meeting of House, Education, and Discipline Committee.      |
| 8  | Th | M.B. Exam.                                                  |
| 9  | F  | <i>Id.</i> ———                                              |
| 10 | S  | <i>Id.</i> ———      B.A. and B.Sc. Pass Lists Published.    |
| 11 | §  |                                                             |
| 12 | M  | B.A. Hons. Exam. commences.    B.Sc. Hons. Exam. commences. |
| 13 | Tu |                                                             |
| 14 | W  | Meeting of Council.                                         |
| 15 | Th | M.B. Exam.                                                  |
| 16 | F  | <i>Id.</i> ———                                              |
| 17 | S  | <i>Id.</i> ———                                              |
| 18 | §  |                                                             |
| 19 | M  |                                                             |
| 20 | Tu |                                                             |
| 21 | W  |                                                             |
| 22 | Th |                                                             |
| 23 | F  |                                                             |
| 24 | S  |                                                             |
| 25 | §  |                                                             |
| 26 | M  |                                                             |
| 27 | Tu |                                                             |
| 28 | W  |                                                             |
| 29 | Th | Meeting of Academic Board.                                  |
| 30 | F  |                                                             |

## DECEMBER—1888.

|    |    |                                                       |
|----|----|-------------------------------------------------------|
| 1  | S  |                                                       |
| 2  | S  |                                                       |
| 3  | M  |                                                       |
| 4  | Tu |                                                       |
| 5  | W  | Meeting of House, Education and Discipline Committee. |
| 6  | Th |                                                       |
| 7  | F  |                                                       |
| 8  | S  |                                                       |
| 9  | S  |                                                       |
| 10 | M  |                                                       |
| 11 | Tu |                                                       |
| 12 | W  | Meeting of Council.                                   |
| 13 | Th |                                                       |
| 14 | F  | Last day for Certifs. for January Matric.             |
| 15 | S  |                                                       |
| 16 | S  |                                                       |
| 17 | M  |                                                       |
| 18 | Tu |                                                       |
| 19 | W  |                                                       |
| 20 | Th |                                                       |
| 21 | F  |                                                       |
| 22 | S  |                                                       |
| 23 | S  |                                                       |
| 24 | M  |                                                       |
| 25 | Tu | <i>CHRISTMAS DAY.</i>                                 |
| 26 | W  | Bank Holiday.                                         |
| 27 | Th |                                                       |
| 28 | F  |                                                       |
| 29 | S  |                                                       |
| 30 | S  |                                                       |
| 31 | M  |                                                       |

THE MASON SCIENCE COLLEGE,  
BIRMINGHAM.



FOUNDED BY SIR JOSIAH MASON, KNIGHT,  
FEBRUARY 23rd, 1875.

OPENED OCTOBER 1st, 1880.



## Trustees of the College.

---

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ROBERT LAWSON TAIT, Esq.

## Officers.

Mr. G. J. JOHNSON, *Hon. Secretary.*

Mr. G. H. MORLEY, *Secretary and Registrar.*





# Academic Board.

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|                                                                | Date of<br>Appointment. |
|----------------------------------------------------------------|-------------------------|
| Professor T. W. BRIDGE, M.A.,<br><i>Chairman.</i>              | } 10th Jan., 1880.      |
| Professor W. HILLHOUSE, M.A.,<br>F.L.S., <i>Vice-Chairman.</i> | } 5th April, 1882.      |
| Professor R. S. HEATH, M.A., D.Sc.,<br><i>Secretary.</i>       | } 21st May, 1884.       |
| Professor F. J. ALLEN, M.A., M.B.                              | ...13th July, 1887.     |
| Professor E. ARBER, F.S.A.                                     | .....19th May, 1881.    |
| Professor W. E. BENTON, Assoc. R.S.M.,<br>F.G.S.               | } 8th July, 1885.       |
| Professor K. DAMMANN, Ph.D.                                    | ..... 10th May, 1881.   |
| Professor C. LAPWORTH, LL.D., F.G.S.                           | 10th May, 1881.         |
| Professor E. LOREILLE, B.ès-L.                                 | .....2nd July, 1884.    |
| Professor J. H. POYNTING, D.Sc.                                | .....10th Jan., 1880.   |
| Professor R. H. SMITH, M.I.M.E.,<br>M.I.C.E.                   | } 10th May, 1881.       |
| Professor E. A. SONNENSCHNEIN, M.A.                            | 15th Nov., 1882.        |
| Professor W. A. TILDEN, D.Sc., F.R.S.                          | ,...10th Jan., 1880.    |

## PROFESSORS, LECTURERS, AND OTHER OFFICERS OF THE COLLEGE.

|                                              |   |                                                                                                                                                                       |
|----------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Greek . . . . .                              | } | Professor E. A. SONNENSCHIEIN, M.A., Oxon.,<br>B.A., Lond.                                                                                                            |
| Latin . . . . .                              |   |                                                                                                                                                                       |
| English Language and Literature              | { | Professor EDWARD ARBER, F.S.A., Fellow<br>of King's College, London.                                                                                                  |
| French . . . . .                             | { | Professor E. LOREILLE, B.ès-L., University<br>of France.                                                                                                              |
| German . . . . .                             |   | Professor KARL DAMMANN, Ph. D.                                                                                                                                        |
| Mathematics . . . . .                        | { | Professor ROBERT S. HEATH, M.A., Cantab.,<br>D.Sc., Lond., Fellow of Trinity College,<br>Cambridge.                                                                   |
| Physics . . . . .                            | { | Professor J. H. POYNTING, D.Sc., late<br>Fellow of Trinity College, Cambridge.<br>Demonstrator, ERNEST F. J. LOVE, B.A.,<br>Cantab.                                   |
| Chemistry . . . . .                          | { | Professor W. A. TILDEN, D.Sc., Lond.,<br>F.R.S.<br>Assistant Lecturer, W. W. J. NICOL, M.A.,<br>D.Sc., Edin.<br>Demonstrator, THOMAS TURNER, Assoc.<br>R.S.M., F.C.S. |
| Metallurgy . . . . .                         |   | Professor W. A. TILDEN, D.Sc., Lond., F.R.S.<br>Lecturer and Instructor in Assaying, THOS.<br>TURNER, Assoc. R.S.M., F.C.S.                                           |
| Zoology and Comparative<br>Anatomy . . . . . | { | Professor T. W. BRIDGE, M.A., Cantab.,<br>Professor's Assistant, F. W. CRISPE.                                                                                        |
| Botany and Vegetable Physiology              | { | Professor W. HILLHOUSE, M.A., Cantab.,<br>F.L.S.                                                                                                                      |
| Physiology . . . . .                         | { | Professor F. J. ALLEN, M.A., M.B. Cantab.,<br>M.R.C.S., L.R.C.P.                                                                                                      |
| Geology and Physiography . . . . .           |   | Professor CHARLES LAPWORTH, LL.D., F.G.S.                                                                                                                             |
| Mining . . . . .                             |   | Professor W. E. BENTON, Assoc. R.S.M., F.G.S.                                                                                                                         |
| Civil and Mechanical Engineering             | { | Professor ROBERT H. SMITH, M.I.M.E.,<br>M.I.C.E., Mem. of the Order of Meiji<br>of Japan.<br>Demonstrator and Workshop Instructor,<br>J. HAMILTON, Whitworth Scholar. |
| Librarian . . . . .                          |   | W. H. COPE.                                                                                                                                                           |

|                                             |               |
|---------------------------------------------|---------------|
| Steward . . . . .                           | W. HODGKISS.  |
| Clerk . . . . .                             | F. E. MOORE.  |
| Assistant in Physical Laboratory . . . .    | A. T. RYDER.  |
| Assistant in Chemical Laboratory . . . .    | G. E. WELCH.  |
| Assistant in Physiological Laboratory . . . | F. BISSELL.   |
| Assistant in Geological Museum . . . .      | C. G. CULLIS. |
| Fitter in Engineering Department . . . .    | G. FISHER.    |
| Chief Porter . . . . .                      | JOSEPH EVANS. |
| Assistant Porter . . . . .                  | G. LACEY.     |
| Fitter . . . . .                            | D. JONES.     |



**SESSION 1887-1888.**

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**FACULTIES OF ARTS AND SCIENCE.**

The Session will be opened on Monday, 3rd October, 1887, when a Meeting of the Students and their friends will be held in the Chemistry Lecture Theatre of the College. The prizes will then be distributed, and the Bailiff will present his Annual Report.

An Address will afterwards be delivered by the Chairman of the Academic Board (Professor Bridge, M.A.)

The Session is divided into the following Terms :—

**WINTER TERM—**

Commencement, 3rd October, 1887 ;

Termination, 21st December, 1887.

**SPRING TERM—**

Commencement, 17th January, 1888 ;

Termination, 28th March, 1888.

**SUMMER TERM—**

Commencement, 24th April, 1888 ;

Termination, 4th July, 1888.

The College is closed on February 23rd, the Founder's birthday, and on Whit-Monday.

Examinations will be held at the following dates :—

CHRISTMAS—16th to 21st December.

EASTER—23rd to 28th March.

MIDSUMMER—25th June to 4th July.



## THE FOUNDATION DEEDS.

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The following Extracts from the original Foundation Deed dated the 12th of December, 1870, and the two subsequent Deeds of Variation dated respectively, the first the 23rd of February, 1874, and the second the 23rd of February, 1881, show the objects and aim of the College.

### EXTRACTS FROM THE DEED DATED 12TH OF DECEMBER, 1870.

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14.

Preliminary declaration of purpose.

\* Altered to the Mason Science College, by deed of Feb. 23, 1881.

AND IT BEING UNDERSTOOD that the Institution intended to be hereby founded is intended to be called \* "JOSIAH MASON'S SCIENTIFIC COLLEGE," or "JOSIAH MASON'S COLLEGE FOR THE STUDY OF PRACTICAL SCIENCE," and that the same and the Preparatory School which may be added thereto in pursuance of the trusts herein contained are referred to either under those designations or one of them, or under the more general expression, "The Institution," he, the said Josiah Mason, hereby declares that his intention in founding the same is to promote, in conformity with the provisions of these presents, thorough systematic education and instruction specially adapted to the practical, mechanical, and artistic requirements of the manufactures and industrial pursuits of the Midland District, and particularly the Boroughs of Birmingham and Kidderminster, to the exclusion of mere literary education and instruction, and of all teaching of theology and of subjects purely theological, which limitations the said Josiah Mason hereby declares to be fundamental, and that with that view the Institution shall, when completed fit for occupation, be for the use and accommodation,

General declaration of trusts, freehold and leasehold.

under the provisions in that behalf herein-after contained, of such students and other persons of the class and description hereinafter in that behalf specified, as shall be from time to time admitted under the provisions in that behalf hereinafter contained, and of all such professors, lecturers, librarians, teachers, and other persons as shall from time to time be hired, employed, or invited to attend at or assist in carrying out all the purposes of the Institution in conformity with the provisions of these presents; AND for more particularly setting forth the trusts and purposes of these presents, IT IS HEREBY DECLARED AND AGREED, and the said Josiah Mason doth hereby expressly direct that, subject and without prejudice to the uses, trusts, and powers hereinbefore declared or authorised as to the freehold hereditaments hereinbefore assured, the said parties hereto of the second part, their heirs, executors, administrators, and assigns respectively, shall henceforth stand seized and possessed of and interested in as well the said freehold messuages, lands, and hereditaments hereby expressed to be assured as of the said leasehold messuages hereby assigned or intended so to be respectively, with the respective appurtenances (all which, as well freehold as leasehold, are intended to be comprised and referred to in the expression "the hereby assured hereditaments"), upon the trusts and with, under, and subject to the provisions and declarations hereinafter contained and declared concerning the same respectively (that is to say), UPON TRUST that they the said parties hereto of the second part, and the survivor of them, and the heirs, executors, or administrators of such survivor, and their or his assigns (as the case may be), or other the trustees or trustee for the time being of these presents, who (unless otherwise distinguished) are and is herein-after referred to as "the Trustees," do and shall from time to time permit the Founder, his executors or administrators, or any other person or persons to



be appointed by the Founder, if for the time being living, or if he shall be for the time being dead, then to be approved by the trustees, from time to time to enter into and upon the hereby assured hereditaments or any part or parts thereof respectively, and to cause the houses and buildings now standing or hereafter to be erected upon the said fifthly and sixthly described hereditaments, and upon such other part or parts (if any) of the hereby assured hereditaments, as shall be for the time being thought expedient by the Founder, or after his decease, by the trustees, to be either wholly or partly pulled down, and all such alterations or additions to be made thereto, and such other erections or buildings to be erected on the site thereof, and also whether any such houses or buildings shall or shall not for the time being have been either wholly or partly pulled down as aforesaid, to cause such erections or buildings to be erected on any portions for the time being vacant of the hereby assured hereditaments as shall in such judgment as aforesaid be requisite, first for a College, with the buildings, fixtures, fittings, apparatus, mechanical, scientific, and artistic, necessary for the thorough systematic education of regular students as herein defined, and afterwards for a school for youth of both sexes for a general and special education preparatory to the studies of the said College, and for any other buildings expedient for otherwise effectuating the purposes of these presents; AND DO AND SHALL PERMIT all such erections and buildings, when so erected, or so altered and improved as aforesaid, and such other portions (if any) of the hereby assured hereditaments as in such judgment as aforesaid it shall be from time to time thought necessary or expedient to appropriate in that behalf, to be used, occupied, and enjoyed for the accommodation and convenience of the Institution, and of the professors, teachers, students; and other persons from time to time lawfully resorting thither in conformity with the

And permit the buildings to be used as the Institute.

provisions and regulations contained in or authorised by these presents.

#### 24.

Provision as to  
course of instruc-  
tion.

\* Extended by  
the two Deeds of  
Variation.

As soon as practicable after the completion of suitable buildings and erections in connection with the Institution, proper arrangements shall be made by the Trustees for the systematic instruction of the students by means of regular classes, and such other means as shall from time to time be deemed expedient, in all such subjects as shall be necessary to accomplish the purpose and intention of the said Institution as heretofore declared. AND the Founder hereby expressly declares that such instruction (hereinafter referred to as

\* "regular systematic instruction") shall as far as practicable, include the following subjects, viz. :

Mathematics, abstract and applied ; Physics, both mathematical and experimental ; Chemistry, theoretical, practical, and applied ; the Natural Sciences, especially geology and mineralogy, with their application to mines and metallurgy ; Botany and Zoology, with special application to manufactures ; and Physiology, with special reference to the laws of health ; and the English, French, and German languages ; and may in the discretion of the trustees include all such other subjects of instruction as shall be necessary to carry into effect the intention of the Founder to give thorough systematic scientific education and instruction specially adapted to the practical, mechanical, and artistic requirements for the time being of the manufactures and industrial pursuits of the Midland district and of the boroughs of Birmingham and Kidderminster and the surrounding districts, specially including mechanical drawing and architecture, but excluding mere literary education and instruction.

#### 25.

Powers of Trustees as to arrangements for popular or unsystematic instruction.

IN addition to the arrangements for regular systematic instruction hereinbefore directed, and subject and without prejudice to such arrangements, it shall be lawful for the trustees to make arrangements for giving instruction (hereinafter

referred to as "popular or unsystematic instruction") of a more general or popular character, by means of additional lectures or classes, whether occasional or otherwise, upon all or such one or more of the subjects which must or may be included in the regular systematic instruction as the trustees shall from time to time approve.

26.

Questions purely theological or political not to be taught.

PROVIDED ALWAYS that no lectures, or teaching, or examination shall be permitted in the institution upon theology, or any question or subject in its nature purely theological, or upon any question which for the time being shall be the subject of party political controversy; and this condition the said Josiah Mason doth declare to be fundamental.

27.

Provision for popular or unsystematic instruction.

AND with regard to the lectures and classes in connection with popular or unsystematic instruction it is hereby declared that they may, in the discretion of the Trustees, be either gratuitous, or for such fees or other consideration as the Trustees shall from time to time think fit to appoint or authorise, and shall be open to the attendance of all persons, without distinction of age, class, creed, race, or sex, who shall from time to time incline to attend, and shall be held at such times and under such regulations consistent with the provisions of these presents as the Trustees shall from time to time think fit to appoint.

28.

As to systematic instruction.

AND it being understood that the lectures and classes in connection with the regular systematic instruction hereinbefore directed are hereinafter referred to as "the regular lectures and classes," it is hereby declared that the regular lectures and classes shall be held at such times and under such regulations as regards fees or payments in respect thereof, and shall be open to the attendance of such students without distinction of creed, race, or sex, as the Trustees shall from time to time, consistently with the provisions of these presents, think fit to direct.

29.

PROVIDED ALWAYS that the Trustees shall have absolute discretion as to the scales of fees or pay-

ments to be required or taken, as well for the popular or unsystematic instruction as for the regular and systematic instruction, and shall not be obliged to adopt uniform scales of fees, but may vary the same to adapt them to the varying conditions of the different classes of pupils, and may in their absolute discretion remit wholly or in part the fees which according to any scale would be payable by any student or number of students.

30.

AND it being understood that the persons who under the provisions of these presents shall be admitted to attendance upon all or any of the regular lectures or classes forming "the regular systematic instruction" of the institution are hereinafter referred to as "the regular students," it is, with regard to the numbers and qualifications of such regular students, hereby declared as follows, namely :

31.

Regulations as to  
number and ad-  
mission of stu-  
dents.

THE number of regular students to be admitted to the benefits of the Institution shall be such number as the Trustees shall consider the Institution for the time being capable of accommodating. In the admission of regular students qualified as herein provided, the Trustees shall (other things being equal) give preference to candidates otherwise eligible for admission who have been, or shall for the time being be, inmates of Josiah Mason's Orphanage, and who shall be recommended by the trustees of the said Orphanage as qualified by natural ability and inclination to profit by the course of instruction at the said Institution, yet so that no such preference shall be given to such students hereinafter termed "Orphanage students" if and whilst such Orphanage students shall for the time being be one-fifth of the whole number of regular students, and, subject to such preference of Orphanage students, the Trustees shall (other things being equal), in the admission of regular students, give the preference to candidates (otherwise eligible for admission) born within the boroughs of Birmingham and Kidderminster, in the proportion of

two Birmingham students to one Kidderminster student.

BY THE SECOND CLAUSE OF A DEED OF VARIATION, DATED 23RD DAY OF FEBRUARY, 1874, IT IS PROVIDED THAT if and whilst but only if and whilst the Founder or after his decease the Trustees shall from time to time think expedient the expression "regular systematic instruction" referred to in the Deed of Foundation may include the following subjects (hereinafter referred to as "the said additional subjects") namely—Anatomy and the Greek and Latin languages and the said additional subjects or such of them as the Trustees with the concurrence of the Founder if for the time being living shall for the time being think it expedient to include as part of such regular systematic instruction shall be taught as part of such regular systematic instruction in accordance with the provisions of the Deed of Foundation under such regulations and restrictions as the Trustees with the concurrence of the Founder (if for the time being living) shall from time to time approve.

THE LAST DEED OF VARIATION, DATED THE 23RD DAY OF FEBRUARY, 1881, recites that, by a Deed thereafter referred to as "the said Supplemental Deed") supplemental to the before mentioned Deed of Foundation bearing date the twenty-third day of February, one thousand eight hundred and seventy-four, the Founder (subject nevertheless to the power therein contained of altering or varying such supplemental provisions) hath authorized the teaching of certain other subjects not specifically included in the Foundation Deed for the purpose of making in the institution established by the said Deed of Foundation provision for the systematic instruction of students of medicine and surgery, AND WHEREAS, since the date and execution of the said Supplemental Deed the University called

“The Victoria University” has been constituted under a charter granted by Her Present Majesty Queen Victoria bearing date the twentieth day of April, one thousand eight hundred and eighty, under which charter power is given to the said Victoria University to incorporate with itself any incorporated College on the conditions therein mentioned the first of which conditions is that the College applying to be admitted a College in the said University shall have established a reasonably complete curriculum and shall possess a reasonably sufficient teaching staff in the department of arts and sciences at least. AND WHEREAS, in order the more fully to effectuate the objects of the institution established by the said Deed of Foundation, and the better to adapt the said institution to the existing practical, mechanical, and artistic requirements of the manufacturing and industrial population of the Midland district of England and especially of the boroughs of Birmingham and Kidderminster the Founder is desirous of so enlarging the powers of the Trustees as to enable them to provide in the said institution such systematic instruction as will enable it to be hereafter admitted as a College in the said Victoria University or any other University and he has accordingly determined to exercise the powers vested in him by the said Deed of Foundation and the said Supplemental Deed respectively of varying the trusts and provisions contained therein to the extent and in manner hereinafter specified. NOW THESE PRESENTS WITNESS that for effectuating the said desire and determination and by virtue and in exercise and execution of the power or authority or powers or authorities to him the said Sir Josiah Mason for this purpose given as well by the Deed of Foundation as by the Supplemental Deed and of every other power or authority in anywise enabling him in this behalf. HE the said Sir Josiah Mason the Founder, BOTH by this Deed by

him sealed and delivered in the presence of and attested by the two persons whose names are intended to be hereunder written as witnesses attesting the sealing and delivery of these presents by the said Sir Josiah Mason direct and appoint as follows namely—

1.

Enlargement of the scope of the regular systematic instruction authorised by the Deed of Foundation.

If and whilst but only if and whilst the Founder or after his decease the Trustees shall from time to time think expedient the “regular systematic instruction” authorised by the said Deed of Foundation may include not only the subjects specified in that behalf in the said Deed of Foundation and the additional subjects specified in that behalf in the said supplemental Deed but also all such other subjects (if any) not being expressly excluded by the said Deed of Foundation as the Founder if for the time being living and after his decease the Trustees for the time being, shall judge necessary or desirable for the general benefit of the students with the view more especially of promoting and maintaining such a course of study as shall qualify for degrees in Arts and Science in the said Victoria University or the London University or any other University of which the Institution shall form part.

2.

Clause 3 in supplemental deed annulled and new clause substituted.

The Clause numbered 3 in the said supplemental Deed shall be and the same is hereby revoked and annulled, and the following Clause or provision shall be taken in lieu and substitution thereof (that is to say)—

3.

Substituted clause.

It shall be lawful for the Trustees, if and whilst they shall from time to time think proper, with the concurrence of the Founder (if for the time being living) from time to time to permit any part or parts of the buildings for the time being occupied for the purposes of the Institution established under the provisions of the Deed of Foundation to be used as lecture rooms class rooms and otherwise for the accommodation of such Professors Lecturers or Teachers and other persons as shall be from time to time appointed

or authorised in that behalf under the provisions of the Deed of Foundation and of the Deed or Deeds for the time being incorporated therewith for the purpose both of giving "regular systematic instruction" within the meaning of that expression as defined by the Deed of Foundation and these presents and of giving popular or unsystematic instruction upon such other subjects not expressly excluded by the Deed of Foundation as the Trustees shall from time to time think fit and also from time to time to vary the course of instruction either by the addition or introduction of subjects not for the time being previously taught and not expressly included by the Deed of Foundation or by the discontinuance of any subject or class of subjects previously taught, as the Trustees shall from time to time in their absolute discretion think fit.

4.

Power to become  
affiliated to Vic-  
toria University.

The Trustees for the time being of the Institution established by the Deed of Foundation are hereby authorised if and when they shall in their absolute discretion think proper to apply for the admission of the said institution as a college affiliated to or in connection with the said Victoria University or any other university granting degrees in arts and sciences and with that view to take all such proceedings as they may think proper for the incorporation of the said institution as provided by the last clause of the Deed of Foundation as a College in any such University and to defray the costs and expenses of all such proceedings either out of the capital of the trust funds vested in them or out of the income thereof at their discretion.

5.

The Name of the  
Institution to be  
the Mason  
Science College.

Subject and without prejudice to the provision as to changing the name or incorporation contained in the last Clause of the Deed of Foundation the name of the institution established by the Deed of Foundation shall be and is hereby declared to be "The Mason Science College."

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### ADMISSION OF STUDENTS.

1.—The Chairman of the Academic Board and the Professors will be present on Friday, the 30th of September, from ten o'clock a.m. to one o'clock p.m., to confer with intending Students and give them advice respecting their classes.

2.—No student will be admitted under the age of sixteen without having passed a preliminary examination. (*For regulations see p. 44.*)

3.—Students *over* sixteen years of age are admitted without any examination whatever, but they are strongly recommended to consult the Professors of the subjects they propose to study before finally selecting their classes.

4.—*All Departments of the College are open to both sexes on the same terms. Special arrangements are made for the convenience of Ladies.*

5.—Applications for admission to the Classes must be made, either in writing or personally, to the Secretary, Mason Science College, Birmingham.

6.—Students on applying to enter any class are required to sign an engagement that they will conform to such regulations as have been or may be made for the maintenance of order in the College, and in the classes they attend.

7.—All Fees are to be paid in advance (*i.e.* at the beginning of the Session or Term on account of which they are due) at the Secretary's Office, in the College. Drafts should be drawn in favour of Mr. G. H. Morley.

8.—Students should not enter for classes until after mature consideration, as fees once paid cannot be returned.

9.—Within the first week of attendance at any class, each Student is required to present to the Professor either a ticket for that class, or a written statement from the Secretary shewing the reason why delay in taking out such ticket has been allowed.

10.—Students intending to take lodgings in Birmingham or the vicinity are requested to place themselves in communication with the Secretary.

**ENTRANCE EXAMINATION FOR STUDENTS  
UNDER 16 YEARS OF AGE.**

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1.—Morning, 10 to 1 :—*Arithmetic*, including proportion and extraction of square root; *Algebra* to simple equations; *Geometry*, First Book of Euclid or its equivalent.

2.—Afternoon, 2 to 5 :—Paper on *English Grammar* and *Dictation*.

*Vivâ-voce* examination in either Greek, Latin, French or German at the choice of the candidate.

Notice must be given by Candidates for this examination, to the Secretary, ten clear days before the commencement of term.

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**REGULATIONS TO BE OBSERVED BY STUDENTS.**

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1.—All Students are required to conduct themselves in a quiet and orderly manner whilst in the College, not only during lecture hours, but on entering and leaving the building.

2.—Smoking is strictly prohibited except in the Common Room. This regulation extends to the pavement immediately in front of the College.

3.—Students are required to attend punctually and regularly at the lectures and classes for which their names are entered.

4.—When a Student has been absent it is desirable that he should report the cause of his absence to the Professor on his return to the class. In the event of illness or unavoidable absence notice should be sent to the Secretary of the College as soon as convenient.

### COMMON ROOMS.

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A Common Room on the ground floor is provided for male Students.

Separate cloak rooms and reading rooms in the east wing (ground floor) are reserved for the accommodation of female Students.

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The Secretary's Office is open from 9 to 1, and 2 to 5, except on Saturdays, when it closes at 1.

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### LOCKERS FOR BOOKS, &c.

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Lockers are provided in the locker room (first floor), to enable students to preserve their books and papers in safety, at a charge of one shilling per term. Each student will be supplied with a key, upon which a deposit of one shilling will be charged. The key must be delivered up to the Steward on or before the last day of the Session, or the deposit will be forfeited.

A master-key of all the lockers is kept by the Steward.

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### LIBRARY.

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The Library is open for the use of Students throughout the Session on the first five days of the week, from 9 a.m. till 6 p.m., and on Saturday, during the Winter and Spring Terms from 9 a.m. till 5 p.m., and during the Summer Term from 9 a.m. till 1 p.m. It is also open during

the vacation, but is then closed at 5 p.m. on the first five days of the week, and at 1 p.m. on Saturday, and is closed from the middle of August to the middle of September for cleaning.

The following are further regulations for the use of the Library:—

- 1.—Strict silence must be observed in the Library.
  - 2.—Students are permitted to take books from the shelves ; but they are to be returned to the Librarian, and are not to be placed on the shelves by the readers.
  - 3.—The Library is to be used for reference only, and no books, pamphlets, journals, or patent specifications are allowed to be taken from it, except by members of the teaching staff and those who have obtained the express permission of the Council.
  - 4.—Certain valuable books of reference, as indicated by the Council, will not be allowed to be taken from the Library.
  - 5.—In the event of a book being injured, the person injuring it will be required to supply another copy in its place, to the satisfaction of the Council.
  - 6.—Books borrowed from the Library must be returned to the Librarian before the expiration of 15 days, subject to a renewal for a further period of 15 days, unless required by another reader. No one is allowed to have more than three volumes at one time in his possession.
  - 7.—All books, pamphlets, &c., in the hands of those having permission to borrow them must be returned by the first day of August.
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## SCHOLARSHIPS AND PRIZES.

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The following Scholarships and Prizes, to be awarded during the Session 1887-88, are offered for competition:—

- A. *Entrance Scholarships—tenable for one Year.*  
Two Scholarships of £25 each.
- B. *Scholarships for Students of One Year's standing—tenable during the Second Year.*  
Two Scholarships of £30 each.
- C. *Scholarships for Students of Two Years' standing—tenable during the Third Year.*  
Two Scholarships of £30 each.
- D. *Prizes connected with the Examinations of the University of London.*
- E. *Technical Scholarships—tenable for One Year.*

Two Scholarships of £30 each.

*Mem.*—Any balance from unawarded Scholarships may be paid, in terminal instalments, to students of special merit of at least Two or Three years' standing—such students not being required to pay fees.

### I.—GENERAL REGULATIONS.

1. The Scholarships are open to all students, or intending students, without distinction of sex.
2. It is within the discretion of the Academic Board to recommend to the Council that any of these Scholarships be withheld, if the examiners report that no candidates of sufficient merit have presented themselves.
3. No two Scholarships given by the College may be held at the same time by the same student.
4. All scholars are required to attend classes in three different departments of the College (Latin and Greek to count as two) during the whole period of tenure of their Scholarships, (with the exception of Queen's College students attending Anatomy classes, who are required to attend in two different departments); and

also to obtain the written approval of the Chairman of the Academic Board for the course of study they propose to follow.

5. Scholarship payments are made at the commencement of each term, in three equal instalments; the second and third on condition of a satisfactory report being sent in by the several Professors concerned to the Chairman of the Academic Board; such report being communicated to the Council.

Payment of the fees on the Sessional Scale is in such cases allowed in terminal instalments.

6. Honorary Scholarships may be awarded to students who are qualified, but who may not desire to take pecuniary rewards. In such cases the scholarship may be awarded to the student next in order of merit, provided such student be deemed worthy of a scholarship by the Academic Board.

## II.—ENTRANCE SCHOLARSHIPS.

1. Two Entrance Scholarships of £25 each for one year, to be competed for immediately before the commencement of the Session.

2. Candidates for Entrance Scholarships must be under eighteen years of age on the first of October nearest to the date of the examination; and they are required to produce a certificate of good conduct from the last school attended.

3. One of the two Entrance Scholarships shall be offered for candidates who present themselves for examination in Group **A**, and one for candidates who present themselves for examination in Group **B**.

In Group **A** the subjects for examination will be any three of the following subjects:—

Latin.  
Greek.  
English.  
French.  
German.  
Mathematics.

In Group **B** the subjects for examination will be any three of the following subjects :—

Mathematics.  
Physics.  
Chemistry.  
Zoology.  
Botany.  
Physiography.  
French or German.

In cases of approximate equality on the part of candidates in Group **B**, preference will be given to that candidate who possesses a knowledge of Drawing.

4. These Scholarships are adjudged by the Academic Board, on Report of Committees consisting respectively of the Professors examining in each group.

5. Candidates for these Scholarships must send in their names to the Secretary and Registrar not later than the 17th of September prior to the examination, and they must then state what group, and subjects in the group, they propose to take.

### III.—SCHOLARSHIPS FOR STUDENTS OF ONE YEAR'S STANDING, TENABLE DURING THE SECOND YEAR.

Two Scholarships of £30 each for the best First Year students, upon condition of having attended classes in at least three separate departments of the College during the whole of the Session (with the exception of Queen's College students who shall have attended in two different departments).

The selection of the best candidate in any Department to be made by the Professor concerned on some basis of examination.

Credit will not be given for results obtained in more than four subjects of examination.

IV.—SCHOLARSHIPS FOR STUDENTS OF TWO YEARS' STANDING, TENABLE DURING THE THIRD YEAR.

Two Scholarships of £30 each for students who have completed their second year's course of study in the College, to be awarded to the students who have obtained the best place in the College Examinations, one in the Science, and the other in the Arts Department, upon condition of having attended classes in at least three separate departments of the College during the whole of the Session (with the exception of Queen's College students who have attended Anatomy Classes, and shall have attended in two different departments).

Credit will not be given for results obtained in more than four subjects of examination.

Third Year students are not required to attend in three different departments during the tenure of their Scholarship, but they must obtain the written approval of the Chairman of the Academic Board to the course of study they propose to follow.

V.—PRIZES CONNECTED WITH THE EXAMINATIONS OF THE UNIVERSITY OF LONDON, TENABLE DURING THE SESSION.

1. A prize of books or instruments to the value of £5 for any student who shall take First Class Honours in the following examinations of the University of London :—

Preliminary Scientific (M.B.)

Intermediate Arts.

Intermediate Science.

Final Examination for Degree of B.A.

Final Examination for Degree of B.Sc.

2. A prize of books or instruments to the value of £3 for any student who shall take Second Class Honours in—

Preliminary Scientific (M.B.)

Intermediate Arts.

Intermediate Science.

Final Examination for Degree of B.A.

Final Examination for Degree of B.Sc.



## VI.—TECHNICAL SCHOLARSHIPS.

Two Technical Scholarships of £30 each for one year—one to be awarded in the Chemical Department, and the other in the Engineering Department.

The Scholarship in the Chemical Department is awarded to the candidate who obtains the highest place in an examination in Theoretical and Practical Chemistry, to be held at the commencement of the Session. All candidates must have either (*a*) studied Chemistry in the College during two years previously, according to the course prescribed in the Calendar for students preparing for the Associateship of the Institute of Chemistry (French and German not being compulsory), or (*b*) they may be Bachelors of Science of the University of London, or (*c*) Associates of the Institute of Chemistry. This Scholarship not to be tenable by the Priestley Scholar from the Birmingham and Midland Institute.

The Scholarship in the Engineering Department shall be awarded to the student who, having studied Engineering for two years in the College, obtains the highest place in the College Examinations in the Technical Engineering Classes, held during the Session.

NOTE.—*The above technical scholarships being presented by the Messrs. Tangye the holders of them will be styled "Tangye Scholars."*

VII.—Any balance remaining from Scholarships unawarded under the foregoing scheme may be placed to a special fund, from which sums of £10 to £30 may be granted, from time to time, to students of special merit who have passed two or three years as systematic students in the College, in order to enable them to pursue original research in any one of the laboratories under the direction of the Professor, or to continue to study with a view to a higher degree, such as M.A., or D.Sc.

These grants will be made in three terminal instalments, and be payable only on condition of a favourable report from the Professor under whose direction the student is studying.

Such students are not required to pay fees.

(*For list of Scholars see next page.*)

| SCHOLARS.                             |          |     |               |
|---------------------------------------|----------|-----|---------------|
|                                       | ELECTED. |     | RE-ELECTED.   |
| Badger, Alfred Bernard .....          | 1884     |     |               |
| Baker, Thomas James.....              | 1886     |     |               |
| Baylis, Walter Henry.....             | 1886     |     |               |
| Blatch, Francis Joseph.....           | 1885     |     |               |
| Chattaway, Frederick Daniel .....     | 1884     |     |               |
| Challen, Walter Bernard.....          | 1884     |     |               |
| Crump, Ernest Henry.....              | 1886     |     |               |
| Daniell, George Frederick .....       | 1885     |     |               |
| Edwards, Jessie.....                  | 1884     |     |               |
| Ehrhardt, Ernest Francis .....        | 1885     |     |               |
| Exell, William Wallis .....           | 1886     |     |               |
| Kellett, Alfred Featherstone .....    | 1884     |     |               |
| Lay, Charles Johnson .....            | 1884     | ... | 1885          |
| Manton, Arthur Woodroffe.....         | 1884     |     |               |
| Reynolds, Albert Heywood.....         | 1885     |     |               |
| Stern, Arthur Landauer .....          | 1884     | ... | 1885 ... 1886 |
| Ward, William Latimer Oakden ...      | 1886     |     |               |
| Williams, Walter Collingwood, B.Sc... | 1884     | ... | 1885          |
| Wood, George Croft Orwin .....        | 1886     |     |               |

### THE HESLOP MEMORIAL SCHOLARSHIP.

At a Public Meeting held at the Council House, Birmingham, on Friday, the 3rd of July, 1885, the following resolutions were unanimously passed:—

“That it is desirable to commemorate in some permanent form the long and valuable services rendered to the town of Birmingham, and especially to its Charitable and Educational Institutions, by the late Dr. HESLOP, and thus to place on record the public estimation of his character and labours.”

“That for the purpose mentioned in the previous resolution a subscription list be now opened, and that such subscriptions to the amount of £1,000 be applied to the formation of a Scholarship at the Mason College, tenable by pupils from the Schools on the Foundation of King Edward VI.”

The subscriptions obtained for the purpose of the foregoing resolutions, after deducting costs of advertising,

&c., amounted to £755 19s. 0d., and the income arising therefrom (about £25 per annum) will provide a Heslop Memorial Scholarship, which will be awarded upon the following conditions :—

1. The Scholarship will be open to all pupils who have been pupils in any of the Schools on King Edward's Foundation for not less than two years immediately preceding ;

2. It will be tenable for two years at the Mason Science College ;

3. It will be awarded by the Council of the College on the result of the College examination for Entrance Scholarships ;

4. It will not be tenable together with any other Exhibition or Scholarship awarded at the same examination.

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#### WRIGHT MEMORIAL SCHOLARSHIPS.

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By arrangement with the Birmingham School Board the Council have granted six Wright Memorial Scholarships tenable at the College under the following conditions and regulations :—

- I. The object of a Wright Memorial Scholarship is to enable a scholar to go through a science course at the Mason Science College.

- II. In order to prepare for this, the Scholarship is tenable either at King Edward's School or at the Technical School of the Board, for the time intervening between leaving the Board School and entering the College.

- III. The Scholarship is awarded on the recommendation of the School Management Committee to a candidate who shows special scientific attainments in an examination, and, in making their selection, the School Management Committee have power to consider the particular circumstances of each case.

- IV. The Scholarship is tenable for three years at the Mason Science College, and at King Edward's School

or the Technical School, for such preceding period as may be necessary to fit the scholar to enter the College. The continuance of the Scholarship is at all times subject to satisfactory reports as to the fulfilment of the conditions under which it is held.

V. All College fees are remitted.

SCHOLARS.

|                             | ELECTED. |
|-----------------------------|----------|
| Francis Joseph Blatch ..... | 1882     |
| Thomas Henry Hill .....     | 1882     |
| John Crossley .....         | 1884     |
| John James Podesta .....    | 1885     |
| Harry Bishop .....          | 1885     |
| Frank Jukes Peplow .....    | 1887     |

### THE HESLOP MEMORIAL MEDAL.

THE HESLOP GOLD MEDAL, provided out of the proceeds of a bequest to the College by the late Thomas Pretious Heslop, Esq., M.D., is awarded annually by the Council on the recommendation of the Academic Board, for the best Dissertation or Essay upon a subject to be selected by the candidate. The Medal will be open to past or present students of not less than two years' standing, whose original entry into the College classes dates back not more than six years from the commencement of the current Session.

Before the 25th of December in each year the Academic Board will issue a list of subjects arranged in the following divisions:—

1. Physical Science;
2. Biological Science;
3. Literature or Philosophy.

Candidates will be at liberty either to select from this list, or choose any other subject of similar scope and character.

The Essays must be sent in to the Chairman of the Academic Board, under a motto, not later than the 15th of June; a sealed envelope containing the name of the candidate to be deposited at the same time with the Secretary of the College.

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**THE PANTON GEOLOGICAL PRIZE.**

The "PANTON PRIZE," of the value of Two Guineas,—presented by George Panton, Esq., F.R.S.E.,—is awarded to the best student in the class of Local Geology: the prize being given upon the result of a competitive examination upon the Geology of the neighbourhood of Birmingham, or as a reward for a special thesis upon the Geology of the Birmingham District.

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**ASSOCIATESHIP.**

1. Complete systematic courses of instruction are laid down in all the departments of the Science Faculty of the Mason College, and special Certificates and Diplomas are awarded to those students who pass through these courses satisfactorily.

2. Science Students following these systematic courses are denominated "Associate Students."

3. The title of *Associate of the Mason College* is conferred upon all who have been systematic students of the College during three Sessions, and have passed successfully through the prescribed courses of study laid down in the several branches of Physical, Biological, and Technological Science taught within the College.

4. The course of instruction for students desirous of obtaining the Diploma of Associateship of the Mason College, extends over three years. The instruction is arranged in such a manner as to give the student a preliminary training in the general principles of Science, followed by advanced instruction in one or more special branches. The first year's course of study is the same for all Associate Students. During the Second and Third Years they follow defined courses of advanced instruction, which vary according to the special division of Science in which they elect to take their Associateship.

5. Students who are not candidates for the Associateship may take up the course of instruction in one or more of the three years' courses, and, on passing the Examinations, will receive a certificate to that effect.

6. The Associateship is granted in one or more of the following divisions:—

A. *Physical Science.*

(1) Mathematics, (2) Physics, and (3) Chemistry.

B. *Biological Science.*

(4) Zoology, (5) Botany, (6) Physiology, and  
(7) Geology.

C. *Technological Science.*

(8) Mining and (9) Metallurgy.

7. The prescribed courses of study for these divisions are as follows:—

### FIRST YEAR.

*For all Associate Students.*

Mathematics (Junior), Physics (Junior), Elementary Chemistry, and Natural Science (comprising the Elements of Biology and Physiography), together with one of the following:—(a) French, (b) German, (c) Freehand and Model Drawing as taught in the Engineering Department.

### SECOND YEAR.

#### A. PHYSICAL SCIENCE.

##### 1. MATHEMATICS.

Mathematics (Middle), Physics (Middle), with French, German, or Chemistry (General Course, I.)

##### 2. PHYSICS.

Physics (Middle), Mathematics (Middle), with French, German, or Chemistry (General Course, I.)

##### 3. CHEMISTRY.

Chemistry (Inorganic and Organic), Experimental Physics, with one of the following:—French or German, or Mechanical Drawing.

#### B. BIOLOGICAL SCIENCE.

##### 4. ZOOLOGY.

Zoology (Middle), Botany (Middle), Physiology (Elementary).

## 5. BOTANY.

Botany (Middle), Zoology (General), Physiology (Elementary).

## 6. PHYSIOLOGY.

Physiology (Junior and Practical), Biology (General), Organic Chemistry.

## 7. GEOLOGY.

Geology (Junior), Zoology (General), Chemistry (General Course, I.)

**C. TECHNOLOGICAL SCIENCE.**

## 8. MINING.

Mathematics (Middle), Physics (Middle), Geology (Junior), Mechanical Engineering (one Term).

## 9. METALLURGY.

Chemistry (General Course, I.), Geology (Junior), with one of the following:—Mechanical Drawing, French or German.

**THIRD YEAR.****A. PHYSICAL SCIENCE.**

## 1. MATHEMATICS.

Mathematics, Pure and Applied (Higher Senior); Physics (Senior).

## 2. PHYSICS.

Physics (Senior), Mathematics, Pure and Applied (Senior).

## 3. CHEMISTRY.

Chemistry, with one additional subject chosen from the following:—(a) Technical Chemistry, (b) Mineralogy, (c) Geology.

**B. BIOLOGICAL SCIENCE.**

## 4. ZOOLOGY.

Zoology (Senior), Physiology, (Middle), Geology (Junior).

## 5. BOTANY.

Botany (Senior), Physiology (Middle), Geology (Junior).

## 6. PHYSIOLOGY.

Physiology (Advanced and Practical), Geology (Junior).

## 7a. GEOLOGY (HISTORICAL).

Geology (Historical), Botany (Middle).

**C. TECHNOLOGICAL SCIENCE.**

## 7b. GEOLOGY (APPLIED).

Geology (Applied), with Mineralogy, Mining, and Assaying.

## 8. MINING.

Metal Mining and Mining Machinery, Mine Mapping, Geology (Applied), Metallurgy, Assaying.

## 9. METALLURGY.

Metallurgy and Assaying, Geology (Applied), with one extra subject continued from the second year.

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8. Examinations are held at the end of each year's course of instruction, and at such other periods as may be found necessary. On the results of these Examinations, the successful candidates are arranged in two classes, first and second; there are also honours for the subjects of the Third Year, the candidates being placed in order of merit.

9. Associate Students already qualified in any subject may present themselves for Examination in that subject at the commencement of their First and Second Session; and, on passing such Examination, will receive a Certificate excusing their attendance at the classes in that subject during the year, on payment of the special Examination Fees.

10. An Associate Student must pass the several Examinations in the subjects of each year before proceeding to the next year's course; but, in the event of failure in any one subject, he may present himself again for Examination in that subject the following year, or may proceed as a non-Associate Student.



11. A student who passes successfully through the prescribed course of instruction for the First or Second Year will receive a Special Certificate to that effect.

12. The Diploma of *Associate of the Mason College* will be conferred upon all those who pass successfully in all the subjects laid down for the three years' course they select for their Associateship.

13. They will be required to obtain three First Classes in the First Year, and two in the Second, in distinct departments of the College (one of them being that selected for their Associateship), and to pass the Special Examination to be held at the end of the Third Year.

14. The Fees for the several Associate Courses vary from about £15 to £25 per Session, according to the special division selected by the student.

15. The Diploma of Associate will also be conferred upon those students who have been systematic students of the College for three Sessions, and who have obtained :—

(1) A University Degree, taken with such distinctions as shall be deemed satisfactory by the Academic Board.

(2) The Senior Engineering Diploma.

16. The Associateship may also be conferred for original research or distinguished merit, upon past students of the College who have not fulfilled the above requirements.

17. The Associateship may also be conferred, at the discretion of the Council, upon past members of the staff, who have rendered special services to the College.

18. For the present, Associates will have the following privileges :—

(1) The use of the Library.

(2) Free admission to Lectures, and admission to Laboratories upon payment of a fee to cover expenses.

(For list of Associates see next page.)

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## ASSOCIATES OF THE MASON COLLEGE.

|                                                                          | ELECTED. |
|--------------------------------------------------------------------------|----------|
| Allport, Samuel, Librarian 1880-1887 .....                               | 1887     |
| Barratt, John Oglethorpe Wakelin, B.Sc.(Lond.) .....                     | 1884     |
| Housman, Robert Holden (holder of the Senior Engineering Diploma) .....  | 1884     |
| Manton, Arthur Woodroffe (holder of the Senior Engineering Diploma)..... | 1885     |
| Morris, George Harris, Ph.D. (Würzburg) .....                            | 1884     |
| Riley, John Thomas, D.Sc.(Lond.) .....                                   | 1884     |
| Williams, Walter Collingwood, B.Sc.(Lond.) .....                         | 1884     |

## UNIVERSITY EXAMINATIONS.

The work of the College Classes is designed in the first instance to prepare for the Examinations of the University of London, but attention is also called to the act that by the Statute of April 29th, 1884, women are now admitted to certain of the Honours Examinations for men in the University of Oxford, and are thus enabled to obtain without Residence or Matriculation, and subject only to passing the Delegates Preliminary Examination, a Diploma carrying all the weight of a Degree. The Professors will, so far as possible, endeavour to adapt the work of their respective departments to meet the requirements of Candidates for Oxford.

**DATES OF EXAMINATIONS FOR DEGREES OF  
THE UNIVERSITY OF LONDON.**

The Examinations for Degrees in Arts, Science, and Medicine, and for Honours, Exhibitions, and Scholarships conferred by the *University of London*, take place annually as follows :—

Matriculation in January and June. (The Queen's College, Birmingham, has been appointed a local centre for this examination.)

Intermediate Examinations in Arts and Science in July.  
(The Mason Science College has been appointed a local centre for both these examinations.)

B.A. and B.Sc. in October and November.

M.A. in June.

D.Sc. in June.

D.Lit. in December.

Preliminary Scientific (M.B.) (Pass) in January.

Preliminary Scientific (M.B.) (Pass and Honours) in July. (The Mason Science College has been appointed a local centre for this examination.)

Intermediate Examination in Medicine in July and August.

M.B. in October and November.

B.S. in December.

M.S. in December.

M.D. in December.

Examination in subjects relating to Public Health in December.

Examination in the Art, Theory, and History of Teaching in March.

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## GOVERNMENT AID TOWARDS THE INSTRUCTION OF SCIENCE TEACHERS.

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In accordance with a minute adopted by the Right Honourable the Lords of the Committee of Her Majesty's Most Honourable Privy Council on Education, June, 1881 (Science Form, No. 1,126), their Lordships are prepared to pay three-fourths of the fees for courses of laboratory instruction, as stated below, for a limited number of Teachers engaged in Science Teaching, on condition that satisfactory terminal reports of their progress (to be ascertained by examination), and of their conduct, be received at the end of the Winter, Spring, and Summer Terms.

Applications for this privilege must be made to the Secretary to the Science and Art Department, South Kensington, not later than the 31st August.

The selection of the applicants will rest with the Science and Art Department.

The fees for two days a week for the Session, from October to June, are :—

|                                   |     | £ | s. | d. |
|-----------------------------------|-----|---|----|----|
| For the Chemical Laboratory ...   | ... | 9 | 9  | 0  |
| For the Physical Laboratory ...   | ... | 7 | 7  | 0  |
| For the Biological Laboratory ... | ... | 7 | 7  | 0  |

NOTE.—One-fourth of the fee for the whole Session must be paid by the Student on entrance, under the usual conditions of the College. The remaining three-fourths of the fee will be paid by the Department, in equal instalments, at the commencement of each term, subject, however, to the right of the Department to withhold payment of the second and third instalments should the reports not be satisfactory.

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### GEOLOGICAL MUSEUM.

Owing to important purchases made by the Council, and many valuable gifts by various donors, the Geological Department possesses collections of specimens adequate to the illustration of the lectures on Lithology, Mineralogy and Palæontology, as laid down in the Calendar.

The original collection of Igneous and Metamorphic rocks acquired by the Council has been largely increased by the addition of specimens collected or presented by the officers and pupils of the Department and others.

The well-known Ketley collection of Upper Silurian fossils from Dudley and Malvern, which was the first important acquisition made by the Council, has been supplemented by the purchase of the Sharp collection of upwards of 15,000 specimens of fossils and minerals. This collection was the property of the late Samuel Sharp, F.G.S., of Wellingborough, who devoted much of his life to the study of the Jurassic strata of the Midlands. But in addition to Jurassic fossils, the collection contains an excellent stratigraphical series, ranging through

all the formations from the Cambrian to the Recent. It also includes a fine series of Palæolithic and Neolithic flint implements from the river gravels of England and France, together with remains of Mastodon, Elephant, Rhinoceros, and other extinct British mammals.

## COLLEGE SOCIETIES.

### THE MASON COLLEGE UNION.

This Society was formed with the sanction of the Council in 1881. The opening meeting of the Session, 1887-88 will be held on Friday, the 7th of October.

#### OFFICERS FOR 1886-87.

*President* .....The President of the Council.

*Vice-Presidents*..The Professors and Demonstrators, and their Wives.

*Committee* .....Miss M. D. Albright, Miss Brierley, Miss Charles, Miss E. W. C. France, Miss E. Jordan, Miss Lewis, Miss G. E. Southall, Mr. G. St. Johnston, Mr. J. F. Jordan, Mr. W. M. Langford, Mr. C. P. Larner, and Mr. A. L. Stern.

*Chairman* .....Mr. E. F. Ehrhardt.

*Treasurer* .....Mr. C. F. M. Ward.

*Secretaries* .....Miss Jessie Edwards and Mr. James Neal,

#### EXTRACT FROM THE RULES.

1. The Society shall be called "THE MASON COLLEGE UNION."

2. The Society shall have for its object "intellectual intercourse and recreation."

3. None but present and former day students shall be members of the Union.

*The Mason College Magazine* is published by the Union. It appears twice during each term, and may be had from Messrs. Cornish, New Street, price 6d.

## THE MASON COLLEGE PHYSICAL SOCIETY.

## OFFICERS.

*President* .....Professor Poynting, M.A.*Vice-Presidents*...Mr. E. F. J. Love, B.A. and Mr. R. H. Housman.*Secretary* .....Mr. G. F. Daniell.*Treasurer* .....Mr. W. M. Langford.

## THE MASON COLLEGE CHEMICAL SOCIETY.

## OFFICERS.

*President* .....Professor Tilden, D. Sc., F.R.S.*Vice-Presidents*...Mr. W. W. J. Nicol, M.A., D. Sc., and  
Mr. Thomas Turner, Assoc. R.S.M.,  
F.C.S.*Secretary* .....Mr. T. J. Baker.

## THE MASON COLLEGE BOTANICAL SOCIETY.

## OFFICERS.

*President* .....Professor Hillhouse, M.A.*Vice-Presidents*...Mrs. Hillhouse, Miss J. Charles.*Secretary* .....Mr. W. L. O. Ward.

## MASON COLLEGE PHYSIOLOGICAL SOCIETY.

## OFFICERS.

*President* .....Professor Haycraft, M.B., B.Sc.*Vice-President* ...Dr. Hogben.*Secretary* .....Mr. S. H. Perry.*Treasurer*.....Miss Gertrude E. Southall.

## MASON COLLEGE ENGINEERING SOCIETY.

## OFFICERS.

*President* .....Professor Smith.*Vice-Presidents*...Mr. James Hamilton, Mr. R. H.  
Housman, and Mr. L. Myers.*Secretary and* }  
*Treasurer* } Mr. E. M. Barnby.

## THE MASON COLLEGE POESY CLUB.

## OFFICERS.

|                            |                                                       |
|----------------------------|-------------------------------------------------------|
| <i>President</i> .....     | Professor Arber, F.S.A.                               |
| <i>Vice-Presidents</i> ... | The Professors and the Secretary, and<br>their Wives. |
| <i>Secretaries</i> .....   | Miss C. E. Brierley, Mr. E. F. J.<br>Love, B.A.       |
| <i>Treasurer</i> .....     | Miss M. Bishop.                                       |

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THE MASON COLLEGE FRENCH  
DEBATING SOCIETY.

## OFFICERS.

|                           |                              |
|---------------------------|------------------------------|
| <i>President</i> .....    | Professor Loreille, B. ès-L. |
| <i>Vice-President</i> ... | Miss M. J. Keep.             |
| <i>Secretary</i> .....    | Mr. C. P. Larnier.           |

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## MASON COLLEGE CYCLISTS' CLUB.

## OFFICERS.

|                                            |                              |
|--------------------------------------------|------------------------------|
| <i>President</i> .....                     | Professor Poynting, M.A.     |
| <i>Vice-President</i> ...                  | Professor Sonnenschein, M.A. |
| <i>Captain</i> .....                       | Mr. W. M. Langford.          |
| <i>Secretary and</i><br><i>Treasurer</i> } | Mr. James Hamilton.          |

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## MASON COLLEGE TENNIS CLUB.

## OFFICERS.

|                            |                                                                                 |
|----------------------------|---------------------------------------------------------------------------------|
| <i>President</i> .....     | Professor Tilden, D.Sc., F.R.S.                                                 |
| <i>Vice-Presidents</i> ... | Mrs. Tilden, Professor Haycraft, Professor<br>Sonnenschein, Professor Loreille. |
| <i>Secretaries</i> .....   | Miss Jessie Charles, Mr. J. F. Jordan.                                          |
| <i>Treasurer</i> .....     | Mr. A. L. Stern.                                                                |

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### THE ADDITIONAL ENDOWMENT FUND.

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This permanent fund has been established to provide—

1. Scholarships and Exhibitions ;
2. Additional apparatus, specimens, &c., for the various laboratories, workshops, and museums; and,
3. Additions to the teaching staff.

The Council earnestly invite donations or annual subscriptions in aid of the above objects.

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#### LIST OF DONATIONS TO THE FUND.

|                                         | £       | s. | d. |
|-----------------------------------------|---------|----|----|
| "F. R. S." .....                        | 5,750   | 0  | 0  |
| George Dixon, Esq., M.P. ....           | 1,000   | 0  | 0  |
| Arthur Albright, Esq. ....              | 500     | 0  | 0  |
| The Right Hon. J. Chamberlain, M.P. ... | 500     | 0  | 0  |
| T. P. Heslop, Esq., M.D. ....           | 500     | 0  | 0  |
| William Middlemore, Esq., J.P. ....     | 500     | 0  | 0  |
| Thomas Avery, Esq., J.P. ....           | 250     | 0  | 0  |
| Richard Chamberlain, Esq., M.P. ....    | 250     | 0  | 0  |
| John H. Chance, Esq. ....               | 250     | 0  | 0  |
| Joseph Gillott, Esq. ....               | 250     | 0  | 0  |
| J. E. Wilson, Esq., J. P. ....          | 250     | 0  | 0  |
| G. J. Johnson Esq., J.P. ....           | 100     | 0  | 0  |
| Martyn J. Smith, Esq. ....              | 100     | 0  | 0  |
| Anonymous .....                         | 100     | 0  | 0  |
| M. Stern, Esq. ....                     | 25      | 0  | 0  |
| John Corbett, Esq., M.P. ....           | 21      | 0  | 0  |
| Messrs. A. B. & F. W. V. Mitchell.....  | 20      | 0  | 0  |
| Alfred Hill, Esq., J.P. ....            | 10      | 0  | 0  |
| William Mathews, Esq., M.A. ....        | 10      | 0  | 0  |
| "A Friend of the late Dr. Heslop" ..... | 5       | 0  | 0  |
|                                         | <hr/>   |    |    |
|                                         | £10,391 | 0  | 0  |
|                                         | <hr/>   |    |    |



# FACULTY OF ARTS.

## DEPARTMENT I.

### GREEK AND LATIN.

Professor E. A. SONNENSCHIN, M.A. Oxon., B.A. Lond.

#### Synopsis of the Work of the Session.

During the Session 1887-88 the work of the ordinary classes will be directed to reading the books prescribed for the Examinations of the University of London. The subjects set for Matriculation (June) will be read in the Junior Classes; those for Intermediate Arts in the Senior Classes; those for B.A. in the Higher Senior Latin and Senior Greek.

The method of instruction is strictly tutorial. The students translate orally and write exercises in composition, which are returned to them with indications of mistakes, which they are expected to correct themselves; these corrections are then re-examined.

Students who desire to commence the study of Latin have an opportunity of doing so by attending the Junior Latin Class on Mondays.

An extra class will also be formed during the Winter Term for the study of the Greek Drama in English translations. (See p. 69.)

The Professor will be prepared to meet students who desire to consult him, on Friday, 30th September, 1887.

### GREEK.

*Junior Class.*—Mondays, Wednesdays, and Fridays, at 4.30 p.m.

Winter, Spring, and Summer Terms: Xenophon, *Cyropaedia*, Book I.

On Fridays the work will consist, throughout the year, of exercises in Grammar and Composition.

**FEES:**—For a Term, £1 11s. 6d.; for the Session, £3 13s. 6d.; for the Grammar class alone, for a term, 10s. 6d.; for the Session, £1 5s.

*Senior Class.*—Mondays and Thursdays, at 2.30 p.m., and Fridays, at 4.30 p.m.

Winter Term : Sophocles, *Electra*.

Spring Term : Xenophon, *Hellenics*, Book I.

Summer Term : Demosthenes, *adv. Androtionem*.

On Fridays the work will consist of exercises in Grammar and Composition.

**FEES.**—For a Term, £1 11s. 6d.; for the Session, £3 13s. 6d. For the translation class alone : for a Term, £1 1s. ; for the Session, £2 12s. 6d.

Editions recommended for the Greek Classes :—

Xenophon, *Cyropaedia* (Teubner's text).

Xenophon, *Hellenics* I., II., by Hailstone (Macmillan).

Sophocles, *Electra*, by Jebb (Rivingtons).

Demosthenes, *adv. Androtionem*, by Wayte (Pitt Press).

Grammar. Abbott and Mansfield.

### LATIN.

*Junior Class.*—Mondays, Wednesdays, and Fridays, at 3.30 p.m.

Winter, Spring, and Summer Terms : Cæsar, *Gallie War*, Book VII.

On Mondays the work will consist, throughout the year, of exercises in Grammar and Translation of easy passages selected from various authors.

**FEES.**—For a Term, £1 11s. 6d. ; for the Session, £3 13s. 6d. For the Grammar Class alone : a single Term, 10s. 6d.; Session, £1 5s.

*Junior Class for Latin Composition.*—Tuesdays at 3.30 p.m., throughout the Session.

**FEES.**—For a Term, 10s. 6d. ; for the Session, £1 5s.

*Senior Class.*—Tuesdays and Fridays at 2.30 p.m.

Winter Term : Livy, Book VI.

Spring Term : Tacitus, *Histories*, Book III.

Summer Term : Virgil, *Æneid*, Books II., III.

**FEES.**—For a Term, £1 1s. ; for the Session, £2 12s. 6d.

*Senior Class for Latin Composition.*—Wednesdays at 2.30 p.m., throughout the Session.

FEES :—For a Term, 10s. 6d.; for the Session, £1 5s.

*Higher Senior Class.*—Tuesdays at 4.30, and Thursdays at 3.30, throughout the Session.

The Georgics of Virgil. Two plays of Plautus.

FEES.—For a Term £1 1s.; for the Session £2 12s. 6d.

A combination fee of £1 10s. 6d. per Term, or £3 10s. 6d. per Session, is charged to students who desire to take both Senior and the Higher Senior Classes in Latin.

Editions recommended for the Latin Classes :—

Cæsar, *Bell. Gall.*, by Bond and Walpole (Macmillan); or, Book VII. (alone), by Peskett (Pitt Press).

Livy VI., by Cluer (Clarendon Press).

Tacitus *History* III., by Simcox (Rivingtons).

Virgil, *Æn.* II, III., and *Georgics*, by Sidgwick (Pitt Press).

Professor Sonnenschein's *Latin Grammar* (in the *Parallel Grammar Series* pub. by Sonnenschein, Lowrey, & Co.) will be used in all the classes.

## EXTRA CLASS.

### GREEK LITERATURE.

This Class will meet during the Winter Term for the study of the Greek dramatists in English translations. The work will consist partly of lectures on the history of the Greek drama, with special reference to the authors studied, partly of explanation and discussion of certain selected masterpieces.

### SYLLABUS OF THE COURSE.

- I. Introductory Lecture.
- II. AESCHYLUS, *Prometheus Bound*, with Goethe's *Prometheus and Shelley's Prometheus Unbound*.
- III. AESCHYLUS, *Agamemnon*.
- IV. SOPHOCLES, *Antigone*.
- V. SOPHOCLES, *Oedipus the King*.
- VI. EURIPIDES, *Alcestis*, with Browning's *Balaustion's Adventure*.
- VII. ARISTOPHANES, *Birds*.

The following translations are recommended :—

Aeschylus (Agamemnon), by Morshead or Browning.

Sophocles, Whitelaw or Campbell.

Euripides.

Aristophanes, Frere (in Morley's Universal Library).

The Class will meet on the following Thursdays, at 4.30 p.m. :—

October 13th, 20th.

November 3rd, 10th, 17th.

December 1st, 8th, 15th.

FEE FOR THE COURSE: £1 1s.

### TIME TABLE.

| GREEK AND LATIN.               | Mon. | Tu.  | Wed. | Th.  | Fri. |
|--------------------------------|------|------|------|------|------|
| GREEK.                         |      |      |      |      |      |
| Junior Class.....              | 4.30 | ...  | 4.30 | ...  | 4.30 |
| Senior Class .....             | 2.30 | ...  | ...  | 2.30 | 4.30 |
| Extra Class .....              | ...  | ...  | ...  | 4.30 | ...  |
| LATIN.                         |      |      |      |      |      |
| Junior Class .....             | 3.30 | ...  | 3.30 | ...  | 3.30 |
| Junior Class—Composition ..... | ...  | 3.30 | ...  | ...  | ...  |
| Senior Class .....             | ...  | 2.30 | ...  | ...  | 2.30 |
| Senior Class—Composition ..... | ...  | ...  | 2.30 | ...  | ...  |
| Higher Senior Class .....      | ...  | 4.30 | ...  | 3.30 | ...  |

*DEPARTMENT II.***ENGLISH LANGUAGE AND LITERATURE.**

Professor EDWARD ARBER, F.S.A.,  
Fellow of King's College, London ;  
Examiner in English Language, Literature, and History  
to the University of London ;  
Examiner in English Language and Literature to the  
Victoria University, Manchester.

**SYSTEMATIC INSTRUCTION.**

(For Popular Lectures, see pp. 79-81.)

**GENERAL ARRANGEMENTS.**

For the following Examinations of the University of  
London, Doctor of Literature.

M.A., Part IV.

B.A., Honours.

B.A., Pass.

Intermediate, Honours.

Intermediate, Pass.

Matriculation ;

the undermentioned Courses of Instruction are provided  
in this Department :

Any single Class of a Course may be attended separately.  
Also attendance at any Pass Course can, with assent of  
the Professor, be spread over more than one year. But  
no Class will be carried on, unless a sufficient number of  
students present themselves in the first week of the Term.

The *Matriculation Course* consists of sixty Lectures on the English Language, and sixty Lectures on English History; 120 Lectures in all: for which a combined Sessional Fee of £4 4s. is charged.

The *Intermediate Pass Course* consists of 180 Lectures (sixty on Anglo-Saxon &c., thirty on English Composition, and ninety on English Literature); for which the Sessional Fees amount to £6 17s. 6d.

Sixty additional Literature Lectures are provided for the *Intermediate Honours Course*; for which (to those who take all the Pass Course) the combined Sessional Fee is £2 2s. Such Fees for both the Pass and the Honours Courses (240 Lectures) amount therefore to £8 19s. 6d.

The *B.A. Pass Course* consists of sixty Lectures on Anglo-Saxon &c.; and sixty on English Literature; 120 Lectures in all: for which the Sessional Fees amount to £4 5s.

Sixty additional Literature Lectures are provided for the *B.A. Honours Course*; for which (to those who take all the Pass Course) the combined Sessional Fee is £2 2s. Such Fees for both the Pass and the Honours Courses (180 Lectures) amount therefore to £6 7s.

For the *M.A. degree*, assistance is given in the Anglo-Saxon &c. Class, as well as in such other of the Literature Classes as the London B.A. may be able to attend.

The degree of *Doctor of Literature* is only obtainable by "original contributions to the advancement of Learning."

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Language Courses of Lectures are distinguished by 1, 2, 3, &c. ;  
Literature and History Courses, by A, B, C, &c.

## LANGUAGE.

### THE ENGLISH LANGUAGE.

The following will be the general plan of study :

- (a) A brief survey of the chief Families of Languages in the World, and of the principles of Comparative Philology ; together with the more salient points in Phonology and Sematology. A more particular examination will be made of the General Laws of Speech, and of their application to the English tongue.
- (b) Elementary teaching in Anglo-Saxon, with its relation to Modern English. The formation of Early English out of Anglo-Saxon and Anglo-French ; with a discussion of its three principal dialects.
- (c) Practical modern English Grammar, including the History of our Alphabet, Etymology, Word-building, Analysis of Sentences, Syntax, Prosody, and Punctuation.

Written Examinations will be held from time to time during the Session ; the papers being afterwards discussed in the Class-room.

1. Sixty Lectures, on Mondays and Wednesdays : from 9.30 to 10.30 in Winter and Spring Terms, and from 10.30 to 11.30 in the Summer Term ; commencing 5th October, 1887.

FEE :—For a Term, £1 10s. 0d. ; for the Session, £2 12s. 6d.

Combined Sessional Fee for *Matriculation Course*,  
1. Language and A. History, £4 4s. 0d.

### ANGLO-SAXON AND EARLY ENGLISH.

2. Unless already possessed of a sufficient knowledge of Anglo-Saxon ; all students of Early English must attend the Anglo-Saxon Lectures during the Winter Term. After which, they can either confine their attention to Anglo-Saxon alone, attending the Class on Mondays ; or to Early English alone, attending the Class on Wednesdays : or (as is strongly recommended to all students) attend both the Classes.

|         |   |                                                                                                                                          |
|---------|---|------------------------------------------------------------------------------------------------------------------------------------------|
| TERMS.  | { | ANGLO-SAXON.—Twenty Lectures on Mondays and Wednesdays, 5.30 to 6.30.                                                                    |
| Winter. |   | Grammar.<br>SWEET. <i>Extracts from</i> ALFRED's <i>Orosius</i> .                                                                        |
|         | { | Forty Lectures. In these Terms, the Texts will be selected for study, according to the requirements of the Students, from the following: |
|         |   | ANGLO-SAXON.—Mondays, 5.30 to 6.30.                                                                                                      |
| Spring. |   | (a) SWEET. <i>Anglo-Saxon Reader</i> :<br>Extract from <i>Beowulf</i> .                                                                  |
| and     |   | <i>The Wanderer</i> .                                                                                                                    |
| Summer. |   | (b) The Text selected for the Cambridge Higher Local Examination.                                                                        |
|         | { | EARLY ENGLISH.—Wednesdays, 5.30 to 6.30.                                                                                                 |
|         |   | (a) MORRIS. <i>Specimens</i> . Part I., I–VI., & X–XVI.                                                                                  |
|         |   | (b) SKEAT. <i>Specimens</i> . I–XX.                                                                                                      |

A Fee of £1 10s. will admit to any one, or all, of these Lectures; which will commence on 5th October, 1887.

#### ENGLISH COMPOSITION.

3. This Class will study the mechanism of English Prose and of English Versification; the history of English Satire, Essay-writing, Letter-writing, &c.; the more noticeable errors in writing; and the principal points of Rhetoric as applied to Style.

Among the English Works that will be discussed in reference to Style, will be J. LYLY's *EUPHUES*, Sir P. SIDNEY's *Apology for Poetry*, R. HOOKER's *Ecclesiastical Polity*, Lord CLARENDON's *History*, A. POPE's *Essay on Criticism*, Bishop E. COPLESTON's *Advice to a young Reviewer*, and Lord MACAULAY's *History*: and among those relating to Rhetoric; S. HAVES's *Pastime of Pleasure*, and T. WILSON's *Art of Rhetorique*.

Papers written by members of the Class, upon a variety of topics, and treated in various ways, will be subsequently discussed and estimated in the class-room.

Thirty Lectures, on Wednesdays, from 4.30 to 5.30; commencing 5th October, 1887.

FEE:—For a Term, 10s. 6d; for the Session, £1 7s. 6d.



## HISTORY.

A. A rapid Survey of the more important Institutions and Events in English History ; from the earliest times to 1700 A.D.

Sixty Lectures, on Tuesdays and Thursdays from 10.30 to 11.30 ; commencing 4th October, 1887.

FEE:—For a Term, £1 10s. 0d. ; for the Session, £2 12s. 6d.

Combined Sessional Fee, for *Matriculation Course*,  
1. Language and A. History, £4 4s.

## LITERATURE AND HISTORY.

## INTERMEDIATE PASS COURSE.

*Besides 2 Anglo-Saxon &c., and 3 English Composition ;  
the following Lectures on Literature :*

## PERIOD.

B. The History and Literature of England from 1700 to 1740 A.D.

*Principal Writers.*—J. ADDISON, Dr. J. ARBUTHNOT, Bp. G. BERKELEY, Lord BOLINGBROKE, T. [COLLEY] CIBBER, D. DEFOE, J. GAY, Lord HERVEY, B. MANDEVILLE, Lady MARY WORTLEY MONTAGUE, A. POPE, S. RICHARDSON, Sir R. STEELE, Dean J. SWIFT, J. THOMSON.

Sixty Lectures, on Mondays and Wednesdays, from 11.30 to 12.30 ; commencing 5th October, 1887.

FEE:—For a Term, £1 1s. ; for the Session, £2 12s. 6d.

## SPECIAL WORKS.

C. The Life and Works of ALEXANDER POPE, with a special study of his

*Essay on Criticism*, 1711 A.D.

*Rape of the Lock*, 1711–12 A.D.

*Essay on Man*, 1732–34 A.D.

J. ADDISON and Sir R. STEELE, *The Spectator*, Nos. 1–50, 1711 A.D.

Thirty Lectures, on Tuesdays, from 4.30 to 5.30; commencing 11th October, 1887.

FEE:—For a Term, 10s. 6d.; for the Session, £1 7s. 6d.

### INTERMEDIATE HONOURS COURSE.

*The Pass Subjects, and in addition,*

#### PERIOD.

**D.** The History and Literature of England from 1740 to 1770 A.D.

*Principal Writers.*—J. BOSWELL, C. CHURCHILL, H. FIELDING, D. GARRICK, O. GOLDSMITH, T. GRAY, Dr. S. JOHNSON, A. POPE, S. RICHARDSON, T. SMOLLETT, L. STERNE, H. WALPOLE.

Thirty Lectures, on Mondays: from 10.30 to 11.30 in Winter and Spring Terms, and from 9.30 to 10.30 in the Summer Term; commencing 10th October, 1887.

FEE:—For a Term, 10s. 6d.; for the Session, £1 7s. 6d.

#### SPECIAL WORKS.

**E.** A study of

A. POPE. *Satires and Epistles.* 1717–1738 A.D.,  
with the Life of Dr. S. JOHNSON, and a study of his

*London.* 1738 A.D.

*The Vanity of Human Wishes.* 1749 A.D.

*RASSELAS.* 1759 A.D.

Thirty Lectures, on Wednesdays: from 10.30 to 11.30 in Winter and Spring Terms, and from 9.30 to 10.30 in the Summer Term; commencing 5th October, 1887.

FEE:—For a Term, 10s. 6d.; for a Session, £1 7s. 6d.

Combined Sessional Fee (to those who take all the Pass Course) for this Honours Course, £2 2s.

### B.A. PASS COURSE.

*Besides 2 Anglo-Saxon &c., the following Lectures on Literature:*

#### PERIOD.

**F.** The History and Literature of England during the 15th Century.

*Principal Writers.*—Dame J. BERNES, W. CAXTON, Sir J. FORTESCUE, Blind HARRY, R. HENRYSON, King JAMES I. of Scotland, J. LYDGATE, T. OCCLEVE, *The Paston Letters*, Bp. R. PECOCK, J. SKELTON, WILLIAM of Thorpe.

Thirty Lectures, on Tuesdays, from 11.30 to 12.30; commencing 4th October, 1887.

FEE:—For a Term, 10s. 6d.; for the Session, £1 7s. 6d.

#### SPECIAL WORKS.

##### G. A study of

W. SHAKESPEARE. The three Parts of *Henry VI.*

Thirty Lectures, on Tuesdays, from 9.30 to 10.30; commencing 4th October, 1887.

FEE:—For a Term, 10s. 6d.; for the Session, £1 7s. 6d.

#### B.A. HONOURS COURSE.

*The Pass Subjects, and in addition,*

##### PERIOD.

H. The History and Literature of England from 1500 to 1540.

*Principal Writers.*—R. ASCHAM, A. BARCLAY, R. BARNES, Lord BERNES, W. CAVENDISH, Dean J. COLET, Bp. G. DOUGLAS, W. DUNBAR, Sir T. ELYOT, Cardinal J. FISHER, J. FRITH, S. HAWES, G. JOY, Sir D. LYNDSEY, Sir T. MORE, C. ST. GERMAIN, J. SKELTON, W. TINDALE.

Thirty Lectures, on Mondays, from 4.30 to 5.30; commencing 10th October, 1887.

FEE:—For a Term, 10s. 6d.; for the Session, £1 7s. 6d.

#### SPECIAL WORKS.

##### I. A Study of

Sir T. MORE. *Utopia.* 1516–1556 A.D.

W. SHAKESPEARE. *RICHARD III.*  
*HENRY VIII.*

Thirty Lectures, on Thursdays, from 9.30 to 11.30; commencing 6th October, 1887.

FEE:—For a Term, 10s. 6d.; for the Session, £1 7s. 6d.

Combined Sessional Fee (to those who take all the Pass Course) for this Honours Course, £2 2s.

Thirty Lectures, on Tuesdays, from 4.30 to 5.30 ; commencing 11th October, 1887.

FEE:—For a Term, 10s. 6d. ; for the Session, £1 7s. 6d.

### INTERMEDIATE HONOURS COURSE.

*The Pass Subjects, and in addition,*

#### PERIOD.

D. The History and Literature of England from 1740 to 1770 A.D.

*Principal Writers.*—J. BOSWELL, C. CHURCHILL, H. FIELDING, D. GARRICK, O. GOLDSMITH, T. GRAY, Dr. S. JOHNSON, A. POPE, S. RICHARDSON, T. SMOLLETT, L. STERNE, H. WALPOLE.

Thirty Lectures, on Mondays : from 10.30 to 11.30 in Winter and Spring Terms, and from 9.30 to 10.30 in the Summer Term ; commencing 10th October, 1887.

FEE:—For a Term, 10s. 6d. ; for the Session, £1 7s. 6d.

#### SPECIAL WORKS.

E. A study of

A. POPE. *Satires and Epistles.* 1717–1738 A.D., with the Life of Dr. S. JOHNSON, and a study of his

*London.* 1738 A.D.

*The Vanity of Human Wishes.* 1749 A.D.

*RASSERLAS.* 1759 A.D.

Thirty Lectures, on Wednesdays : from 10.30 to 11.30 in Winter and Spring Terms, and from 9.30 to 10.30 in the Summer Term ; commencing 5th October, 1887.

FEE:—For a Term, 10s. 6d. ; for a Session, £1 7s. 6d.

Combined Sessional Fee (to those who take all the Pass Course) for this Honours Course, £2 2s.

### B.A. PASS COURSE.

Besides 2 Anglo-Saxon &c., the following Lectures on Literature :

#### PERIOD.

F. The History and Literature of England during the 15th Century.

*Principal Writers.*—Dame J. BERNES, W. CAXTON, Sir J. FORTESCUE, Blind HARRY, R. HENRYSON, King JAMES I. of Scotland, J. LYDGATE, T. OCCLEVE, *The Paston Letters*, Bp. R. PECOCK, J. SKELTON, WILLIAM of Thorpe.

Thirty Lectures, on Tuesdays, from 11.30 to 12.30; commencing 4th October, 1887.

FEE:—For a Term, 10s. 6d.; for the Session, £1 7s. 6d.

#### SPECIAL WORKS.

##### G. A study of

W. SHAKESPEARE. The three Parts of *Henry VI.*

Thirty Lectures, on Tuesdays, from 9.30 to 10.30; commencing 4th October, 1887.

FEE:—For a Term, 10s. 6d.; for the Session, £1 7s. 6d.

#### B.A. HONOURS COURSE.

*The Pass Subjects, and in addition,*

##### PERIOD.

H. The History and Literature of England from 1500 to 1540.

*Principal Writers.*—R. ASCHAM, A. BARCLAY, R. BARNES, Lord BERNES, W. CAVENDISH, Dean J. COLET, Bp. G. DOUGLAS, W. DUNBAR, Sir T. ELYOT, Cardinal J. FISHER, J. FRITH, S. HAWES, G. JOY, Sir D. LYNDSEY, Sir T. MORE, C. ST. GERMAIN, J. SKELTON, W. TINDALE.

Thirty Lectures, on Mondays, from 4.30 to 5.30; commencing 10th October, 1887.

FEE:—For a Term, 10s. 6d.; for the Session, £1 7s. 6d.

#### SPECIAL WORKS.

##### I. A Study of

Sir T. MORE. *Utopia.* 1516–1556 A.D.

W. SHAKESPEARE. *RICHARD III.*  
*HENRY VIII.*

Thirty Lectures, on Thursdays, from 9.30 to 11.30; commencing 6th October, 1887.

FEE:—For a Term, 10s. 6d.; for the Session, £1 7s. 6d.

Combined Sessional Fee (to those who take all the Pass Course) for this Honours Course, £2 2s.

| COURSE OF LECTURES.            |                                       | TIME TABLE.                                  |       |       |       |       |
|--------------------------------|---------------------------------------|----------------------------------------------|-------|-------|-------|-------|
|                                |                                       | SUBJECTS.                                    | Mon.  | Tu.   | Wed.  | Th.   |
| {                              | 1. Matriculation .....                | Eng. Language ( <i>Winter &amp; Spring</i> ) | 9.30  | ..... | 9.30  | ..... |
|                                | D. Intermediate, HONOURS .....        | Period .....                                 | 9.30  | ..... | ..... | ..... |
|                                | { E. Intermediate, HONOURS .....      | Special Works .....                          | ..... | ..... | 9.30  | ..... |
|                                | G. B.A. ....                          | Special Works .....                          | ..... | 9.30  | ..... | ..... |
|                                | I. B.A. ....                          | Special Works .....                          | ..... | ..... | ..... | 9.30  |
| {                              | 1. Matriculation .....                | English Language .....                       | 10.30 | ..... | 10.30 | ..... |
|                                | D. Intermediate, HONOURS .....        | Period .....                                 | 10.30 | ..... | ..... | ..... |
|                                | { E. Intermediate, HONOURS .....      | Special Works ( <i>Winter &amp; Spring</i> ) | ..... | ..... | 10.30 | ..... |
|                                | A. Matriculation .....                | English History .....                        | ..... | 10.30 | ..... | 10.30 |
|                                | B. Intermediate, PASS .....           | Period .....                                 | 11.30 | ..... | 11.30 | ..... |
| {                              | F. B.A. ....                          | Period .....                                 | ..... | 11.30 | ..... | ..... |
|                                | <i>Popular Afternoon Lectures</i> ... |                                              | 3.30  | 3.30  | 3.30  | ..... |
|                                | H. B.A. ....                          | Period .....                                 | 4.30  | ..... | ..... | ..... |
|                                | C. Intermediate, PASS .....           | Special Works .....                          | ..... | 4.30  | ..... | ..... |
|                                | 3. Intermediate, PASS .....           | English Composition .....                    | ..... | ..... | 4.30  | ..... |
| 2. Intermediate, and B.A. .... |                                       | Anglo-Saxon and Early English .....          | 5.30  | ..... | 5.30  | ..... |

POPULAR COURSES  
OF  
AFTERNOON LECTURES  
ON  
ENGLISH LITERATURE.

Twenty Lectures will be given on Mondays, 3.30 to 4.30 p.m. ; commencing on Monday, 10th October, 1887, on

*The Life & Literature of England  
in the time of Shakespeare.*

1564-1616 A.D.

This Course will include a study of  
Our first English Actors, Theatres, and Dramatists.

- N. UDALL.            *ROISTER DOISTER*, 1553-1566 (the first English Comedy).  
T. SACKVILLE.    } *FERREX and PORREX*, 1561 (the first English  
T. NORTON.        } Tragedy).  
E. SPENSER.        *The Shepherd's Calender*, 1579 [For *Faery Queen*, see page 10].  
SIR P. SIDNEY.    *Arcadia*, 1590 ; *ASTROPHEL and STELLA*, 1591 ; and *Apologie for Poetrie*, 1595.  
The Life, Poems, and Plays of W. SHAKESPEARE.  
J. STOW.            *Annals of England*, 1580 ; *Survey of London*, 1598.  
The Controversies between Protestants and Puritans, including a notice of R. HOOKER's *Ecclesiastical Politie*, 1594-5.  
LORD BACON.        *Essays*, 1597-1612 ; *Advancement of Learning*, 1605.  
The Authorized English Version of the Scriptures, 1611.  
SIR W. RALEGH.    *History of the World*, 1614.

FEE FOR THE COURSE, extending over two Terms, 15s.

## POPULAR COURSES OF

Twenty Lectures will be given on Tuesdays, 3.30 to 4.30 p.m. ; commencing on Tuesday, 11th October, 1887, on

*English Allegories,  
Religious, Political, and Satirical.*  
1362-1759 A.D.

The Course will include a detailed study of

E. SPENSER. *The Faery Queen* - - 1590-1596. V.  
and notices of the following, among other minor  
Allegories :

|               |                                                                          |               |
|---------------|--------------------------------------------------------------------------|---------------|
| W. LANGLAND.  | <i>PIERS Plowman</i> - - -                                               | 1362-1393. V. |
| -----         | <i>The Gesta Romanorum</i> - - -                                         | [1400.] P.    |
| W. DUNBAR.    | <i>The Golden Targe</i> - - -                                            | [1500.] V.    |
| S. HAWES.     | <i>The Example of Virtue</i> - - -                                       | 1503. V.      |
|               | <i>The Pastime of Pleasure</i> - - -                                     | 1507. V.      |
| T. DECKER.    | <i>The Seven Deadly Sins</i> - - -                                       | 1606. P.      |
| P. FLETCHER.  | <i>The Purple Island</i> - - -                                           | 1633. V.      |
| J. DRYDEN.    | <i>ABSOLOM and ACHITOPHEL</i> - - -                                      | 1681. V.      |
|               | <i>MACFLECNOC</i> - - -                                                  | 1682. V.      |
|               | <i>The Hind and the Panther</i> - - -                                    | 1687. V.      |
| J. BUNYAN.    | <i>The Pilgrim's Progress</i> - - -                                      | 1678-1684. P. |
|               | <i>The Holy War</i> - - -                                                | 1682. P.      |
| J. SWIFT.     | <i>The Tale of a Tub</i> - - -                                           | 1704. P.      |
| D. DEFOE.     | <i>Allegories in the Review</i> - - -                                    | 1704-1713. P. |
| J. ADDISON.   | <i>Allegories in the Tatler, Spectator,</i><br><i>and Guardian</i> - - - | 1709-1713. P. |
| J. ARBUTHNOT. | <i>Law is a bottomless Pit</i> - - -                                     | 1712. P.      |
| J. SWIFT.     | <i>GULLIVER's Travels</i> - - -                                          | 1727. P.      |
| J. GAY.       | <i>The Beggars' Opera</i> - - -                                          | 1728. P.      |
|               | <i>POLLY</i> - - -                                                       | 1729. P.      |
| A. POPE.      | <i>The Dunciad</i> - - -                                                 | 1728-1742. V. |
| S. JOHNSON.   | <i>Allegories in the Rambler</i> - - -                                   | 1750-1752. P. |
|               | <i>RASSELAS</i> - - -                                                    | 1759. P.      |

P., Prose ; V., Verse.

FEE FOR THE COURSE, extending over two Terms, 15s.



## AFTERNOON LECTURES.

Twenty Lectures will be given on Wednesdays, 3.30 to 4.30 p.m. ; commencing on Wednesday, 5th October, 1887, on

*The Life and Literature of the  
Restoration Age, &c.*

1660–1702 A.D.

In this Course, the following Works, among others, will be adverted to—

- |                 |                                                                                                                           |
|-----------------|---------------------------------------------------------------------------------------------------------------------------|
| J. EVELYN.      | <i>Diary</i> , 1641–1706.                                                                                                 |
| S. PEPYS.       | <i>Diary</i> , 1659–1669.                                                                                                 |
| S. BUTLER.      | <i>HUDIBRAS</i> , Part I., 1663 ; Part II., 1664 ;<br>Part III., 1678.                                                    |
| J. MILTON.      | <i>Paradise Lost</i> , 1667 ; <i>Paradise Regained</i><br>and <i>SAMSON Agonistes</i> , 1671.                             |
| A. MARVEL.      | Poems and Satires.                                                                                                        |
| J. BUNYAN.      | Works, 1660–1688.                                                                                                         |
| J. DRYDEN.      | <i>Annus Mirabilis</i> , 1667 ; <i>Essay on Dramatic</i><br><i>Poesy</i> , 1667 ; and other Works.                        |
| J. LOCKE.       | <i>Letters on Toleration</i> , 1689.                                                                                      |
| Rev. R. BAXTER. | <i>Autobiography</i> , 1696.                                                                                              |
| D. DEFOE.       | <i>Essays on Projects</i> , 1697 ; <i>The True Born</i><br><i>Englishman</i> , 1701 ; <i>LEGION's Memorial</i> ,<br>1701. |

FEE FOR THE COURSE, extending over Two Terms, 15s

*DEPARTMENT III.***FRENCH LANGUAGE AND LITERATURE.**

Professor EDOUARD LOREILLE, B. ès-L., Paris.

*Junior Class.*—In this class students will be prepared for the Matriculation Examination of the University of London. The work will consist of grammar, accidence, and easy syntax. Simple extracts from the works of classical and modern authors, prose and verse, will be studied, and considerable attention will be given to grammar and easy composition into French. One day in the week will be devoted to the writing of papers which will afterwards be discussed in the class room.

*Lecture Days.*—Tuesdays, at 4.30 p.m. ; Thursdays, at 3.30 p.m. ; and Fridays, at 4.30 p.m.

TEXT-BOOKS.—*Les Maîtres Mosaïstes*, by George Sand, edited by C. H. Parry (Rivington's Series). *Kastner's Elements of French Composition* (partie anglaise), Hachette's series. Loreille's *Conversation and Proverbs*. Loreille's *Verb-book*.

FEES :—For a Term, £1 11s. 6d. ; for the Session, £3 13s. 6d.

*Middle Class.*—The work of this class is designed to meet the requirements of Students preparing for the Intermediate Examination in Arts, or the B.A. Examination of the University of London. The general medium of communication will be the French Language, and considerable attention will be devoted to pronunciation. The Class will read the more difficult authors, and one day in the week will be devoted exclusively to Composition into French.

*Lecture Days.*—Mondays, Wednesdays, and Fridays, at 4.30 p.m.

TEXT-BOOKS.—Chardenal's Exercises for Advanced Pupils. Kastner's French Composition (Hachette's Series). Loreille's Conversation and Proverbs. Portraits de Femmes, par C. A. Sainte-Beuve.

FEES:—For a Term, £1 11s. 6d.; for the Session, £3 13s. 6d.

*Senior Class.*—A course of Lectures will be given on the General History of French Literature and Style. The composition in this class will include the translation at sight into French of English works, and short essays on "Sketches" given by the Professor. This course of lectures will be delivered in French, and is intended for students desirous of prosecuting the study of French Literature in general and of keeping up their acquaintance with the spoken language, as well as for those students who are reading for Honours at the B.A. Examination of the University of London. Every opportunity will be given in the class for conversation. Students preparing for examinations are recommended to attend the *Composition Class* on Fridays, at 4.30 p.m.

*Lecture Days.*—Mondays, 3.30 p.m., Thursdays, 2.30 p.m.

TEXT-BOOKS.—Histoire de la Littérature Française, par J. Demogeot. Primer of French Literature, by Saintsbury (Clarendon Press Series).

FEES:—For a Term, £1 1s.; for the Session, £2 12s. 6d.

*Ladies Class.*—This class, which is exclusively for ladies, will meet the requirements of those who are studying for the various Oxford and Cambridge Local Examinations. Special attention will be given to questions of grammar, idioms, proverbs, and composition. The requirements of individual students will be attended to, and all necessary help will be afforded them. The general medium of communication will be the French language, and considerable attention will be devoted to pronunciation. Students preparing for examinations are recommended to attend the *Composition Class* on Fridays at 4.30 p.m.

*Lecture Days.*—Mondays, at 2.30 p.m., and Thursdays, at 4.30 p.m.

TEXT-BOOKS. — Chardenal's Exercises for Advanced Pupils. Dosia, by Gréville. Loreille's Conversation and Proverbs. Loreille's Verb-book.

FEES :—For a Term, £1 1s. ; for the Session, £2 12s. 6d.

If necessary a Special Class, in connection with the Ladies' Class, will be held for students preparing for the Cambridge Higher Local Examination.

### LECTURES ON FRENCH PRONUNCIATION.

During the Winter Term, Professor Loreille will give a Special Course of Six Lectures in French on French Pronunciation and the art of reading French Poetry. A modern author will be chosen, and extracts read, a copy of the extracts being given to each student. The life and works of the selected author will be explained.

*Lecture Days.*—Wednesdays, at 3.30 p.m. ; commencing November 2nd, 1887.

FEE :—Five Shillings.

### FRENCH DEBATING SOCIETY.

In connection with the French Classes a Debating Society has been formed by the Professor, with the view of affording the students an opportunity of acquiring the power of conversing fluently in the French language.

### FRENCH CIRCULATING LIBRARY.

A French Circulating Library of carefully selected books, under the superintendence of the Professor, is open to all the students in attendance upon the French Classes.

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The Professor recommends students to use the French Grammar (Parallel Grammar Series) by Professor L. Moriarty ; and the Mason College Indexed Note Book, published by Messrs. Cornish Bros., New Street.

## TIME TABLE.

| FRENCH.              | Mon. | Tu.  | Wed. | Th.  | Fri. |
|----------------------|------|------|------|------|------|
| Junior Class .....   |      | 4.30 |      | 3.30 | 4.30 |
| Middle Class .....   | 4.30 |      | 4.30 |      | 4.30 |
| Senior Class .....   | 3.30 |      |      | 2.30 |      |
| Ladies' Class .....  | 2.30 |      |      | 4.30 |      |
| Special Course ..... |      |      | 3.30 |      |      |

## SATURDAY MORNING CLASSES.

## ELEMENTARY.

Professor Loreille will deliver a course of thirty lectures extending through the Session. These lectures are intended for school teachers who are unable to attend the day or evening classes, but they are also open to all comers. The first lecture will take place on Saturday, October 8th, 1887, from 10-15 to 11-15 a.m.

Students whose pronunciation is defective will do well to attend this class, as this is the one in which the Professor will lay the greatest stress upon the rules of pronunciation.

Particular attention will be given to a sound grammatical knowledge.

TEXT-BOOKS.—The Oxford and Cambridge French Grammar, Part I. Kastner's Anecdotes Historiques and Littéraires. Loreille's Conversation. Loreille's Verb-book.

FEES:—Five shillings for each Term ; for the Session, 12s. 6d.

## ADVANCED.

The Professor will also give a course of thirty lectures, extending through the Session, on Saturdays, from 11-15 to 12-15.

Special attention will be given to difficult questions of Grammar, idioms, proverbs, and composition.

The general medium of communication will be the French language, and considerable attention will be given to pronunciation.

TEXT-BOOKS.—*Dosia*, by Gréville. Loreille's Conversation and Proverbs. Loreille's Verb-book.

FEES :—Five shillings for each Term ; for the Session, 12s. 6d.

## EVENING CLASSES.

### ELEMENTARY.

Professor Loreille will give a course of thirty lectures extending through the Session (1887-1888) on Mondays, from 6 to 7 p.m., commencing Monday, October 10th, 1887.

This class is intended only for beginners.

The following will be the general plan of study :—

1st.—Translation from English into French of simple extracts from a selection of different works of classical and modern authors.

2nd.—The rudiments of Grammar, limited (for the first year) to the *Accidence*.

3rd.—Translation of English sentences and easy extracts from modern authors into French. Dictation.

4th.—Reading and conversation.

TEXT-BOOKS.—The Oxford and Cambridge French Grammar, Part I. Kastner's *Anecdotes Historiques et Littéraires*. Loreille's Conversation. Loreille's Verb-book.

FEES.—Five shillings for each term, which will include ten lectures ; for the Session, 12s. 6d.

### ADVANCED.

Professor Loreille will give a course of thirty lectures, extending through the Session (1887-1888) on Mondays, from 7 to 8 o'clock, commencing Monday, October 10th, 1887.

This Class is intended for those having already a fair knowledge of French. The medium of communication will be mostly the French language.

The work will consist of Recapitulation of Accidence, Syntax, idioms, and easy composition.

TEXT BOOKS.—Second year. Oxford and Cambridge French Grammar, Part II. Kastner's *Anecdotes Historiques et Littéraires*. Loreille's *Conversation*.

FEES.—Five shillings for each term, which will include ten lectures ; for the Session, 12s. 6d.

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In connection with the Evening and Saturday Morning Classes a Special Course of Lectures will be given on French Pronunciation ; times to be arranged at the commencement of the Session.

FEE FOR THE COURSE OF SIX LECTURES :—3s.

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*DEPARTMENT IV.*  

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**GERMAN LANGUAGE AND LITERATURE.**

Professor KARL DAMMANN, Ph.D.

*Junior Class.*—Correct pronunciation will be insisted on; reading and translation of standard authors, as well as easy composition will be practiced; grammar will be studied, and an elementary knowledge of literary history imparted.

*Lecture Days.*—Tuesdays and Thursdays, at 2.30 p.m.

TEXT BOOKS.—Meissner's Grammar. Buchheim's German Poetry for Repetition. Other books will be selected as required.

FEE:—£1. 1s. per Term.

*Senior Class.*—Lectures on the language and literature of Germany will be delivered in German, and some of the best works of classical authors read. Special attention will be paid to conversation, composition, and comparative idioms; students are allowed to converse only in German.

*Lecture Days.*—Tuesdays and Thursdays, at 3.30 p.m.

TEXT BOOKS.—Eve's German Grammar, 2nd edit. Buchheim's Materials for German Prose Composition. Bue's Comparative Idioms, English Part. Other books will be recommended from time to time.

FEE:—£1. 1s. per Term.



*Morning Class.*—This Class will be quite elementary, and is specially intended to prepare for the Afternoon Junior Class. The accidence, easy readings, and practice of conversational phrases will be the chief objects of the class.

*Lecture Days.*—Saturday Mornings, from 10.30 to 12.30.

TEXT BOOKS.—Dammann's German Accidence. Lechner's Easy German Passages (Rivington's).

FEE :—£1 1s. per Term.

### TIME TABLE.

| GERMAN.             | Mon. | Tues. | Wed. | Thur. | Fri. | Sat.                 |
|---------------------|------|-------|------|-------|------|----------------------|
| Junior Class .....  | ...  | 2.30  | ...  | 2.30  | ...  | ...                  |
| Senior Class .....  | ...  | 3.30  | ...  | 3.30  | ...  | ...                  |
| Morning Class ..... | ...  | ...   | ...  | ...   | ...  | 10.30<br>to<br>12.30 |

Students preparing for examinations will have extra instruction at hours to be fixed specially for that purpose. No further charge will be made for such instruction to students attending either of the above classes.

# FACULTY OF SCIENCE.

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## DEPARTMENT I.

### MATHEMATICS.

Professor R. S. HEATH, M.A., Cantab., D.Sc., Lond.,  
Fellow of Trinity College, Cambridge.

#### (A) PURE MATHEMATICS.

##### I.—*Junior Class* :—

Monday, Wednesday, and Friday, from 10.30 to 11.30, during the first and second terms; and during the third term, Monday, Tuesday, Wednesday, Thursday, and Friday, from 9.30 to 10.30.

First Term.—Arithmetic and Geometry.

Second Term.—Algebra and Geometry.

Third Term.—Algebra and Geometry, and general revision of the preceding work.

The subjects treated in this Class will meet the requirements of Students preparing for the Matriculation Examination of the University of London, and the Delegates' Preliminary Examination for Women in the University of Oxford. They will include :—

ARITHMETIC :—Ordinary Rules, Vulgar and Decimal Fractions, Extraction of Square Root, Scales of Notation, Methods of Approximation, Use of Tables, Proportion, Interest, Discount, Stocks.

ALGEBRA.—Ordinary Rules, Fractions, Simple Equations, Proportion, Arithmetical and Geometrical Progression.

GEOMETRY.—The substance of Euclid I.—IV., according to Syllabus prepared by the Association for the improvement of Geometrical teaching.

TEXT BOOK.—Hall and Knight's Elementary Algebra.

FEES :—For a Term, £1 11s. 6d; for the Session, £4 4s.

NOTE :—Candidates preparing for the Second Examination (Pass for women in the University of Oxford, are recommended to attend, (1) the Junior Class of Pure Mathematics; (2) the Middle Class during the first Term; and (3) the Junior Physics Class during the First and Second Terms.

## II.—*Middle Class* :—

Monday and Friday, from 12.30 to 1.30 ; Tuesday and Thursday, from 11.30 to 12.30.

### *First Term.*

ALGEBRA.—As far as the Binomial Theorem, exclusive. The nature and use of Logarithms. Interest and Annuities.

GEOMETRY.—Euclid, Books VI. and XI. Elementary properties of the Sphere.

### *Second and Third Terms.*

TRIGONOMETRY, including the solution of Plane Triangles, and the Determination of Heights and Distances.

Mensuration of the Sphere, Cylinder, and Cone.

Elements of Plane Co-ordinate Geometry, as far as the Equations to the Straight Line and Circle.

Students attending this Class will be expected to be acquainted with the elements of Arithmetic, Algebra, and Geometry as far as they are taught in the Junior Class. The subjects treated will meet the requirements of Students preparing for the Intermediate Pass Examinations in Arts and Science of the University of London.

TEXT BOOKS :—Hall and Knight's Higher Algebra ; Lock's Elementary Trigonometry ; Wilson's Elementary Solid Geometry ; C. Smith's Elementary Conic Sections.

FEES :—For a Term, £1 11s. 6d. ; for the Session, £4 4s.

## III.—*Senior Class* :—

Monday, Wednesday, and Friday, from 9.30 to 10.30, during the first and second terms ; and during the third term from 10.30 to 11.30.

### *First Term.*

ALGEBRA.—The Binomial and Exponential Theorems, with their Applications. Introduction to the Theory of Determinants.

GEOMETRY.—Elementary Properties of the Conic Sections treated geometrically.

PLANE TRIGONOMETRY.—De Moivre's Theorem and its Applications.

SPHERICAL TRIGONOMETRY.—As far as the Solution of Triangles.

*Second and Third Terms.*

PLANE CO-ORDINATE GEOMETRY.—Properties of Conics, Poles and Polars ; the General Equation of the Second Degree.

DIFFERENTIAL CALCULUS, as far as Maxima and Minima, inclusive ; Tangents and Normals to Plane Curves.

INTEGRAL CALCULUS.—Integration ; Areas and Lengths of Curves.

In this Class weekly problem papers are set to be worked by the students out of lecture hours.

The subjects treated in this Class have been selected with reference to the requirements of the B.A. (Branch 4 (a) ) and B.Sc. (Branch 1) Pass Examinations of the University of London.

TEXT BOOKS.—Hall and Knight's Higher Algebra. Todhunter's Plane Trigonometry, and Spherical Trigonometry. C. Taylor's Elementary Geometry of Conics. C. Smith's Conic Sections. Williamson's Differential Calculus and Integral Calculus.

FEES :—For a Term £1 11s. 6d. ; for the Session £4 4s.

NOTE.—Candidates preparing for the Second Examination (Honours) for Women in Pure Mathematics in the University of Oxford, are recommended to attend this class, and to take the Advanced Class in the following year.

IV.—An Advanced Class will, if required, be formed for Students who possess a knowledge of the course designed for the Senior Class.

The subjects will be selected from the following :—

The higher parts of Algebra, the Theory of Equations, the higher parts of Differential and Integral Calculus, and Differential Equations and the Elements of Solid Geometry.

This Course, though not specially intended for any examination will be found useful for the Examination for Honours in Mathematics at the Intermediate Examination in Arts and Science, and for the Pass B.A. and B.Sc. Examinations at the University of London, and for the Honours Second Examination for Women in Pure and Mixed Mathematics in the University of Oxford.

## (B) APPLIED MATHEMATICS.

I.—*Junior Class* :—

Tuesday and Thursday, 10.30 to 11.30.

**Kinetics :—**

Measures of Velocity and Acceleration. Composition and Resolution of velocities and accelerations. Measures of Mass, Density, Momentum and Kinetic Energy. Laws of Motion. Measures of Force, Impulse, Work. Transformation of Units. Motion of masses under the action of forces. Uniformly accelerated Motion. Conservation of Energy.

**Statics :—**

Composition, resolution, and equilibrium of forces acting at a point, in a plane, or in parallel straight lines. The Centres of Inertia of Rigid Bodies. The Mechanical Powers. Graphical methods as applied to frameworks of jointed bars. Friction.

**Hydrostatics :—**

Pressure of Fluids. Equilibrium of Fluids. Equilibrium of Floating Bodies. Specific Gravity.

Students attending this class will be expected to be acquainted with the elements of Plane Geometry so far as to understand the properties of Similar Figures, and with Algebra as far as Quadratic Equations.

The subjects treated will include the Mixed Mathematics required for the Intermediate Pass Examination in Science of the University of London.

TEXT BOOKS.—Garnett, Elementary Dynamics. Greaves, Elementary Statics. Besant, Elementary Hydrostatics.

FEES :—For each Term, £1 1s.

**II.—Senior Class :—**

This Class will meet at hours to be fixed at the commencement of each Term.

**First and Second Terms.**

The subjects treated in the Junior Class carried to a higher development, and also the following :—

The free motion of a particle under the action of Central Forces, or of any Forces. Constrained Motion. Resisted Motion. Impact of Spheres.

Moments of Inertia. Rotation of rigid bodies. The Pendulum.

Equilibrium of any system of forces acting on a rigid body. Equilibrium of jointed bars and flexible cords. The Principle of Virtual Velocities.

## Third Term.

## Astronomy :—

Determination of the Position of the Stars. Phenomena depending on the Earth's rotation about its axis, on its revolution about the Sun, and on change of place on the surface of the Earth. Determination of Time and Place on the surface of the Earth. Kepler's Laws and their consequences. Refraction. Aberration. Parallax. Precession and Nutation. Solar and Lunar Eclipses.

Students attending this class during the First and Second Terms will be expected to be acquainted with the elements of the Differential and Integral Calculus as far as they are taught in the Senior Class of Pure Mathematics. Students attending during the Third Term may attend (without fee) the Lectures on Spherical Trigonometry during the First Term in the Senior Class of Pure Mathematics, in order to obtain a knowledge of that subject sufficient to enable them to understand the Lectures on Astronomy.

The subjects treated will include the Mixed Mathematics required for the B.Sc. Pass Examination (Branch 2).

TEXT BOOKS. — Minchin, Treatise on Statics. Besant, Dynamics. Routh, Rigid Dynamics, Vol I. (New Edition). Godfray, Treatise on Astronomy.

FEES :—For the First or Second Term, £1 1s; for the Third Term, £1 11s. 6d.; for the Session, £3 3s.

[Students who are preparing for the B.A. Pass Examination (Branch 4 (*b*)) are recommended to attend the Junior Class of Applied Mathematics throughout the Session; and the Senior Class during the Third Term. A course of about ten Lectures will also be arranged for them on the motion of Projectiles under the action of Gravity; on Circular and Harmonic Motion; and on the Vibrations of Simple Pendulums in small Circular Arcs. Fee, 10s. 6d. Composition Fee for the B.A. Course, £4 14s. 6d.]

III.—*Higher Senior Class* :—

This Class will meet at hours to be fixed at the commencement of each Term.

The Subjects will be selected from the following:—Analytical Statics, Dynamics of a Particle and of Rigid Bodies, Statics and Dynamics of Fluids, Geometrical and Physical Optics, Newton's Principia, Sections I., II., III., IX., and XI., and Lunar and Planetary Theories.

This course will be found useful for the B.A. and B.Sc. Examinations for Honours in Mathematics at the University of London, and for the Honours Second Examination for Women in Pure and Mixed Mathematics in the University of Oxford.

## TIME TABLE.

| MATHEMATICS.                          | Mon.  | Tues.            | Wed.  | Th.   | Fri.  | Sat. |
|---------------------------------------|-------|------------------|-------|-------|-------|------|
| A. PURE.                              |       |                  |       |       |       |      |
| Junior ( <i>Winter and Spring</i> ).. | 10.30 | ...              | 10.30 | ...   | 10.30 |      |
| Junior ( <i>Summer</i> )              | 9.30  | 9.30             | 9.30  | 9.30  | 9.30  |      |
| Middle .....                          | 12.30 | 11.30            | ...   | 11.30 | 12.30 |      |
| Senior ( <i>Winter and Spring</i> ).. | 9.30  | ...              | 9.30  | ...   | 9.30  |      |
| " ( <i>Summer</i> )                   | 10.30 | ...              | 10.30 | ...   | 10.30 |      |
| Advanced .....                        | ...   | (By arrangement) |       |       | ...   |      |
| B. APPLIED.                           |       |                  |       |       |       |      |
| Junior .....                          | ...   | 10.30            | ...   | 10.30 | ...   |      |
| Senior Class .....                    | ...   | (By arrangement) |       |       | ...   |      |
| Higher Senior }<br>Class .....        | ...   | (By arrangement) |       |       | ...   |      |

## EVENING CLASSES.

A course of Twenty Lectures on ELEMENTARY TRIGONOMETRY will be given by Professor HEATH, M.A., D.Sc., on Wednesday Evenings, from 7.0 to 8.0 p.m., throughout the Winter and Spring Terms. In these lectures the properties of the Trigonometrical Functions will be explained, and the course will lead up to the practical

application of Trigonometrical Methods and Tables to the determination of the heights and distances of distant objects, and to Surveying. An elementary knowledge of Algebra and Geometry is all that will be required of students attending this class. Numerous exercises will be given from time to time, and the use of Logarithmic and other tables thoroughly explained and practised.

Chambers' Mathematical Tables will be used.

FEES :—5s. for each term, which will include ten lectures. Artisans will be admitted on payment of half fees.

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*DEPARTMENT II.***PHYSICS.**

Professor J. H. POYNTING, D.Sc., Late Fellow of Trinity College, Cambridge.

Demonstrator, ERNEST F. J. LOVE, B.A., Cantab.

*Elementary Class.*—On Properties of Matter, Heat, and Electricity. A course of about twenty lectures will be given during the Winter Term, suitable for candidates for the first Examination of the Examining Board of the Royal College of Physicians, and the Royal College of Surgeons. These lectures may serve as an elementary course on Physics for other than Medical Students.

*Lecture Days.*—Tuesday and Friday, 3 to 4.

FEE:—£1 1s.

**GENERAL COURSE.**

The complete course in Physics extends over three years. As a general rule, first year Students are recommended to enter the Junior Class; second year Students, or Students who have Matriculated in the University of London, should enter the Middle Class, and third year Students the Senior Class. This rule is, however, subject to modification according to the previous Mathematical and Physical training of the Students.

In connection with the first and second year courses, Practical Classes will be held in the Physical Laboratory, which will occupy about two hours weekly. In these, Students will have an opportunity of going through short courses of Practical work, consisting chiefly of the repetition of experiments performed in the lecture class. Members of the Senior Class should take the full Physical Laboratory Course for at least six hours weekly.

In all the lecture classes examples will be set to be worked out of Class.

The following is a detailed account of the various classes :—

*Junior Class.*—Tuesday and Thursday, 11.30 to 12.30.

Winter and Spring Terms.—Statics, Dynamics, Hydrostatics.

Summer Term.—Properties of Matter and Revision of Preceding Work.

This course includes the subjects in which candidates are examined in Mechanics at the Matriculation Examination of the University of London. The lectures will be illustrated by experiments.

Members of this class are recommended to join the

*Junior Practical Class*, Mondays, 2.30 to 5.—This class will be held in the Winter and Spring Terms, and will occupy about two hours weekly. The work of the class will consist chiefly of a repetition on the part of the students of experiments performed in the lectures. See Laboratory Regulations p. 101.

FEES :—

|                                        |             |
|----------------------------------------|-------------|
| For the Lecture Class for the Session, | £2 12s. 6d. |
| For one Term, ... ..                   | £1 1s. 0d.  |
| For the Practical Class, ... ..        | £1 11s. 6d. |
| For one Term, ... ..                   | 17s. 6d.    |
| Caution Money in the Laboratory...     | 10s. 0d.    |

TEXT BOOKS.—Magnus's Elementary Mechanics. Magnus's Hydrostatics. Worthington's Practical Physics.

Members of the Junior Class, especially those who wish to prepare for Heat and Light, or Electricity and Magnetism, in the Matriculation Examination of the University of London, may attend the lectures on these subjects in the Middle Class. The former will be given in parts of the Winter and Summer Terms, the latter in the Spring Term. Fee for either course, £1 11s. 6d. including the Practical Class.

*Middle Class.*—Monday, Wednesday, and Friday, 11.30 to 12.30.

Winter Term.—Mechanics (including Elasticity and Surface Tension), and Heat.

Spring Term.—Magnetism and Electricity.

Summer Term.—Light and Sound.

This course includes the subjects in which Candidates are examined in Physics at the first B.Sc. Pass Examination of the University of London. The Lectures will be illustrated by experiments.

Members of this Class are recommended to join the

*Middle Practical Class*, Wednesdays, 2.30 to 5.—This class will occupy about two hours weekly. The work of the Class will consist chiefly of a repetition on the part of the students of experiments performed in the Lectures. See Laboratory Regulations p. 101.

FEES:—

|                                          |             |
|------------------------------------------|-------------|
| For the Lecture Class for the Session,   | £3 13s. 6d. |
| For one Term, ... ..                     | £1 11s. 6d. |
| For the Practical Class for the Session, | £2 2s. 0d.  |
| For one Term, ... ..                     | £1 1s. 0d.  |
| Caution Money in the Laboratory...       | 10s. 0d.    |

TEXT BOOKS.—Tait's General Properties of matter. Balfour Stewart's Elementary Treatise on Heat. S. P. Thompson's Elementary Lessons in Electricity. Stone's Elementary Lessons in Sound. Haughton's Manual of Optics.

*Senior Class*.—Monday and Friday, 12.30 to 1.30.

This course, which will be taken by the Demonstrator, will include the subjects in which candidates are examined in Physics at the B.Sc. Pass Examination of the University of London. Members of the class will be expected to have a knowledge of Elementary Algebra, and Trigonometry.

They are recommended to take the Physical Laboratory Course for at least six hours weekly.

FEES:—For the Session, £2 12s. 6d.; for one term, £1 1s. 0d.

TEXT BOOKS.—Maxwell's Matter and Motion. Tait's General Properties of Matter. Balfour Stewart's Elementary Treatise on Heat. Clerk Maxwell's Theory of Heat. Glazebrook's Physical Optics. Stokes, On the Nature of Light. J. C. Maxwell's Elementary Treatise on Electricity. Cumming's Theory of Electricity. Encyclopædia Britannica: Articles on Atoms, Ether, Electricity, Elasticity, Heat, Magnetism.

## PHYSICAL LABORATORY COURSE.

The Laboratory will be open from 10 to 5 on Monday, Tuesday, Wednesday, Thursday and Friday, for Students wishing to go through a course of Practical work more advanced than that of the Practical Classes.

Before entering on the course, they will be expected to have a knowledge of Elementary Physics, and Mathematics.

On completing each experiment to the satisfaction of the Professor or Demonstrator, the Student is required to enter an account of his work on one of the Laboratory forms.

To Students who have passed through this, or an equivalent course, opportunity will be given for further experiments or original research.

A course of experiments is arranged for those who are desirous of studying the practical applications of Electricity. This includes, in addition to the experiments of the Physical Laboratory course, further measurements of resistance, electro-motive force and currents; experiments illustrating the principles of dynamo machines; testing of a dynamo; measure of work done in lamps, and of the light given; use of the dynamo as a motor; testing of telegraph lines for faults.

A special course is also arranged for students who are preparing for the Associateship of the Institute of Chemistry. This includes, besides many of the experiments of the ordinary course, other experiments which may be of especial value to chemists.

## FEES :—

|                                                      |    |      |     |
|------------------------------------------------------|----|------|-----|
| For Six hours per week for the Session               | £4 | 0s.  | 0d. |
| For one Term ... ..                                  | £2 | 0s.  | 0d. |
| For each succeeding Six hours for the Session ... .. | £2 | 0s.  | 0d. |
| For one Term ... ..                                  | £1 | 0s.  | 0d. |
| Caution Money ... ..                                 |    | 10s. | 0d. |

TEXT BOOKS. — Glazebrook and Shaw's Practical Physics. Stewart and Gee's Practical Physics. Kohlrausch's Physical Measurements.

*Regulations to be observed by Students in the Physical  
Laboratory.*

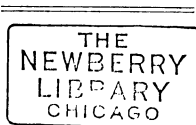
1. All experiments carried on in the Laboratory must be taken from the Course for which the Student has entered. In the case of the more advanced Students, opportunities for further experiment or original research will be afforded, but all such experiments must receive the sanction of the Professor or Demonstrator.

2. An account of each experiment must be entered on one of the Laboratory forms, and must also be entered in the Student's note book, to the satisfaction of the Professor or Demonstrator, before another experiment is commenced.

3. All Students on entering upon either of the Laboratory Courses will deposit the sum of ten shillings, out of which will be defrayed any expenses arising from breakages, &c. When the whole sum has been thus expended, a further deposit will be required. Any balance unexpended will be returned to the Student at the end of the Session.

TIME TABLE.

| PHYSICS.                            | Mon.   | Tues. | Wed.   | Thur. | Fri.  | Sat. |
|-------------------------------------|--------|-------|--------|-------|-------|------|
| Elementary Class...                 | ...    | 3.0   | ...    | ...   | 3.0   | ...  |
| Junior Class.....                   | ...    | 11.30 | ...    | 11.30 | ...   | ...  |
| Junior Practical }<br>Class ..... } | 2.30-5 | ...   | ...    | ..    | ...   | ...  |
| Middle Class.....                   | 11.30  | ...   | 11.30  | ...   | 11.30 | ...  |
| Middle Practical }<br>Class ..... } | ...    | ...   | 2.30-5 | ...   | ...   | ...  |
| Senior Class.....                   | 12.30  | ...   | ...    | ...   | 12.30 | ...  |
| Laboratory .....                    | 10-5   | 10-5  | 10-5   | 10-5  | 10-5  | ...  |



*DEPARTMENT III.***CHEMISTRY.**

Professor W. A. TILDEN, D.Sc., Lond., F.R.S.

Assistant Lecturer, W. W. J. NICOL, M.A., D.Sc., Edin.

Demonstrator, THOMAS TURNER, Assoc. R.S.M., F.C.S.

**GENERAL INSTRUCTIONS.**

1. Before taking their Tickets, Students are recommended to consult the Professor as to the course of study they propose to pursue.

2. Students desirous of attending either of the Courses of Lectures a second time can do so on payment of half the usual fee.

3. EXAMINATIONS are held in connection with each Course of Lectures. As a result of those Examinations the Students are arranged in classes according to merit.

4. PRIZES in Theoretical and in Practical Chemistry are awarded at the end of each Session. The Examinations for Prizes in this Department are held at the end of the Summer Term. Students who have obtained a First or Second Class at either of the Terminal Examinations are eligible to compete, provided they have attended at least one hundred lectures on Chemistry in the College. The questions will include both "Inorganic" and "Organic" Chemistry.

5. The Examination for Prizes and Certificates in Practical Chemistry is held in the Laboratory, and occupies three whole days. Candidates must have worked in the Laboratory during three Terms for at least nine hours a week or during two Terms every day.

The Professor offers a Second Prize.

6. Laboratory students, upon admission, are required to pay a deposit of £1 as Caution Money. This will be returned at the end of the Course after deducting the costs for breakages, &c., incurred by the student. Caution Money, however, will not be repaid unless claimed by the student within one year of finally leaving College.

## LECTURES.

### ELEMENTARY COURSE.

Lecturer, Dr. W. W. J. NICOL.

Forty lectures adapted to the requirements of beginners will be given in the Winter and Spring Terms.

*Lecture Days.*—Wednesdays and Fridays at 11.30.

A second course of twenty Lectures, having reference only to the subjects included in the Syllabus of the Matriculation Examination of the University of London, will be given in the Summer Term.

*Lecture Days.*—Wednesdays and Fridays at 11.30, Thursdays at 4.30.

Persons entirely unacquainted with Chemistry are recommended to attend the first of these Courses of Lectures before entering for the more extended General Course, which commences in October. Candidates for the Matriculation Examination of the University of London, if they have no previous knowledge of the subject, are advised to attend both these Courses.

## SYLLABUS.

Chemistry of the Chief Non-Metallic Elements—Hydrogen, Oxygen, Nitrogen, Chlorine, Bromine, Iodine, Fluorine, Carbon, Silicon, Sulphur, Phosphorus.

General Properties of Gases.

Laws of Chemical Combination, Symbols and Nomenclature.

The Atmosphere, its Chemical Composition and Constitution.

Combustion—Structure and Properties of Flame.

Water, Hydrochloric Acid, Ammonia, Carbonic Oxide and Carbonic Acid, Sulphuric and Sulphurous Acids, Sulphuretted Hydrogen, Phosphoric Acid, and a few others of the more important compounds containing the elements enumerated above.

The Chief Physical and Chemical Properties of the Metals as a class.

The Properties and Constitution of Salts.

TEXT-BOOK RECOMMENDED—Roscoe's Lessons in Elementary Chemistry. (Macmillan.)

FEE:—For the First Course, £2 2s. For the Second Course, £1 1s.

#### GENERAL COURSE.

The design of this Lecture course will be, to offer to the Student full systematic instruction in the general principles of the science, as well as information regarding the properties of the most important elements and their compounds. Efforts will also be specially made to indicate the application of this kind of knowledge to useful purposes in the Arts and Manufactures.

The General Course of Lectures on Chemistry will be found useful by Students who are afterwards to become—

Engineers,  
Architects,  
Builders,  
Brewers, or  
Manufacturers (such as Metallurgists,  
Alkali, Soap, Manure, Glass, or Cement  
Makers, Bleachers and Dyers, &c.)

In addition to attendance at Lectures, a course of instruction in experimental chemistry in the Laboratory is essential to all who wish to obtain a practical knowledge of Chemistry, the duration of such course depending upon the circumstances of each case.

Students preparing for the Intermediate Examination in Science and Preliminary Scientific (M.B.) Examination of the University of London, should attend the Lectures on *General Inorganic Chemistry* (Winter and Spring Terms).



Candidates for B.Sc. and Intermediate Examinations in Medicine will in general require only that part of the course (Summer Term) which relates to *Organic Chemistry*.

A special more advanced class, meeting once a week, has been arranged for the benefit of students preparing for the B.Sc. degree. Students desirous of joining this class should apply to the Professor at the beginning of the Session.

The full course, extending over three terms, will also satisfy the requirements of students preparing for the Associateship of the Institute of Chemistry, so far as attendance at lectures on General and Theoretical Chemistry is concerned.

*Persons about to become students, and desiring advice upon any of these matters are invited to apply to the Professor, at the College.*

PART I.—From *October to March* (Winter and Spring Terms).

About one hundred lectures on *Inorganic Chemistry and Chemical Philosophy* will be given on Mondays, Tuesdays, Wednesdays, Thursdays, and Fridays, at 9.30 a.m., commencing Tuesday, October 4th, 1887. The subjects treated of will include a full exposition of the principles of Chemistry, the chemical history of the Non-metallic elements, the Metals and their most important compounds, to be followed by a short account of the preparation and properties of a few of the chief compounds of carbon.

FEE:—£3. 3s. for a single term, or £5. 5s. for the course from October to March.

PART II.—*April to June* (Summer Term).

About forty lectures will be given on *Organic Chemistry*, or the chemistry of the most important series of *Carbon Compounds*.

This course will include all the subjects required for the Intermediate Examination in Medicine of the University of London.

Lecture Days :—Monday, Tuesday, Wednesday, and Thursday, at 9.30 a.m.

FEE :—£2. 2s.

TEXT BOOKS.—Thorpe's Manual of Inorganic Chemistry, 2 vols, (Collins). Tilden's Chemical Philosophy, (Longmans). Roscoe and Schorlemmer's Treatise on Chemistry, 2 vols (Macmillan). Watts (Fownes) Chemistry, 2 vols. (Churchill). Armstrong's Organic Chemistry (Longmans' Text Books of Science).

In all these courses the instruction will often take the form of class teaching, and exercises will be set which students will be expected to work at home.

#### ADVANCED CLASS.

A class for the study of Theoretical Chemistry and those parts of the subject which are required for the degree of B.Sc. in the University of London, will meet once a week, at an hour to suit the convenience of the class.

FEE for the Session, £3 3s.

### PRACTICAL CHEMISTRY.

#### LABORATORY PRACTICE.

The College Laboratory will be open daily from 9-30 to 5, except on Saturdays, when it will be closed at 1 p.m.

The object of the Laboratory Course is to supply instruction in the principles and practice of Chemical Analysis, Qualitative and Quantitative, to enable the Student to conduct original investigation, or to pursue practically the study of any special branch of Chemistry, with a view to its application to manufacturing or other purposes.

Attention will be given to the requirements of Medical and Pharmaceutical Students.

Each Student will pursue an independent Course of study to be determined after consultation with the Professor. He will be guided in his operations by the Professor or his Assistants.

NOTE.—Candidates for Intermediate Examination in Science, Preliminary Scientific (M.B.), B.Sc. and Intermediate Examination in Medicine of the University of London, may obtain in the Laboratory of the College, the instruction necessary. The three months Course of Practical Chemistry for the B.Sc. Edinburgh, in the department of Public Health, may be taken in the Mason College Laboratory.

Candidates for Intermediate Science and Preliminary Scientific Examinations will in general require a course of practical work extending over three terms.

The Ordinary Course for Medical Students is given on Tuesdays and Thursdays at 2 to 4 p.m. throughout the Summer Term.

TEXT BOOKS.—Tilden's Qualitative Analysis (Longmans); Clowes' Qualitative Analysis (Churchill); Fresenius' Qualitative Analysis (Churchill); Thorpe's Quantitative Analysis (Longmans); Fresenius' Quantitative Analysis (Churchill).

| FEES :—     |               |                         |                                                   |  |
|-------------|---------------|-------------------------|---------------------------------------------------|--|
|             | All day.      | Three hours<br>per day. | Three hours<br>per day ;<br>Three days<br>a week. |  |
| One Term    | ... 7 guineas | ... 4½ guineas          | ... 2½ guineas.                                   |  |
| Two Terms   | ...13 „       | ... 8½ „                | ... 5 „                                           |  |
| Three Terms | ...18 „       | ...12 „                 | ... 6½ „                                          |  |

Each student will be required to provide himself with a set of simple apparatus, the total cost of which need not exceed 30s. If preferred it may be hired at the Laboratory store for a charge of 7s. 6d.

Gas, water, and all ordinary re-agents (except rectified spirit, ether, chloroform, silver nitrate and platinum perchloride) are supplied by the College, and the larger forms of apparatus may be obtained on loan from the Laboratory store.

## LIST OF APPARATUS TO BE PROVIDED BY EACH STUDENT.

One small Bunsen Burner, with Rose and 3 ft. Flexible Tubing.  
Three Porcelain Basins,  $8\frac{1}{2}$  in., 6 in., 3 in. diameter.  
One Retort Stand, three Rings, and Clamp.  
One Sand Tray.  
Three small Flasks, 6 oz., 12 oz., 16 oz.  
Several Packets of Filter Paper.  
One White Glazed Tile.  
Two Porcelain Crucibles.  
One Blowpipe.  
Three small Glass Funnel.  
Two dozen Test Tubes,  $6 \times \frac{3}{4}$  in.  
Test Tube Stand, and Brush.  
One Pair of Crucible Tongs.  
One Round File, one Triangular File.  
 $\frac{1}{2}$  lb. Glass Rod.  
1 lb. Glass Tubing.  
3 ft. small India Rubber Tubing  
Three dozen Corks.  
Three Beakers, 6—12 oz.  
Platinum Foil and Wire.  
Two Books Litmus Paper.  
One Book Turmeric Paper.  
Rough Sponge.  
Two Glass Cloths.  
Note Books (Plain-ruled Copy Books).  
 $\frac{1}{4}$  oz. Silver Nitrate (Crystals).  
 $\frac{1}{8}$  oz. Platinum Perchloride (Solid).

## LIST OF ADDITIONAL APPARATUS to be provided by each Student upon commencing QUANTITATIVE ANALYSIS.

One Desiccator.  
Weighing Tubes.  
One double Funnel Stand in Wood.  
Stout Flask, Funnel, and India Rubber Stopper for use with filter pump.  
Two Convex Glass Covers for beakers.  
Platinum Capsule, Crucible, and Spatula if required.

A box of weights is provided with each balance for general use, but Students are strongly recommended to purchase their own weights.

## PRACTICAL CLASS.

*For Laboratory Students.*

A Course of short demonstrations and exercises will be given by the Professor or one of his Assistants once a week. All first-year Students will be required to attend, unless exempted for special reasons by the Professor.

No Fee.

*Extract from the Rules to be observed by Students  
in the Chemical Laboratories.*

Students are expected to make proper use of the *Fume Chambers*, and to prevent as far as possible the escape into the Laboratory of injurious gases or vapours, especially *sulphuretted hydrogen, chlorine, nitric acid, hydrochloric acid, hydrocyanic acid.*

Waste of gas, water, and chemicals must be avoided.

Every Student is expected to keep his apparatus and working table clean and in good order.

Such operations only can be allowed as belong to the course of study marked out for each Student by the Professor, and *no other experiment may be undertaken without the express permission of the Professor*, or, in his absence, of the Demonstrator. In all cases the *methods* adopted must be such as are indicated by the Professor or Demonstrator.

## EXCURSIONS.

During previous Sessions permission has been obtained to visit some of the great factories in and near Birmingham, in which chemical and metallurgical industries are carried on. Students have thus had most valuable opportunities of gaining a practical acquaintance with some branches of Applied Science. The privilege thus courteously granted by several manufacturers will, it is hoped, be enjoyed in every future Session. The excursions will be conducted by the Professor.

*Course of Study recommended to Students preparing for the*

## ASSOCIATESHIP OF THE INSTITUTE OF CHEMISTRY.

## FIRST YEAR.

1. Elementary Mathematics.
2. Elementary Physics
3. Elementary Chemistry.
4. French.
5. German.

The Elementary course of lectures in Chemistry will afford instruction sufficient for the Matriculation Examination of the University of London.

## SECOND YEAR.

1. Special course of experiment in the Physical Laboratory.
2. Chemistry.—General course of Lectures on Inorganic and Organic Chemistry.
3. Chemical Laboratory (full time).
4. French and German, if necessary.

Candidates for Intermediate Science and Preliminary Scientific (M.B.) Examinations will require to attend only the Lectures on Inorganic Chemistry, from October to March. They will also require to work in the Chemical Laboratory for about three days a week during two or three terms.

## THIRD YEAR.

1. Mineralogy ; or Geology ; or Technical Chemistry.
2. Chemical Laboratory (full time).
3. Special instruction in Chemistry.

Students taking Chemistry for the B.Sc. Examination (London), should attend the Lectures on Organic Chemistry (April to June), and give as much time as possible throughout the Session to practical work in the Chemical Laboratory. They should also attend the special class, page 106. Candidates for the Intermediate Examination in Medicine require the Lectures on Organic Chemistry (April to June): also about two terms in the Chemical Laboratory.

**CHEMISTRY FOR MEDICAL STUDENTS.**

The course of Lectures on Chemistry required by Students of Medicine in their first year is given in the Winter Session, which extends from October to March. Students preparing for the Intermediate Science and Preliminary Scientific (M.B.) Examinations of the University of London should attend during the Winter Session only. Candidates for Intermediate Examination

in Medicine will in general require only the course on Organic Chemistry which is given in the Summer. For further information concerning these courses see page 105.

### PRACTICAL CHEMISTRY.

The Chemical Laboratories of the College are open from 9.30 to 5. For fees and further information see page 107.

The usual course of Practical Chemistry for Medical Students is given on Tuesdays and Thursdays, at 2 to 4 o'clock, in the Summer Term. Every Student attending this course must provide himself with the following:—

#### APPARATUS.

One small Bunsen Burner and 2 feet Flexible Tubing.  
One Porcelain Dish, 3 in. diameter.  
One Wire Tripod.  
One Sand Tray.  
One Washing Bottle.  
One small Flask, 6 oz.  
Twenty-five Cut Filters, 3 in. diameter.  
One Porcelain Crucible.  
Crucible Tongs and Wire Triangle.  
One Blowpipe.  
Two small Glass Funnels, 2 in. diameter.  
One dozen German Test-Tubes,  $6 \times \frac{3}{4}$  in.  
Test-Tube Stand and Brush.  
One Round File and one Triangular File.  
Half-a-pound Glass Tubing free from lead.  
Three or four small Stirring Rods.  
One dozen Corks.  
Half-a-yard small India Rubber Tubing.  
One small Beaker, 6 oz.  
Platinum Wire and Foil.  
Two Books of Litmus Paper.  
 $\frac{1}{4}$  oz. Silver-Nitrate.  
 $\frac{1}{2}$  oz. Solution of Platinum Perchloride.  
Glass Cloth.  
Note Book.

The foregoing set of Apparatus can be obtained packed in a box for fifteen shillings.

## TIME TABLE.

| CHEMISTRY.                                                         | Mon.         | Tues.        | Wed.         | Thur.        | Fri.         | Sat.         |
|--------------------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| LECTURES—                                                          |              |              |              |              |              |              |
| Elementary.....<br>(Winter and Spring Terms.)                      |              |              | 11.30        |              | 11.30        |              |
| Elementary.....<br>(Summer Term.)                                  |              |              | 11.30        | 4.30         | 11.30        |              |
| General Course .....<br>(Winter and Spring Terms)                  | 9.30         | 9.30         | 9.30         | 9.30         | 9.30         |              |
| Organic Chemistry .....<br>(Summer Term.)                          | 9.30         | 9.30         | 9.30         | 9.30         |              |              |
| Mining Engineers .....<br>(Spring Term.)                           | 5            |              |              |              |              |              |
| LABORATORY ..... }                                                 | 9.30<br>to 5 | 9.30<br>to 5 | 9.30<br>to 5 | 9.30<br>to 5 | 9.30<br>to 5 | 9.30<br>to 1 |
| LABORATORY for Inter.<br>and Prel. Sci. .... }                     | 2 to 5       |              | 2 to 5       |              | 2 to 5       |              |
| LABORATORY for Engineer-<br>ing Students ..... }<br>(Summer Term.) | 2 to 5       |              | 2 to 5       |              | 2 to 5       |              |
| Medical Course .....<br>(Summer Term only.)                        |              | 2 to 4       |              | 2 to 4       |              |              |



## EVENING CLASSES.

A course of Ten Lectures on

## THE CHEMISTRY OF ILLUMINANTS,

with reference chiefly to Coal Gas and Mineral Oils, will be delivered by Professor TILDEN during the Spring Term on Tuesday evenings, at 7 o'clock, commencing on January 24th, 1888.

FEE:—Five Shillings. Artisans will be admitted on payment of half fees.

A course of Ten Lectures on

## THE CHEMISTRY OF COMMON LIFE,

will be delivered by Dr. W. W. J. NICOL during the Winter Term on Tuesday evenings, at 7 o'clock, commencing on October 11th, 1887.

FEE:—Five Shillings. Artisans will be admitted on payment of half fees.

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*DEPARTMENT IV.***METALLURGY.**

Professor W. A. TILDEN, D.Sc., Lond., F.R.S.,

Lecturer and Instructor in Assaying,

THOMAS TURNER, Assoc.R.S.M., F.C.S., F.I.C.

Three courses of day lectures will be given in the year, as follows :—

**FIRST COURSE.**

Ten Lectures on the *Principles and Practice of Metallurgy* will be delivered by Dr. Tilden during the Winter Term (October to December). This course is intended to form an introduction to the subject of Metallurgy, and special attention will be given to processes carried out in the district, and to the requirements of mining and engineering students.

**SYLLABUS.**

General Principles. Chemical and Physical Properties of Metals. Furnace Materials :—Acid, Basic, and Neutral. Composition of Fire Clay, Manufacture and Testing of Fire-bricks and Crucibles. Physical and Chemical Properties of Fuel. Principles of Combustion. Pyrometers. Mechanical Stokers. Gaseous Fuel. Preparation of Coke, Charcoal, and Patent Fuels. Slags and Fluxes. Composition and Character of Slags. Utilization of Slag.

**SECOND COURSE.**

Ten Lectures on *Iron and Steel* will be delivered by Mr. Turner, during the Spring Term (January to March).

**SYLLABUS.**

Composition, Characters, and Preliminary Treatment of Iron Ores. Manufacture of Cast Iron. Theory of the Blast Furnace. Chemical and Mechanical Properties of Cast Iron. Foundry Practice. Manufacture of Wrought Iron. Chemistry of the Puddling Furnace. Properties of Wrought Iron. Manufacture and Properties of Steel. Puddled, blister, shear, and crucible steel. Bessemer and Siemens's Steel. Basic Process. Chemical Composition and Mechanical Testing of different varieties of Iron and Steel.

## THIRD COURSE.

Ten Lectures for *Senior Metallurgical Students* will be delivered by Mr. Turner during the Summer Term (April to June).

## SYLLABUS.

Preparation, Properties, and Principal Alloys of Gold, Silver, Copper, Zinc and Lead. Principles of Electro-Metallurgy.

The subjects treated of will be selected as far as possible to suit the requirements of the class. The rarer metals are considered in the General Chemistry course (Spring Term). Senior Metallurgical Students should consult the Professor before joining this class.

*Lecture Days.*—Thursday, at 11.30.

FEE :—10s. 6d. for each course.

TEXT BOOKS RECOMMENDED :—

Greenwood's Metallurgy. Vols. I. & II.  
Phillips' Metallurgy. (Griffin.)

As it will be necessary to assume that Students in this department possess an elementary knowledge of Chemistry, those who desire to profit by these Lectures are advised to attend first a course of instruction in Theoretical and Practical Chemistry. Students entering for the Associateship in Metallurgy will be required to satisfy the Professor as to their knowledge of the subjects treated of during the three courses of lectures, and to satisfactorily pass an examination in laboratory work.

## METALLURGICAL LABORATORY.

In the Metallurgical Laboratory, which adjoins the Chemical Laboratory, arrangements are provided for giving instruction in the usual processes of wet and dry assaying, and in the preparation and analysis of alloys and various furnace products. Students entering for the Associateship pass through a comprehensive course of study. During their second year they receive special instruction in the Engineering Laboratory in the mechanical testing and physical properties of metals.

Students may join the Metallurgical Laboratory at any time. When possible a systematic course of study is

strongly recommended ; in other cases, by arrangement with the Professor, special branches of work may be taken separately.

FEES :—

|                 | All day.      | Three hours<br>per day. | Three hours<br>per day ;<br>Three days<br>per week. |
|-----------------|---------------|-------------------------|-----------------------------------------------------|
| One Term ...    | 7 guineas ... | 4½ guineas ...          | 2½ guineas.                                         |
| Two Terms ...   | 13 „ ...      | 8½ „ ...                | 5 „                                                 |
| Three Terms ... | 18 „ ...      | 12 „ ...                | 6½ „                                                |

Gas, fuel, water, and ordinary reagents are supplied by the College, but Students must provide themselves with a set of Apparatus ; also with crucibles and materials when large quantities are required.

Course of Study for the Associateship in Metallurgy :—

FIRST YEAR.

(See page 56.)

Mathematics (Junior), Physics (Junior), Elementary Chemistry and Natural Science (comprising the elements of Biology and Physiography) together with one of the following :—(a) French, (b) German, (c) Freehand and Model Drawing as taught in the Engineering Department.

SECOND YEAR.

Chemistry (General Course), Geology (Junior), with one of the following :—Mechanical Drawing, French, or German.

THIRD YEAR.

Metallurgy and Assaying, Geology (Applied), with one extra subject continued from the second year.

EVENING LECTURES.

After Christmas, a course of six Popular Evening Lectures on WROUGHT IRON will be given by Mr. Turner.

FEE :—2s. 6d.

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*CONJOINT DEPARTMENTS V., VI., and VII.***BIOLOGY.**

Professors { T. W. BRIDGE, M.A., Cantab.  
W. HILLHOUSE, M.A., Cantab.  
F. J. ALLEN, M.A., M.B., Cantab.

**ELEMENTARY BIOLOGY.**

A course of lectures on the structure and physiology of a series of typical examples of animals and plants will be delivered by the Professors of Zoology, Botany, and Physiology during the session of 1887-8. This course, which will consist of about seventy lectures, with demonstrations, is specially intended for beginners and those desirous of acquiring a general knowledge of the facts, methods and principles of Biology; and also as preparatory for the more advanced courses of instruction in Zoology, Botany, and Physiology. The course will also meet the requirements of First-year Associate Students.

The lectures and demonstrations will be carried on by the Professors of Zoology, Botany, and Physiology conjointly, each taking charge of such parts of the course as appertain to his own special department.

The structure, physiology, life-history, and habitat of the following types of plant and animal life will be carefully studied:—

**PLANTS.**

The green slime of damp walls,  
Yeast and Fermentation,  
Bacteria and Disease,  
Moulds and Decay,  
Algæ; fresh water and seaweeds,  
Mosses,  
Ferns,  
Cone-bearing trees,  
Flowering plants.

## ANIMALS.

Proteus-Animalcule (Amœba),  
 Bell-Animalcule (Vorticella),  
 Slipper-Animalcule (Paramecium),  
 Freshwater Polype (Hydra),  
 Crayfish,  
 Freshwater Mussel,  
 Frog,  
 Rabbit.

The lectures, &c., on Physiology will embrace—

## PHYSIOLOGY.

The principles of Digestion and Absorption,  
 The Heart and the circulatory system,  
 Blood, Lymph, Epithelium, &c.,  
 Respiration,  
 Connective tissues,  
 Bone, Joints, &c.,  
 Muscle and Nerve,  
 Secretion and Excretion,  
 Chemical basis of the Animal body.  
 Income and Expenditure of the body and its sources  
 of energy.  
 The functions of the nervous system,  
 The special tissues, sight, hearing, &c.

The Lectures will be alternated in such manner as may seem best for the elucidation of the subject.

*Lecture Days*.—Tuesday and Thursday, at 4 p.m., commencing on Tuesday, October 4th.

*Demonstrations* on the subject of the preceding Lecture will take place by arrangement with the class.

**FEE**.—For the entire course, including Demonstrations, £3 3s.

## TIME TABLE.

| SUBJECT.                | TIMES. |                 |      |     |      |      |
|-------------------------|--------|-----------------|------|-----|------|------|
|                         | Mon.   | Tu.             | Wed. | Th. | Fri. | Sat. |
| Elementary Biology..... | ...    | 4.0             | ...  | 4.0 | ...  | ...  |
| Demonstrations .....    |        | By arrangement. |      |     |      |      |

## DEPARTMENT V.

## ZOOLOGY AND COMPARATIVE ANATOMY.

Professor T. W. BRIDGE, M.A., Cantab.

Courses of Lectures will be given during the Session 1887-88 on Elementary Biology, Zoology (Junior Course), Zoology (Middle Course), Zoology (Senior Course), and Comparative Embryology.

Students intending to commence and continue the study of Zoology, either with a view to the Associateship in Biology or, without reference to any system of examinations, with the object of acquiring a more or less complete knowledge of the methods, facts, and principles of the science, are recommended to attend the Lecture Courses in the following order:—

*First Year:*—The Lectures and Laboratory work in Elementary Biology during the Winter, Spring, and Summer Terms.

*Second Year:*—The Lectures and Laboratory work in Zoology (Middle Course) during the entire session.

*Third Year:*—The Lectures and Laboratory work in Zoology (Senior Course), during the Summer Term, and, in addition, special courses of Laboratory work in the Winter and Spring Terms.

Students preparing for University Examinations in Arts, Science, or Medicine, are advised to attend the following Lecture Courses:—

## LONDON UNIVERSITY EXAMINATIONS.

*Preliminary Scientific (M.B.) and Intermediate Science (B.Sc.) Examinations.*—Candidates are recommended to attend the Junior Course in Zoology, and also the Tutorial Class. Candidates for Honours are requested to communicate with the Professor.

*B.A. and B.Sc. (Honours or Pass) Examinations.*—Candidates are advised to confer with the Professor as to the Lecture Courses they should attend in preparing for these Examinations.

## EDINBURGH UNIVERSITY.

Candidates for the First Professional (M.B.) Examination should enter for the Middle Course in Zoology.

## FELLOWSHIP OF THE COLLEGE OF SURGEONS.

Candidates should attend the Senior Course of Lectures on Zoology.

## OXFORD AND CAMBRIDGE LOCAL EXAMINATIONS.

For the Senior and Higher Local Examinations candidates are recommended to take the Middle Course in Zoology.

The Professor will be glad to confer with students as to the course to be pursued in special cases.

## THE SESSION.

## ELEMENTARY BIOLOGY.

For Syllabus of this course, which is conducted in conjunction with the Professors of Physiology and Botany, see conjoint sections V., VI., and VII., p. 117.

## ZOOLOGY (MIDDLE COURSE).

During the Winter, Spring, and Summer Terms a course of about seventy lectures will be given on General Zoology. The course will treat of the anatomy, development, and systematic relations of a series of typical examples of the Animal Kingdom.

## SYLLABUS.

Introduction ; distinctive features of animals as compared with plants ; animal and vegetable protoplasm ; comparison of *Amœba* and *Protococcus* ; the classification of animals ; division of the animal kingdom into groups, each group including animals more or less resembling one another ; structure and life-history of the following important types of the main sub-divisions of the Animal Kingdom :—

## GROUPS.

## EXAMPLES.

PROTOZOA.—A. Monera ..... *Protamœba. Myxotritum.*

B. Endoplastica.

(i.) Rhizopoda ..... *Amœba. Difflugia. Globigerina. Actinophrys. Actinosphaerium.*



- (ii.) Infusoria ..... *Monas. Vorticella.*  
*Peridinium. Aci-*  
*neta.*
- (iii.) Gregarinida ..... *Gregarina.*
- METAZOA.—A. Porifera ..... *Ascetia. Spongilla.*
- B. Cœlenterata.
- (i.) Hydrozoa ..... *Hydra. Sertularia.*  
*Stylaster, &c.*
- (ii.) Actinozoa ..... *Actinia, &c.*
- C. Vermes.
- (i.) Platyhelminthes.. *Convoluta. Mesc-*  
*stomum. Lepto-*  
*plana. Nemertes.*  
*Distomum. Taenia.*
- (ii.) Discophora ..... *Hirudo.*
- (iii.) Chætopoda ..... *Lumbricus. Aphro-*  
*dite. Polygordius.*
- (iv.) Polyzoa..... *Plumatella. Lox-*  
*osoma.*
- (v.) Brachiopoda ..... *Terebratula.*
- D. Echinodermata..... *Asterias. Echinus.*  
*Holothuria.*
- E. Arthropoda.
- (i.) Crustacea ..... *Astacus. Lepas,*  
*Sacculina.*
- (ii.) Tracheata ..... *Peripatus. Scol-*  
*opendra. Blatta.*  
*Scorpio. Limulus.*
- F. Mollusca.
- (i.) Lamellibranchiata. *Anodon. Pecten.*
- (ii.) Odontophora..... *Chiton, Buccinum*  
*Aplysia, Helix.*  
*Sepia, Nautilus.*
- G. Chordata.
- (i.) Hemichordata ..... *Balanoglossus.*
- (ii.) Urochordata ..... *Appendicularia.*  
*Ascidia. Pyro-*  
*soma. Salpa.*
- (iii.) Cephalochordata.. *Amphioxus.*
- (iv.) Craniata. (Vertebrata).
- (i.) Pisces ..... *Scyllium and Gadus.*
- (ii.) Amphibia ... *Rana. Menobran-*  
*chus.*

- (iii.) Reptilia ... *Lacerta*.    *Chelone*,  
                                                           *Boa*, *Crocodylia*.  
 (iv.) Aves ..... *Columba*.    *Struthio*.  
 (v.) Mammalia... *Echidna*, *Macropus*,  
                                                           *Canis*.

Distribution of animals in time and space. Zoological regions. Influence of physical conditions in modifying the structure of animals. Origin of species. The theory of Evolution.

#### LABORATORY COURSE.

In the practical class, which will be conducted in connection with this course, as many of the above-mentioned animal types as may be obtainable will be dissected and microscopically examined.

Each student will be provided with use of microscope, chemical re-agents, and dissecting instruments.

Lecture days and laboratory hours to be fixed by arrangement with the class.

FEE:—For lectures and laboratory course, £2 12s. 6d. per term.

TEXT BOOKS.—I. Anatomy of Invertebrated Animals, by Huxley (Churchill). II. Anatomy of Vertebrated Animals, by Huxley (Churchill).

### WINTER AND SPRING TERMS.

#### ZOOLOGY (JUNIOR COURSE).

A course of about sixty elementary lectures on Animal Morphology will be commenced in the Winter Term, and continued to the end of the Spring Term. The course will treat of the anatomy, physiology, histology, and development of a series of typical examples of the Animal Kingdom.

#### SYLLABUS.

##### PART I.—INTRODUCTION.

Living and non-living matter.—Distinctive properties of living matter or protoplasm, as illustrated by the structure, chemical composition, and "vital" properties of the *Proteus animalcule* or *Amœba*.—The unicellular *Amœba* compared with such higher and more complex multicellular animals as the Frog or Rabbit. Origin of the Rabbit. The egg-cell or ovum. Division of the ovum, and

the subsequent formation of physiologically different groups of cells or tissues. Structure and physiology of the various tissues of the Rabbit. Epithelium. Connective tissues (white fibrous, yellow elastic, and areolar tissues, cartilage and bone). The muscular, glandular, and nervous tissues. Combination of various tissues to form organs.

Anatomy, histology, and physiology of the various organs of the rabbit :—

- (i.) The skeleton.
- (ii.) Organs concerned in the reception, digestion, and distribution through the body of new food material (alimentary canal and associated glands; the blood and organs of circulation).
- (iii.) Organs concerned in the elimination of combustion products and other waste material from the blood (the lungs, kidneys, and skin).

Relation between the income and the expenditure of an animal body, and its sources of energy.

- (iv.) Organs of relation. The nervous system and organs of special sense.
- (v.) The reproductive organs. Ovaries and Testes. Formation of ova and spermatozoa.

Physiological and anatomical differences between the Amœba and the Rabbit. Physiological division of labour and morphological differentiation of structure.

#### PART II.—GENERAL MORPHOLOGY.

This part of the course will treat of the anatomy and physiology of the following types :—

Amœba.  
Vorticella.  
Hydra.  
Distomum.  
Lumbricus.  
Astacus.  
Helix.  
Frog.  
Fowl.  
Rabbit.

#### PART III.

The concluding lectures of the course will be devoted to the embryology of the Hydra, Distomum, Lumbricus, Frog, Fowl, and Rabbit.

#### LABORATORY COURSE.

In the practical class, which will be conducted in connection with this course, the above-mentioned animal types will be dissected and microscopically examined.

Each student will be provided with use of microscope, chemical re-agents, and dissecting instruments.

*Lecture Days* { Tuesday, Wednesday, and Thursday,  
                    at 12.30.

The first lecture will be given on Wednesday, October 5th.

Laboratory hours to be fixed by arrangement with the class.

FEE:—For lectures and laboratory course, £2 12s. 6d. per term.

TEXT-BOOK.—Practical Zoology, by Marshall and Hurst (Smith, Elder & Co.)

### SUMMER TERM.

#### ZOOLOGY (SENIOR COURSE).

A course of about fifty lectures will be given on the Anatomy, Embryology, and Geographical Distribution of particular groups of Vertebrata and Invertebrata.

*Practical Work.*—In illustration of this course of lectures, the following types will be dissected by the student:—Amphioxus, Lamprey, Skate, Cod, Frog, Tortoise, Lizard, Pigeon, and Rabbit.

Lecture days and laboratory hours to be fixed by arrangement with the class.

FEE:—For lectures and Laboratory course, £3 3s.

TEXT BOOKS.—Anatomy of Vertebrated Animals, by Huxley (Churchill). Anatomy of Invertebrata, by Huxley. *Traité de Zoologie*, par C. Claus. *Vergleichenden Anatomie der Wirbelthiere*, by Wiedersheim.

### SUMMER TERM.

#### EMBRYOLOGY.

In the summer term there will be a course of about thirty elementary lectures on Embryology. The course will treat of the Embryology and life-history of selected groups of animal forms, and of the more important generalizations which have been deduced therefrom.

In connection with these lectures there will be a practical course in which the student will work at the Embryology of a selected vertebrate type.

*Lecture Days.*—Saturday, at 11 o'clock.

FEE, including Lectures and Laboratory Course:—  
£2 12s. 6d.

#### TUTORIAL CLASSES.

A Tutorial Class for the revision of the subjects of the Preliminary Scientific (M.B.) and Intermediate Examination in Science (B.Sc.) will be conducted once a week in the Spring and Summer Terms, and will be open to all who have attended the Lecture Courses recommended for these Examinations.

FEE:—10s. 6d. per Term.

A special Tutorial Class, without fee, for candidates intending to take Honours in Zoology at these Examinations, will also be held during the Summer Term.

#### ZOOLOGICAL LABORATORY.

The Laboratory will be open daily from 10 to 5 (Saturdays excepted). In addition to students taking up practical work in connection with lectures, the Laboratory will be open to any who may wish to take up any special course of practical work, or to pursue original investigations, on payment of a Laboratory fee of Two guineas per Term.

#### ZOOLOGICAL MUSEUM.

The Museum of Zoology is open to all students attending any of the foregoing classes.

*(For Time Table see next page.)*

## TIME TABLE.

| SUBJECTS.                       | TIMES. |                   |       |       |       |       |
|---------------------------------|--------|-------------------|-------|-------|-------|-------|
|                                 | Mon.   | Tu.               | Wed.  | Th.   | Fri.  | Sat.  |
| <i>The Session.</i>             |        |                   |       |       |       |       |
| Elementary Biology .....        | .....  | 4.0               | ..... | 4.0   | ..... | ..... |
| Demonstrations .....            | .....  | (By arrangement.) |       |       |       | ..... |
| Zoology (Middle) .....          | .....  | (By arrangement.) |       |       |       | ..... |
| <i>Winter and Spring Terms.</i> |        |                   |       |       |       |       |
| Zoology (Junior).....           | .....  | 12.30             | 12.30 | 12.30 | ..    | ..... |
| Practical Class.....            | .....  | 2-5               | ..... | 2-5   | ..... | ..... |
| <i>Spring and Summer Terms.</i> |        |                   |       |       |       |       |
| Tutorial Class .....            | .....  | .....             | ..... | 5.0   | ..... | ..... |
| <i>Summer Term.</i>             |        |                   |       |       |       |       |
| Zoology (Senior) .....          | .....  | (By arrangement.) |       |       |       | ..... |
| Embryology.....                 | .....  | .....             | ..    | ..... | ..... | 11.0  |
| <i>The Session.</i>             |        |                   |       |       |       |       |
| Laboratory . .....              | 10-5   | 10-5              | 10-5  | 10-5  | 10-5  | ..... |

## EVENING CLASSES.

A series of ten popular lectures on special subjects will be delivered by Professor BRIDGE during the Winter and Spring Terms.

*Winter Term.*

1887.

## SUBJECTS.

|          |       |                                               |
|----------|-------|-----------------------------------------------|
| October  | 13... | } "Deep-Sea Life."<br>(Two Lectures.)         |
| "        | 20... |                                               |
| October  | 27... | } "Rock-building Animals."<br>(Two Lectures.) |
| November | 3...  |                                               |
| November | 10... | "Elephants."<br>(One Lecture.)                |

1888.

*Spring Term.*

|          |       |                                |                 |
|----------|-------|--------------------------------|-----------------|
| January  | 19... | "Apes and Monkeys."            |                 |
|          |       | (One Lecture.)                 |                 |
| January  | 26... | } "Insect-Life."               |                 |
| February | 2...  |                                | (Two Lectures.) |
| February | 9...  | } "Darwin:" his Life and Work. |                 |
| "        | 16... |                                | (Two Lectures.) |

*Thursday Evenings*, at 8 o'clock, commencing on Thursday, October 13th, 1887.

FEE:—2s. 6d. per Term.



*DEPARTMENT VI.*

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**BOTANY AND VEGETABLE PHYSIOLOGY.**

Professor WILLIAM HILLHOUSE, M.A., Cantab, F.L.S.

The Scheme of Botanical instruction, detailed below, is arranged to extend over three years, or two years and a term; and all students who are desirous of thoroughly mastering the subject should follow out the full programme as given. For teaching purposes, the study of Botany is divided into two branches; (1), Vegetable Biology, including Anatomy, Physiology, general Morphology and Life History; and, (2), Systematic Botany, including plant description and classification. More or less parallel courses of Lectures, with accompanying practical work, are provided in both of these branches. Hence the General Student, who has no special extraneous examinations in view, should, in the first year, attend one or other of the two Elementary Courses given; in the second year, the two courses in (1) Vegetable Biology and Morphology, and (2) Systematic Botany; in the third year, the Advanced Lectures.

Candidates for the University of London examinations, Intermediate in Science, or Preliminary Scientific, should attend the Sessional Course (Middle) in Vegetable Biology and Morphology. Candidates for Honours should take also the corresponding course in Systematic Botany. For their B.Sc. examination, this course in Systematic Botany, and the Advanced Lectures and Laboratory work should be taken.

Candidates for the Examinations in Science or Medicine of the University of Edinburgh, should take the course in Vegetable Biology and Morphology, together with the Systematic Botany of the General Summer Course.

Medical Students attached to Queen's College will take the General Summer Course.



## BOTANICAL GARDENS, EDGBASTON.

By arrangement, the Students attending any of the courses of Lectures in Botany are admitted to these Gardens free, at all ordinary times when open, on production of a ticket which can be obtained from the Professor.

STUDENTS' GARDEN.—The attention of Students is particularly drawn to the small Students' Garden, laid out under the directions of the Professor of Botany, which will be found in the south-west corner of the Botanical Gardens. The plants here are arranged (according to Hooker and Bentham) so as to show their relationships, and most of the hardy and half-hardy plants of economic or medicinal importance are likewise represented.

A small collection of economic plants unable to bear out-door exposure, will also be found in the houses.

The following is a detailed account of the various courses of Lectures :—

## A. ELEMENTARY COURSES.

A comprehensive introduction to the study of Botany, for those who are unacquainted with the subject is provided by either of two courses of Lectures and practical work ; the one lasting through the Spring and Summer Terms, the other occupying only an extended summer term. By either of these courses, it is hoped that the Student will acquire a solid ground-work in the practical study of plants, which can subsequently be used as collateral to other lines of study, such as Art, Mining, the College of Surgeons' Examinations, &c., &c., or can be further built upon by means of the more complete courses detailed below.

## I.

A course of about thirty Lectures, with demonstrations, forming the botanical portion of a general course in the Principles of Biology, will be given in the Winter and Summer Terms, as follows :—

**WINTER TERM** (about twenty Lectures).—The life-history of Plants, including the following subjects :—

The Green Slime of damp walls ; Yeast and Fermentation ; Bacteria and Disease ; Moulds and Decay ; Algae, fresh-water and marine, and their work ; Mosses ; Ferns ; Cone-bearing trees ; Flowering plants, their internal structure and external form.

**SUMMER TERM** (about ten Lectures).—Plant description and classification, including a study of some of the largest and most economically important groups in the Vegetable Kingdom.

Each Lecture will be preceded by a microscopical demonstration, or other piece of practical work, bearing upon the previous lecture.

*Lecture Days*.—Winter Term, Tuesday and Thursdays, at 4.0 ; Summer Term, Wednesday, at 4.0. *Laboratory*, at 2.45, before each Lecture.

**FEE**.—For the Winter Term, £1 1s.; for the whole course, £1 11s. 6d.

## II. General Summer Course.

A course of about forty Lectures, somewhat amplified from the above, especially in the direction of Systematic or Classificatory Botany, will be given during the Summer Term, commencing upon the first of the given lecture days coming after May 1st, and lasting until the middle of July. This course is in connection with the system of Medical Education of Queen's College.

In Systematic Botany, especial reference will be made to such natural orders as contain plants of medicinal and economic importance, and the plants themselves will, as far as possible, be studied.

The following are the chief groups which will be studied :—

**DICOTYLEDONS**. — Ranunculaceæ, Papaveraceæ, Cruciferae, Violaceæ, Caryophyllaceæ, Malvaceæ, Geraniaceæ, Rutaceæ (including Aurantiaceæ), Leguminosæ, Rosaceæ, Cucurbitaceæ, Umbelliferae, Rubiaceæ (including Cinchonaceæ), Compositæ, Campanulaceæ, Gentianaceæ, Boraginæ, Solanaceæ, Scrophularinæ, Labiata, Polygonaceæ, Euphorbiaceæ, Coniferae.

**MONOCOTYLEDONS**.—Orchidaceæ, Iridaceæ, Liliaceæ, Cyperaceæ, Gramineæ, Ferns.

*Lecture Days.*—Monday and Friday, at 10.30 a.m.; Wednesday, at 4.0 p.m. After about June 20th, there will, if it appears desirable, be extra Lectures in Systematic Botany, on Monday and Friday, at 4.0 p.m.

*Laboratory.*—During the first two-thirds of the course, work in the Botanical Laboratory will follow the lectures on Monday and Friday mornings.

*Botanical Excursions,* on Saturday afternoons, as announced.

*FEE.*—£3 3s., including Laboratory course and extra Lectures.

## B. MIDDLE COURSES.

There are two courses of Lectures, the one Biological, and extending throughout the entire Session; the other in Systematic Botany, in the Spring and Summer Terms only.

### I. Vegetable Biology and Morphology.

A course of about seventy Lectures, with thorough Laboratory training, will be given during the Session, viz., about thirty lectures in the Winter Term, thirty in the Spring Term, and ten in the Summer Term.

This course is specially recommended to those who wish for a higher course of Botanical study than that laid down in the preceding syllabus, while at the same time strictly maintaining the biological standpoint. While it is very desirable, if possible, that students should have previously familiarised themselves in some degree with Botanical phenomena, by attending one of the earlier courses, this is not absolutely necessary, nor is it assumed in the teaching that they have done so. The special characteristic of this course is that it is more thorough and technical. It is the course recommended to Candidates for Degrees in Medicine or Science of the Universities of London and Edinburgh, for Scientific Brewers, Geologists, &c. Students for Edinburgh University will likewise have to attend certain Lectures from a course in Systematic Botany, including such Natural Orders as are needed for their examinations.

**WINTER TERM.**—The General Biology, vegetative and reproductive, of Plants, the evolution of sexuality, and progressive specialisation of tissues for mechanical, protective, conducting, and assimilatory purposes as illustrated by the life-history of the following special types:—

*Protooccus*, Yeast, Bacteria, *Spirogyra*, *Vaucheria*, Brown Seaweed (*Fucus*), Red Seaweed (*Florideae*), Pin-mould (*Mucor*), Green mould (*Penicillium*), Lichens, Leaf fungi (*Ecidiium*), Mushroom (*Agaricus*), Stoneworts (*Chara* and *Nitella*), Moss, Fern, sketch of the higher Cryptogamia, *Pinus*, and the Flowering Plant.

**SPRING TERM.**—The morphology, histology, development, and physiology of the plant-members; the origin and manner of growth of hairs, stems, roots, and leaves, with their chief modifications. The mode of origin and leading characters of epidermal, vascular, and ground tissue. The Chemistry of the plant.

The general form and arrangement of the plant-members, and principal deviations therefrom.

The relations of the plant with its environment.

**SUMMER TERM.**—The special structure and development of the floral organs; the phenomena of fertilisation; embryology; the structure of the seed; the changes involved in the development of the fruit; germination, and its chemistry. The symmetry of the flower. Floral dissections, and construction of Floral diagrams.

*Lecture Days.* { Winter and Spring Terms: Monday,  
Wednesday, and Friday, at 4.0.  
Summer Term: Saturday, at 10.0.

**Laboratory Work.**—During the whole Session, the Lectures will be accompanied by a Laboratory Course, which will include full instruction in the use of the Microscope in the examination of plant structure. From the first, Students will be led to look upon structure as having a definite meaning, and taught to consider the relations which exist between structure and function as the key to this meaning. While sections will, where it seems necessary, be cut and distributed, Students will be

encouraged to make themselves independent of this assistance, and taught how best to do so. The methods and purpose of the permanent preservation of objects will also be taught, and Students will be assisted in this part of their work.

The Class will meet for this part of its work on Saturday mornings, at 10 o'clock; during the summer term, after the morning Lecture. The work will last until 1 o'clock.

N.B.—For the convenience of students who are unable to attend on Saturdays, the whole of the Saturday morning's work throughout the Session will be repeated on the following Wednesday.

FEE:—£5 5s. for the Course as above, including Laboratory, use of microscope, and all materials.  
TERMINAL FEE:—Winter Term, £2 2s.; Spring Term, £2 2s.; Summer Term, £1 11s. 6d.

## II. Systematic Botany.

A special Course of about forty Lectures in Morphology, Systematic Botany, and Plant Description will be delivered in the Spring and Summer Terms. As the resources of the Botanical Gardens, Edgbaston, are, by special arrangement with the Botanical and Horticultural Society, placed at the disposal of Students, these Lectures will be abundantly illustrated by entire plants, of which the general form and character will be analysed, and the Lectures will be accompanied, as far as possible, by dissection, under the superintendence of the Professor, of portions of illustrative plants, of which the Students will carefully study the leaf and flower characteristics. Those parts of the Lectures not dealing with plant description will be as thoroughly untechnical as it is possible to make them; and in order to combine popularity with scientific value, all *unnecessary* technicalities will be eliminated from descriptive usage, while those used will be clearly and repeatedly explained and illustrated.

Careful arrangements are being made whereby a full supply of plants illustrating the undermentioned natural orders will be in readiness—a considerable proportion of the plants being grown for this special purpose. Of all the natural orders which are taken, the Students will be

enabled to become acquainted, not merely with the botanical characteristics, but also the geographical distribution and conditions which affect them; habitat, or local distribution; uses in domestic life, manufacture, arts and medicine, and the reasons for such uses; while such plants as are used solely for ornamental purposes will also be considered. The relations of plants with the past history of our globe will be from time to time introduced.

The Plants studied will be selected mainly from amongst the following Natural Orders:—

A. DICOTYLEDONES.

1. *Thalamifloræ*. Ranunculaceæ, Magnoliaceæ, Berberideæ, Papaveraceæ, Cruciferae, Cistineæ, Violaceæ, Caryophyllaceæ, Hypericaceæ, Camelliaceæ, Malvaceæ.
2. *Discifloræ*. Linææ, Geraniaceæ, Rutaceæ (including Aurantiaceæ), Acerineæ, Hippocastaneæ.
3. *Calycifloræ*. Leguminosæ, Rosaceæ, Saxifragaceæ, Crasulaceæ, Myrtaceæ, Lythraceæ, Onagraceæ, Passifloreæ, Cucurbitaceæ, Umbelliferae.
4. *Gamopetalæ (Corollifloræ)*. Caprifoliaceæ, Rubiaceæ (including Cinchonaceæ), Dipsaceæ, Compositæ, Campanulaceæ (including Lobeliaceæ), Ericaceæ, Primulaceæ, Apocynaceæ, Asclepiadeæ, Gentianaceæ, Convolvulaceæ, Boraginææ, Solanaceæ, Scrophularinææ, Labiatæ.
5. *Monochlamydeæ*. Polygonaceæ, Urticaceæ, Amentiferae, Salicineæ, Euphorbiaceæ, Aristolochiaceæ, Cupuliferae, Coniferae.

B. MONOCOTYLEDONES. Orchideæ, Iridaceæ, Amaryllidaceæ, Aroideæ, Liliaceæ, Juncaceæ, Cyperaceæ, Gramineæ.

Also Ferns.

*Lecture Days*.—Tuesday and Thursday, at 4.30. In the Spring Term the subject will be Morphological Botany; in the Summer Term the study of Natural Orders and Plant Description. Lectures on certain of the above natural orders will be delivered in the Botanical Gardens, Edgbaston, to which Students attending this Course will at all ordinary times have admission.

*Fee*.—£2 2s. for the Course.

### ADVANCED COURSE.

A Course of Advanced Lectures will be given, extending through the entire Session, from October to June. The Lectures will be thus arranged:—

## WINTER AND SPRING TERMS.

Anatomy and Development, and Physiology.

## SUMMER TERM.

Special Morphology and Life History.

The latter portion of this Course, delivered in the Summer Term, will deal with the Life History of representatives of the chief groups of the vegetable kingdom, viz. : Thallophytes, Muscineæ, Vascular Cryptogams, Gymnosperms, Monocotyledons, and Dicotyledons.

*Lecture Days.* { Winter and Spring : Monday, Wednesday, and Friday, at 10.30.  
                              { Summer : Tuesday and Thursday, at 10.30.

*Laboratory Course.*—During the Winter and Spring Terms the Lectures, as above, will be illustrated by a Laboratory Course, at times to be arranged to meet the convenience of Students.

Students are required to give six hours a week to laboratory work.

*FEE.*—The fee for the course, including laboratory work and materials, is £6 6s. For Winter or Spring Term separately £2 12s. 6d. ; Summer Term, £2 2s.

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Tutorial Classes.

A Tutorial Class for the revision of the Botany for the Preliminary Scientific (M.B.) and Intermediate Examination in Science will be held on Wednesdays at 5.0 p.m. (or other time if more convenient), during part of the Spring and Summer Terms, commencing towards the end of the month of February, and will be open to all those who are attending the lecture course for these examinations. Fee: 10s. 6d.

A Tutorial Class will, if necessary, be also formed for students for Honours or higher Examinations. Fee: 10s. 6d.

## Botanical Laboratory.

Persons not attending lectures but wishing to work in the Botanical Laboratory, can do so at all times when open, on payment of a terminal fee of £2 2s., or Sessional

of £4 4s. to cover all expenses in work. Such Students will have admission to all Laboratory Classes, and, if capable, will be encouraged and assisted in the prosecution of original investigations.

### Botanical Excursions.

In the months of June and July weekly excursions will be made (weather permitting) for the purpose of studying the local flora. Most of these will be half-day (afternoon) excursions; but usually one or two (in mid-July) are whole day expeditions to more distant districts. They are open to all students who have been, or are, members of the botanical classes. No fee.

### Repetition of Courses.

Any student who may wish to attend a second time a course of lectures already attended, can do so on payment of a reduced fee which is calculated at two-thirds of the ordinary fee for that course.

### TEXT BOOKS.

*Elementary.*—Elementary Biology, by Huxley and Martin (Macmillan and Co.) Oliver's Elementary Lessons (Macmillan and Co.)

*Medical and General.*—Henfrey's Elementary Course (Van Voorst), or Bentley's Manual (Churchill).

*Middle.*—Practical Botany, by Strasburger and Hillhouse (Sonnenschein and Co.) Text Book of Botany, by Prantl and Vines (Sonnenschein and Co.) *Systematic.*—Hooker's Students' Flora (Macmillan).

*Advanced.*—Vines, the Physiology of Plants (Pitt Press, Cambridge). De Bary, Comparative Anatomy, translated by Bower and Scott (Clarendon Press, Oxford). Goebel, Outlines of Classification and Special Morphology; English Edition by Balfour and Garnsey (Clarendon Press, Oxford). Sachs, Lectures on the Physiology of Plants, translated by Marshall Ward (Clarendon Press, Oxford). De Bary, Comparative Morphology and Embryology of the Fungi Mycetozoa and Bacteria, translated by Balfour and Garnsey (Clarendon Press, Oxford).

Special advice on the choice of text books will be given in the introductory lecture to each course, or to any intending student upon application to the Professor. The Professor is at all times willing to consult with and advise students as to their work.



## TIME TABLE.

| BOTANY.                                     | Mon.  | Tu.               | Wed.  | Th.    | Fri.  | Sat. |
|---------------------------------------------|-------|-------------------|-------|--------|-------|------|
| <i>A. ELEMENTARY COURSES—</i>               |       |                   |       |        |       |      |
| I. Winter Term .....                        | ...   | 2.45-5            | ...   | 2.45-5 | ...   | ...  |
| Summer Term .....                           | ...   | ...               | 4.0   | ...    | ...   | ...  |
| II. General Summer—<br>(May to July) }      | 10.30 | ...               | 4.0   | ...    | 10.30 | ...  |
| " Laboratory .....                          | 11.30 | ...               | ...   | ...    | 11.30 | ...  |
| " Extra .....                               | 4.0   | ...               | ...   | ...    | 4.0   | ...  |
| <i>B. MIDDLE COURSES—</i>                   |       |                   |       |        |       |      |
| I. Biology—Winter and<br>Spring Terms }     | 4.0   | ...               | 4.0   | ...    | 4.0   | ...  |
| " Summer Term                               | ...   | ...               | ...   | ...    | ...   | 10.0 |
| " Laboratory ...                            | ...   | ...               | ...   | ...    | ...   | 10-1 |
| II. Systematic—Spring<br>and Summer }       | ...   | 4.30              | ...   | 4.30   | ...   | ...  |
| <i>C. ADVANCED COURSE—</i>                  |       |                   |       |        |       |      |
| Winter and Spring                           | 10.30 | ...               | 10.30 | ...    | 10.30 | ...  |
| " Summer .....                              | ...   | 10.30             | ...   | 10.30  | ...   | ...  |
| " Laboratory .....                          | ...   | (by arrangement.) |       |        | ...   | ...  |
| Tutorial Class—Spring and<br>Summer Terms } | ...   | ...               | 5.0   | ...    | ...   | ...  |

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(For Evening Classes see next page.)

## EVENING CLASSES.

Professor HILLHOUSE, M.A., will deliver a course of ten Lectures *during the Winter Term only*, entitled

## STUDIES OF FLOWERLESS PLANTS.

1. Flowers of Tan ; a study of the nature of life.
2. The green slime on damp walls.
3. Yeast and Fermentation.
4. Bacteria and their relations with Disease.
5. Algae.
6. Moulds.
7. Mushrooms and Toadstools.
8. Mosses.
- 9-10. Ferns.

The lectures will be followed by microscopical demonstrations and experiments in the Botanical Laboratory, lasting for about one hour, and commencing after the second lecture. A microscope will be provided for each student, and they will be instructed how to prepare and examine microscopic objects.

LECTURE HOUR :—Wednesdays, 7-8 p.m., commencing on October 12th. Laboratory, 8-9 p.m.

FEE (including Laboratory) :—Ten Shillings.

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## DEPARTMENT VII.

## PHYSIOLOGY.

Professor F. J. ALLEN, M.A., M.B., Cantab.,  
M.R.C.S., L.R.C.P.

Those students who have not attended the lectures in Zoology and Botany required for the Preliminary Scientific (or the Intermediate Science) Examination of the London University, are recommended to attend the *Course of Elementary Biology* (see page 117) during their first year.

## ELEMENTARY CLASS.

In this Class of Histology and Physiology Students will be prepared for the first or Elementary Examination in Physiology, held by the Royal College of Surgeons of England and the Royal College of Physicians, London. Students who intend to enter only for the M.R.C.S. (England) and L.R.C.P. (London) examinations, are advised to take out this course, together with the class of Embryology meeting on Fridays, in their first winter, passing on to the advanced class in their second year. Those entering for University degrees, or who intend to compete for the Fellowship Examination, will find it advisable to take out the advanced course *twice*, beginning in their first winter.

## SYLLABUS.

- (1) The Histology and Physiology of the simple tissues. Connective tissue, bone, cartilage, epithelium, muscle, nerve-fibres, and cells.
- (2) The phenomena exhibited by striped and unstriped muscle during both rest and contraction.
- (3) The chemistry of food and its digestion.
- (4) The organs of secretion and excretion. The chemistry of the products of secretion.

- (5) The coagulation and circulation of the blood.
- (6) The mechanism and chemistry of respiration.
- (7) Animal heat. Its production and regulation.
- (8) General structure and function of the nervous system.

LECTURE DAY :—Wednesday, at 11 a.m., commencing on October 5th, 1887.

FEE :—£1 1s. 0d. Students of Queen's College, who have paid the Composition fee, admitted on payment of 10s. 6d.

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#### ADVANCED COURSE.

It is presumed that students taking out this course have some knowledge of Chemistry, and of Elementary Anatomy. In Embryology the physiological aspects only will be considered. For the morphology of development students are referred to the lectures given by the Professors of Zoology and of Anatomy.

#### SYLLABUS.

1. The physiology of the Simple Tissues.
2. The chemistry of Blood and Lymph ; their Coagulation.
3. The physiology of Nerve and Muscle. Chemical and physical phenomena of vital activity.
4. Circulation of Blood and Lymph. Nutrition of the Tissues. Mechanism of the Heart and Vessels ; its disturbance in disease. Influence of nervous system on circulation.
5. Chemistry of Food and Digestion. Absorption. Movements of the Alimentary Canal. Action of the nervous system on the processes of digestion.
6. Respiration. The respiratory changes in the blood and tissues. The Movements of respiration, and their muscular and nervous Mechanism,
7. Secretion and Excretion. Excretory functions of the Skin and the Kidneys, and their relation to disease.
8. Metabolic phenomena. The Lymphatic glands, Spleen, Thyroid body, &c. Metabolic functions of the Liver ; Glycogen.
9. The Energy of the body. Chemical changes undergone by its various constituents. History of Nitrogenous bodies ; Urea, &c.

10. Animal Heat ; its production and regulation.
11. The organs of Special Sense. Structure of the Eye. The formation of Images on the Retina. Faults of vision, and their correction by glasses, &c. Sensations of Light and Colour.
12. The Ear and Auditory Sensations.
13. Taste and Smell.
14. Sensations of Temperature and Pressure. The Muscular Sense.
15. Structure and action of the Organs of Speech.
16. Plan of the Nervous System. Functions of its various parts—the Brain, Spinal Cord, and Sympathetic Ganglia.
17. Development of Ova and Spermatozoa. Physiology of the Embryo and of Gestation.

This class will meet during the Winter and Spring Terms on Mondays and Tuesdays, Thursdays and Fridays, at 11 o'clock a.m.

FEE FOR THE COURSE :—£4 4s.

Students wishing to attend the course a second time are admitted at half the ordinary fee.

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## PRACTICAL PHYSIOLOGY.

### SUMMER TERM.

In this course, which will consist of Lectures, combined with Laboratory work (in which each Student will take part) : instruction will be given in :—

#### (1) CHEMICAL PHYSIOLOGY.

Each Student will test for the most important constituents of the blood, bile, urine, milk, &c., and perform experiments on artificial digestion, the coagulation of the blood, &c., &c.

#### (2) MINUTE ANATOMY OF THE BODY (HISTOLOGY).

Each Student will prepare for himself a collection of microscopical specimens of all the tissues and organs of the body. He will receive full instructions in the working of a microscope, and in the hardening and cutting of specimens for examination.

## (3) EXPERIMENTAL PHYSIOLOGY.

Each Student will be taught the practical use of some of the more important Physiological apparatus, such as the Cardiograph, Sphygmograph, Ophthalmoscope, Laryngoscope.

FEE :—£4. 4s. For the Histology alone, the fee is £3 3s., and for the Chemical Physiology, £1 1s.

Students wishing to attend the class a second time are admitted on payment of half the fee.

All apparatus, including the use of a microscope, is provided.

## ADVANCED PRACTICAL CLASS.

Students entering for the higher examinations, and who have previously attended the ordinary Practical Class, are advised to attend this course.

The instruction given will be in Chemical Physiology and Histology of a more advanced nature. Special attention will be given to the methods employed in medical practice for the examination of Urine, &c., both qualitatively and quantitatively.

In addition students will perform for themselves the simpler nerve and muscle experiments, as well as the more important investigations on the hearts of the frog and tortoise, the pulse, nerve, and reflex action.

Students will be admitted to this class at suitable hours during either the Winter, Spring, or Summer Terms. It is important that in all cases they should arrange to enter and work together in pairs.

FEE :—£2 2s. 0d.

## PHYSIOLOGICAL LABORATORY.

The Laboratories are open daily, from 10 a.m. to 5 p.m. (Saturdays excepted), during each term, for the practice of physiological methods and the prosecution of original research. No students are admitted who have not attended a full course of lectures on Physiology in this or some other College.

FEES :—For the Term, £2 2s. ; for the Session, £5 5s.

## TIME TABLE.

| PHYSIOLOGY.                                  | Mon.                     | Tues. | Wed.                     | Thur. | Fri.                     |
|----------------------------------------------|--------------------------|-------|--------------------------|-------|--------------------------|
| ELEMENTARY<br>PHYSIOLOGY. }<br>(Oct.—March). | ...                      | ...   | 11                       | ...   | ...                      |
| ADVANCED<br>PHYSIOLOGY. }<br>(Oct.—March).   | 11                       | 11    | ...                      | 11    | 11                       |
| PRACTICAL<br>CLASS..... }<br>(May—July).     | 9—10.30<br>or<br>11.30—1 | ...   | 9—10.30<br>or<br>11.30—1 | ...   | 9—10.30<br>or<br>11.30—1 |
| ADV. PRAC-<br>TICAL CLASS. }<br>(Oct.—July). | (By arrangement.)        |       |                          |       |                          |
| LABORATORY .....                             | 10—5                     | 10—5  | 10—5                     | 10—5  | 10—5                     |



**DEPARTMENT VIII.**

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**GEOLOGY AND PHYSIOGRAPHY.**

PROFESSOR CHARLES LAPWORTH, LL.D., F.G.S.

There are two distinct series of Lecture Courses in this department. The normal or ordinary series is designed to meet the requirements of ordinary students in the science. The extra or special series is planned to meet the desires of beginners, amateurs, and the general public.

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**NORMAL SERIES.****JUNIOR COURSE (GENERAL GEOLOGY).**

This course of Lectures embraces a general outline of the science and practice of Geology. During the first two terms the student is made acquainted, in the Lecture Room and Laboratory, with the more important methods and conclusions of the science. During the third term he learns how this knowledge is applied to the practical investigation of the Geology of the Birmingham District.

**WINTER TERM.****PHYSICAL GEOLOGY.****(A) PHYSIOGRAPHICAL GEOLOGY.**

The form, size, density, and surface relief of the earth ; its envelopes, rocky crust, and probable mode of origin.

**(B) PETROGRAPHICAL GEOLOGY.**

(i.) *Mineralogy*.—Chief rock-forming minerals, their constitution, form, and classification.

(ii.) *Lithology*.—Essential characteristics and classification of the chief rock types. Description of the more important rocks of the earth-crust.

**(C) DYNAMICAL GEOLOGY.**

(i.) *Hypogenic or subterranean agencies*.

*Volcanoes*, their structure, phases, causes, and effects.  
*Earthquakes*, *secular upheaval and depression*, &c.

(ii.) *Epigene or surface agencies* (denudation and deposition).  
The effects produced by *Water* (rain, springs, rivers, lakes, seas, &c.), *Ice* (glaciers, icebergs, &c.), *Life* (coral reefs, limestones, &c.).



## (D) STRUCTURAL GEOLOGY.

- (i.) *The Stratified rocks*:—Their *original* features (stratification, lamination, superposition, &c.), their *accidental* features (jointing, inclination, curvature, faulting, &c.).
- (ii.) *The Eruptive rocks*:—The *Plutonic* sheets, veins, and dykes; the *Volcanic* lavas, tuffs, and ashes.
- (iii.) *The Metamorphic rocks*, and their mode of origin.  
 (a) *Contact* Metamorphism. (b) *Regional* Metamorphism. (c) Classification and relations of Metamorphic Rocks.
- (iv.) *The Mineral Veins and Ore Beds*.

*Lecture Hour*.—Monday, Wednesday, and Friday, at 10.30 a.m. *Laboratory*, two hours weekly, by arrangement.

FEE FOR THE TERM: Lectures and Laboratory, £2. 2s.

TEXT BOOKS RECOMMENDED.—Jukes Browne's *Handbook of Physical Geology* (Bell and Sons). Geikie's *Textbook of Geology* (Macmillan).

## SPRING TERM.

## HISTORICAL GEOLOGY.

## (A) INTRODUCTORY.

The laws and generalizations of *Stratigraphy* and *Paleontology*. *Fossils*, their mode of petrification, and uses in Geology. The order of superposition of rocks; the sequence of organic remains; the mode of development of the Geological Record.

## (B) THE ARCHEAN AGE.

General physical characters and stratigraphy of the Laurentian and Huronian Rocks of America and their presumed British equivalents. Their supposed fossils and valuable economic products.

## (C) THE PROTEROZOIC AGE.

General characters of the rocks and fossils of this age. Detailed classification of the formations and organic remains of the *Cambrian*, *Ordovician*, and *Silurian* systems in Britain.

## (D) THE DEUTEROZOIC AGE.

Common characteristics of strata and organic remains of British rocks of this age. The *Devonian* and Old Red Sandstone period. The *Carboniferous* system of Britain; its divisions and fossils. British Coal-fields and their economic products. The *Permian* rocks and their peculiar zoological and stratigraphical phenomena.

## (E) THE MESOZOIC AGE.

Physical and zoological features of the *New Red Sandstone* rocks of Britain and Germany. British salt-producing districts. The *Jurassic* formations and their ironstones, building stones, and abundant fossils. The *Cretaceous* rocks, conditions of their deposition, and peculiar forms of animal life.

## (F) THE TERTIARY OR CAINOZOIC AGE.

General characteristics of European Tertiary rocks and fossils. Contrasts between Mesozoic and Cainozoic life. Divisions and remarkable zoological features of British Tertiary rocks. Crust disturbances during Tertiary time.

## (G) THE GLACIAL PERIOD.

*Lecture Hour*.—Monday, Wednesday, and Friday, at 10.30 a.m. *Laboratory*, two hours weekly.

FEE FOR THE TERM: Lectures and Laboratory, £2. 2s.

## SUMMER TERM.

LOCAL GEOLOGY & EXCURSION CLASSES (see p.p. 151, 152).

*Lecture Hour*.—Monday and Wednesday, at 10.30 a.m.

*Excursions*.—Saturday, 1 p.m.

FEE FOR THE TERM: Lectures and Excursions, £2 2s.

## MIDDLE COURSE (APPLIED GEOLOGY).

This Course is laid down for Miners, Civil Engineers, Architects, and Surveyors, for Associate Students in Geology, and generally for those who desire to study in detail the essentially practical and economic aspects of the science. The course extends over three terms. The first term is devoted to the minute study and examination of rocks and minerals; the second term to the study of the accepted methods of developing the structure and contents of the more important mining districts of Britain; and the third term to the personal examination and careful survey of some typical geological district in the neighbourhood of Birmingham.

## WINTER TERM.

## MINERALOGICAL GEOLOGY.

*Mineralogy.*—Form and structure of Minerals ; nature of crystalline form ; systems of crystalline form ; isomorphism ; pseudomorphism, &c. Chemical composition of Minerals. Classification of Minerals. Description and determination of chief rock-forming minerals, &c.

*Petrography.*—Essential ingredients of rocks ; lithological classification of rocks. Divisions of crystalline rocks ; acid, intermediate, and basic rocks ; determination of crystalline rocks. Non-crystalline rocks, arenaceous, argillaceous, calcareous, and carbonaceous ; alteration of non-crystalline rocks. Microscopic examination of rocks.

*Lecture Hour.*—Tuesday and Thursday, at 10.30 a.m. *Laboratory*, four hours weekly.

FEES FOR THE TERM : Lectures and Laboratory, £2. 2s.

TEXT BOOKS RECOMMENDED.—Green's Physical Geology (Rivingtons). Rutley's Study of Rocks (Longmans).

## SPRING TERM.

## MINING AND ECONOMIC GEOLOGY.

*Mining Geology.*—Structure and interrelations of stratified and eruptive rock masses. Faults and folds. Distortion, alteration, cleavage, and metamorphism of rocks.

Principles of geological surveying, the construction of geological maps and sections, determination of out-crops and subterranean position of coal, iron, limestone, &c.

*Economic Geology.*—Relation of rock-structure to the form of the ground. Rocks and soils.

Chief British building stones, ornamental stones, marbles, granite, &c. Limestones, clays, and cement stones.

British Coal fields. The structure of the South Staffordshire and East Warwickshire Coal-fields.

Metallic ores of Britain ; lead, copper, tin, &c.

Drainage and water supply. Chief water-bearing rocks of Britain.

*Lecture Hour.*—Tuesday and Thursday, at 10.30 a.m. ; Friday, 12.30 p.m. *Laboratory*, two hours weekly, by arrangement.

FEES FOR THE TERM : Lectures and Laboratory, £2 2s.

## SUMMER TERM.

## GEOLOGICAL SURVEYING.

During the Summer Term the Students of this course receive instruction in the accepted methods of unravelling, determining, and mapping geological structure, from personal observation in the field. A well defined geological area, in the neighbourhood of Birmingham, is carefully mapped and described in detail by the members of the class.

In connection with this course, one half-day, at least, weekly, is devoted by the student to practical work in the field, the student surveying the ground and preparing the material for his plans and sections under the personal superintendence of the Professor.

*Field Work*.—Monday, 1 to 5 p.m. *Laboratory*, Lectures, &c., by arrangement.

FEE FOR THE TERM: £2 2s.

TEXT BOOK.—Geikie's Field Geology (Macmillan).

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**SENIOR COURSE (HISTORICAL GEOLOGY AND  
PALÆONTOLOGY).**

This Course is projected for those who desire to study in detail the Historical and Biological aspects of the Science. The Lecture Course extends over two terms, Winter and Spring, the student taking up the several sections of the subject in historical sequence, and accompanying every stage by a study of the illustrative series of fossils in the College Museum. During the third Term the pupil studies under the personal direction of the Professor, and prepares a special Thesis upon some selected subject in Historical Geology or Palæontology.

*Lecture Days* and hours by arrangement with class.

FEES FOR EACH TERM: Lectures and Laboratory (four hours weekly) £2 2s.

TEXT BOOKS RECOMMENDED.—Geikie's Textbook of Geology (Macmillan); Nicholson's Ancient Life History of the Earth (Blackwood).

### PRACTICAL CLASS.

In connection with the three foregoing Courses, Practical classes are held in the Geological Laboratory, upon such days and hours as are found most convenient to the students. The instruction given has reference to the actual study and examination of the minerals, rock-specimens and fossils noticed in the lectures; the methods of sectioning, mounting, and determining of fossils; the preparation of rock specimens for the microscope and cabinet; the drawing of figures, maps, sections, &c.

Persons not attending Lectures, but wishing to work in the Geological Laboratory and Museum, can do so at all times when open, on payment of a terminal fee of £2 2s., or 10s. 6d. for two hours weekly each term. Such students will be encouraged and assisted in the prosecution of their private studies or original work.

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### EXTRA SERIES.

#### WINTER AND SPRING TERMS.

During the Winter and Spring terms, a Course of about twenty Lectures (ten in each term) will be delivered on

#### ELEMENTARY GEOLOGY.

These Lectures will be of a popular and untechnical character, and will present a summary of the chief principles, methods, and conclusions of the Science of Geology. They will be fully illustrated by a series of diagrams, rock specimens, and fossils. This course is intended for beginners in Geology, for amateurs, for those persons of leisure who desire a knowledge of the outlines of the Science, and for those who intend to join the Summer Excursion Class.

#### SYLLABUS.

#### WINTER TERM. (PHYSICAL GEOLOGY.)

1. *The Exterior of the Earth-Crust.*

Form and size of the Earth—the atmosphere—oceans—the land and water areas of the globe.

2. *The Materials of the Earth-Crust.*

Rock-forming minerals, rock-structure, classification of rocks.

3. *Agents concerned in altering the form and structure of the Earth-Crust.*

(a) *Internal*.—Volcanoes, Geysers, Earthquakes, &c.

(b) *External (destructive)*.

The air, rain, rivers, frost, glaciers, the sea.

(*re-constructive.*)

The atmosphere, rivers, lakes, plants, animals.

4. *Architecture of the Earth-Crust.*

(a) *The Sedimentary rocks*.—Their stratification, jointing, inclination, contortion and faulting.

(b) *The Igneous rocks*.—The *intrusive*: granites, porphyries, &c. The *contemporaneous*: lavas, tuffs, and ash-beds.

(c) *The Altered rocks*.—Their cleavage, contact-metamorphism and regional-metamorphism.

(d) *The Mineral Veins* and ore beds.

*Lecture Hour*.—Wednesday, 2.30 p.m., commencing October 5th, 1887.

FEE :—12s. 6d.

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SPRING TERM. (HISTORICAL GEOLOGY.)

1. *The Life of the Present.*

Classification of animals and plants; distribution of life forms; theories of biological evolution; mode of preservation of animal and vegetable remains.

2. *The Geological Record.*

History of Geological Discovery; principles of chronological classification of formations; the growth of the geological record.

3. *The Fundamental Rocks.*

The crystalline formations; their great extent; richness in minerals, and barrenness of life.

4. *The Dawn of Existence.*

The primeval islands and shallow seas of Western Europe, their prolific and remarkable forms of animal life.

5. *The Continental Period.*

The western mountain ranges, and great British Lakes of Old Red Sandstone time; the coral banks and fern forests of the Coal period; the great Salt-lakes and Sandy Deserts of the Permian and Trias.

6. *The Great Depression.*

The coral-reefs of the Jura and the Midlands—gigantic sea-lizards and Ammonites.

The vast ooze-covered ocean-floor of the Chalk.

7. *The Re-emergence.*

The gradual development of the Old World; formation of the Alps and Himalayas. The British Andes, volcanoes and plant life; warm climates and remarkable mammalian life of Tertiary Time.

8. *The Age of Man.*

The Ice period, its ice sheets and glaciers, appearance of early man, disappearance of the mammoth and its contemporaries, progress of man through pre-historic times.

9. *The Evolution of the Earth Crust*, and the life with which its surface has been successively peopled.

*Lecture Hour.*—Wednesday, at 2.30 p.m., commencing 25th January, 1888.

FEE :—12s. 6d.

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### SUMMER TERM.

## GEOLOGY OF BIRMINGHAM AND DISTRICT.

### LOCAL GEOLOGY AND EXCURSION CLASS.

The main object of this course is to afford the student a practical knowledge of the geological structure of the neighbourhood of Birmingham, and of the Midlands generally. The various geological formations found within thirty miles of Birmingham are described in a series of Lectures, illustrated by a series of typical rocks and fossils.

Upon every Saturday when practicable, Excursions are made by the members of the class to the more important geological localities of the district, and their visible phenomena studied in the field.

The members of this class are encouraged and assisted in the collection, determination and preservation of representative rocks and fossils.

This class is intended not only for ordinary students of the science, but also for amateurs and persons of leisure, collectors, miners, architects, and for all those who take an interest in the geology of the district.

*Lecture Hour.*—Wednesdays, at 2.30 p.m., or on the evenings of Friday, at 7 p.m.

**FEES FOR THE COURSE:**—Excursions and Lectures, £1 1s.; Lectures only, 12s. 6d.

## EXCURSION CLASS.

*Excursions.*—As a general rule the Excursions take place after 1.0 p.m. A few whole-day excursions are made by arrangement among the members of the class.

FEE FOR THE EXCURSIONS ONLY :—£1 1s.

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## PHYSIOGRAPHY.

Two courses of Lectures are given in this Department—a course in Elementary Physiography, suited to beginners, and a course in Junior Physiography, which is taken by all Associate students in science during the first year of their college career.

## SPRING TERM.

## ELEMENTARY PHYSIOGRAPHY.

During the Spring Term a course of ten lectures will be given upon Physiography and Physical Geography. These lectures will treat of the earth's surface-features as known to us at present, and of the means by which they have been brought into existence.

This course is intended, primarily, for those persons of leisure who desire to make themselves acquainted with the present state of our knowledge of the surface of the globe ; but it will be of especial service also to those preparing themselves for the Oxford and Cambridge Local Examinations, to the Members of the Higher Classes in Schools and Colleges ; and to those intending to join the Classes in Geology.

The subjects treated of in these Lectures will include :—

1. The speculations as to the primeval state of the globe, its gradual development in time ; and the recognised facts respecting its present form and its movements in space.
2. The action of the great subterranean forces as shewn in the phenomena of volcanoes, earthquakes, and the slow upheaval and depression of the earth-crust.
3. The form and distribution of the chief land areas of the globe, and the laws of the origin and development of continents and mountain chains.



4. The form, depth, and contents of the great ocean basins, as deduced from the results of the Challenger and other exploring expeditions; and the movements, temperature, &c., of the ocean waters.

5. The action of fresh water upon the surface of the land, &c., as seen in the great rivers, deltas, waterfalls, and lakes of the globe; and in icebergs and glaciers, &c., past and present.

6. The movements of the atmosphere as shown in the trade winds, hurricanes, &c., of the tropics; the laws which appear to govern these movements, and their application in the prediction and explanation of the courses and behaviour of British storms.

7. The peculiar distribution of animals and plants upon the Earth surface of the present; the laws which apparently govern this special distribution.

*Lecture Hour.*—Tuesday in each week, at 2.30 p.m.; commencing January 24th, 1888.

FEE FOR THE COURSE :—12s. 6d.

TEXT BOOKS RECOMMENDED.—Page's Elementary Text Book of Physical Geography (Blackwood); Geikie's Elementary Lessons in Physical Geography (Macmillan).

## JUNIOR PHYSIOGRAPHY.

### WINTER AND SPRING TERMS.

During the Winter and Spring terms a course of forty lectures will be delivered on the mornings of Monday and Wednesday in each week at 11.30. This course is intended to meet the requirements of those who desire a more detailed knowledge of the essential facts and principles of Physiography than is afforded by the lectures delivered in the Elementary Class. It is taken by all Associate Students in their first year; and should also be taken by all those non-systematic students who intend to proceed to the study of Geology, Biology, or Mining.

### SYLLABUS.

#### 1. *Astronomical Relations of the Earth*

Magnitudes and distances of the stars and constellations; nebulae, comets and meteorites.

The sun, its size, constitution and surface appearances.

The solar system : planets and satellites.

2. *The Earth as a Globe.*

Measurement of the surface of the globe ; maps and map projections.

Form and size of the earth ; movement ; procession of the equinoxes, &c.

Density of the globe ; how measured ; nature of the earth's interior, &c.

Relief of the globe, general distribution of land and water.

Distribution of terrestrial magnetism and electricity ; mariner's compass, dip circle, &c.

3. *The Atmosphere.*

Constitution of the atmosphere ; impurities of atmosphere, &c.

Temperature of atmosphere ; how measured, distribution horizontal and vertical.

Moisture of atmosphere ; hygrometer, clouds, rainfall, glaciers.

Pressure of atmosphere ; variations in ; how measured, how caused.

Prevailing air-currents, winds, cyclones.

Storms and hurricanes, how predicted and mapped.

4. *The Ocean Basins.*

Configuration of the ocean basins, how ascertained and mapped.

Composition, density, temperature, and depth of the ocean waters.

Currents of the ocean ; distribution and climatal effects ; theories of their origin.

5. *The Earth-Crust.*

Chemical and physical constitiution of the accessible Earth-crust.

Rocks stratified and unstratified ; common rock-forming minerals and rocks.

Agents concerned in altering the form of the Earth-Crust—

(a) *Internal agents* (Volcanoes and secular crust movements).

Volcanoes, their origin, mode of action, products and geographical distribution. Geysers and springs.

Earthquakes and their effects. Slow upheavals and subsidences of the earth-crust ; raised beaches, coral islands &c.

*(b) External agents (Rain, rivers, ice, wind, &c.)*

Action of rain water: subterraneous streams and springs.

Work of rivers: erosion, transportation and re-deposition, formation of cañons, terraces, deltas, &c.

Work of the sea: formation of cliffs, beaches; distribution of sediments.

Action of ice: glaciers, icebergs; formation of moraines, &c.

Action of wind: formation of sand - dunes, deserts, &c.

6. *The Life of the Earth.*

Classification of living animals and plants; localization and representation of species; zones of vegetation. Wallace's Biological regions; island life.

7. *Evolution of the Earth.*

Hypothesis of Kant and Laplace respecting the mode of origin of the solar system; evidences in favour of this hypothesis.

The geological formations and fossils, their general distribution in space and time.

The slow development of the land surface by means of crust movements, denudation and deposition; origin of continents, mountains, cañons, fiords, and islands.

Darwin's evolutionary theory, and its bearing upon the present and past distribution of life upon the globe.

*Lecture Hour.*—Monday and Wednesday in each week, at 11.30 a.m. Demonstrations on the subjects of the Lectures will take place by arrangement with the class.

FEE FOR THE COMPLETE COURSE, including Demonstrations:—£3 3s.

For each Term separately, £2 2s.

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(For Time Table and Evening Classes see next page.)

## TIME TABLE.

| GEOLOGY.                          | TIMES. |                 |       |       |       |        |
|-----------------------------------|--------|-----------------|-------|-------|-------|--------|
|                                   | Mon.   | Tu.             | Wed.  | Th.   | Fri.  | Sat.   |
| <i>Winter and Spring Terms.</i>   |        |                 |       |       |       |        |
| Junior Geology.....               | 10.30  | ...             | 10.30 | ...   | 10.30 | ...    |
| Middle Geology.....               | ...    | 10.30           | ...   | 10.30 | 12.30 | ...    |
| Senior Geology.....               | ...    | By arrangement. |       |       | ...   | ...    |
| Junior Physiography.              | 11.30  | ...             | 11.30 | ...   | ...   | ...    |
| Elementary Geology .              | ...    | ...             | 2.30  | ...   | ...   | ...    |
| Laboratory .....                  | ...    | By arrangement  |       |       | ...   | ...    |
| <i>Spring Term.</i>               |        |                 |       |       |       |        |
| Elementary Physio-<br>graphy..... | ...    | 2.30            | ...   | ...   | ...   | ...    |
| Mining .....                      | 5.0    | ...             | ...   | ...   | ...   | ...    |
| <i>Summer Term.</i>               |        |                 |       |       |       |        |
| Junior Geology.....               | 10.30  | ...             | 10.30 | ...   | ...   | ...    |
| Local Geology.....                | ...    | ...             | 2-30  | ...   | 7.0   | ...    |
| Geological Surveying.             | 1 p.m. | ...             | ...   | ...   | ...   | ...    |
| Excursions .....                  | ...    | ...             | ...   | ...   | ...   | 1 p.m. |

## EVENING CLASSES.

A course of twenty Lectures will be delivered by Professor C. LAPWORTH, during the Winter and Spring Terms, on—

## ELEMENTARY GEOLOGY.

These Lectures will be of a popular and untechnical character, and will present a summary of the chief principles, methods, and conclusions of the Science of Geology. They will be fully illustrated by a series of diagrams, rock specimens and fossils.

WINTER TERM. (PHYSICAL GEOLOGY.)

SPRING TERM. (HISTORICAL GEOLOGY.)

For Syllabus see pages 149-151.

*Lecture Hour.*—Friday, 7 to 8 p.m., commencing October 7th, 1887, and January 20th, 1888.

FEE:—Five shillings for each Term. Artisans and Teachers in Elementary Schools, Two shillings and sixpence for each term.

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Should a sufficient number of Students apply, an Advanced Course of Evening Lectures on

MICROSCOPIC PETROGRAPHY, &c.,

will also be delivered.

*Lecture Hour.*—Friday, 8 to 9 p.m., commencing October 7th, 1887, and January 20th, 1888.

FEE:—12s. 6d.

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*DEPARTMENT IX.*

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**MINING.**

Professor W. E. BENTON, Assoc. R.S.M., F.G.S.

During the Session 1887-8 Professor BENTON will deliver four courses of Lectures, viz. :—

- I. *Mining Associateship Course.*
- II. *Coal-Mining Course.*
- III. *Special Course.*
- IV. *Miners' Course.*

**I.—MINING ASSOCIATESHIP COURSE.**

This course, extending over *three years*, is based on those existing at the principal European Mining Schools, and comprises an education in the principles of Coal-Mining, Metal-Mining, Quarrying, Mine Surveying, Plan Making, and those sciences allied to mining operations.

Its aim is to familiarize the student with the principles of General Mining as a ground-work for thorough Special Mining, and to abridge the time required for obtaining the practical power of successfully managing a mine.

It includes the following subjects :—

|                            |                |
|----------------------------|----------------|
| Mathematics.               | Metallurgy and |
| Physics.                   | Assaying.      |
| Inorganic Chemistry.       | Engineering.   |
| Biology.                   | Mining.        |
| Physiography, Geology, and | Plan Making.   |
| Mineralogy.                |                |

The Syllabus of the Mining Lectures, and the various lecture hours, and fees, are given on the following five pages:—

### SYLLABUS OF MINING LECTURES.

The law of Royalty, or the modes of leasing minerals in different countries.

Important facts of mining interest as to the character of stream deposits; lodes; flats; pipe veins; stockworks; irregular deposits and seams.

Searching for minerals by shoothing, trenching, costeaning, and boring.

Modes of employment of mining labour.

Mining tools.

Explosives used in blasting, and their substitutes in fiery mines.

Shaft sinking and level driving.

The working away of minerals.

Underground transport of minerals.

Mechanical appliances for raising water and minerals in shafts and the lowering and raising of persons in shafts.

Occurrence of noxious gases in mines; their removal by natural, physical, and mechanical means. The measurement and distribution of the ventilating current.

Lighting subterraneous workings.

Explosions of firedamp and the spontaneous combustion of coal.

Surface works at Collieries.

Dressing or preparation of ores for the smelter.

The Lectures will be demonstrated by visits to important mines within convenient distances from the College.

PLAN MAKING.—The tuition in the drawing office will consist in the preparation of detailed and finished plans to scale of the various engines, machines, rolling stock, and erections which are

generally used in mining operations. Also in the preparation of plans of the surface and underground operations, with practice in the alteration of plans of one scale to those of other scales. A qualified Assistant will take charge of the drawing office, under the supervision of the Professor.

**MINE SURVEYING.**—Mine Surveying will be taught in the mine (metalliferous and coal mines) both with and without the use of the magnetic needle.

## SYLLABUS OF MINING MACHINERY LECTURES.

**TURBINES AND WATER-WHEELS**, their construction and appliances for transmitting their power.

**BOILERS.**—Economical combustion of coal for steam raising. Hand and mechanical firing. Grate and heating surfaces. Evaporative Power. Horse-power. Feed pumps and injectors. Strength of boilers. Single and double rivetting. Boiler inspection.

**STEAM ENGINES.**—Various forms—vertical, horizontal, beam, condensing and non-condensing. Expansive working. Single cylinder and compound. Indicators and diagrams. Indicated horse-power. Effective or brake horse-power. Computation of size for required horse-power. Steam and exhaust ports. Valves and valve gears. Lap and lead of valves. Steam jackets. Injection and surface condensers.

**PUMPING ENGINES.**—Various styles of—beam, bell-crank, bull, differential, centrifugal, pulsometer. Duty of pumping engines. Horse-power required. Suction and force pumps. Air vessels. Overhead and underground pumps. Strength of spears, rods, beams and bell-cranks.

[How far this course can be carried out will depend on the previous knowledge of the Student; it may be found desirable to extend this course to forty Lectures.]

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FIRST YEAR COURSE. TABLE OF LECTURE HOURS AND FEES.

| SUBJECT.                                                                                                                                    | Mon.          | Tues.       | Wed.          | Thur.       | Fri.          | FEES.              |
|---------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------|---------------|-------------|---------------|--------------------|
| MATHEMATICS (JUNIOR)—<br>1st and 2nd Terms .....<br>3rd Term .....<br>(See p. 30.)                                                          | 10.30<br>9.30 | ...<br>9.30 | 10.30<br>9.30 | ...<br>9.30 | 10.30<br>9.30 | £ s. d.<br>} 4 4 0 |
| PHYSICS (JUNIOR)—<br>Lectures—1st, 2nd, and 3rd Terms.....<br>Laboratory—1st and 2nd Terms.....<br>(See p. 33.)                             | ...<br>2.30-5 | 11.30<br>.. | ...<br>..     | 11.30<br>.. | ...<br>..     | } 4 4 0            |
| CHEMISTRY (INORGANIC)—<br>Lectures—1st and 2nd Terms .....<br>Laboratory—3rd Term .....<br>(See p. 103.)                                    | ...<br>2-5    | ...<br>..   | 11.30<br>2-5  | ...<br>..   | 11.30<br>2-5  | } 4 14 6           |
| NATURAL SCIENCE—<br>BIOLOGY (ELEMENTARY)—<br>Lectures—1st, 2nd, and 3rd Terms ...<br>Laboratory Hours (by arrangement) ...<br>(See p. 117.) | ..<br>..      | 4<br>..     | ...<br>..     | 4<br>..     | ...<br>..     | } 3 3 0            |
| PHYSIOGRAPHY (JUNIOR)—<br>Lectures—1st and 2nd Terms .....<br>Laboratory Hours (by arrangement) .....<br>(See p. 153.)                      | 11.30<br>...  | ...<br>..   | 11.30<br>..   | ...<br>..   | ...<br>..     | } 3 3 0            |
| MECHANICAL DRAWING—3rd Term .....<br>(See p. 177.)                                                                                          | ..            | 2-5         | ...           | 2-5         | ...           | 1 11 6             |
| Fee for First Session .....                                                                                                                 |               |             |               |             |               | £21 0 0            |



THIRD YEAR COURSE.

[illegible]

## II.—COAL-MINING COURSE.

This course is specially intended for the assistance of candidates for Certificates of Competency as Colliery Managers.

It extends over *two years* and embraces :—

- (a) Forty lectures on Coal-Mining and Colliery Management ;
- (b) Ten lectures on Chemistry ; and,
- (c) Ten lectures on Geology.

The syllabuses of these lectures, the lecture hours, and fees are given on the following three pages.

## SYLLABUS.

COAL-MINING AND COLLIERY  
MANAGEMENT.

## COLLIERY LEASES.

MODES OF OCCURRENCE OF COAL and influences affecting the yields of Coal Seams.

SEARCHING FOR COAL.—Preliminary considerations. Various methods of boring by hand and machinery. Free-falling cutters and clearing instruments. Boring accidents, their treatment and prevention. Notable European bore-holes. Comparison of the successes and costs by various methods. Surveying the bore-hole. Commercial tests of fuel found.

MINING TOOLS.—Qualities of iron and steel. Welding. Description of tools for hard and soft ground, their points of weakness, strength, and cost.

WINNING COAL.—Adits. Inclined planes. Shafts : their form, size, and position. Various methods of sinking in difficult ground. Rock boring machines. Blasting. Shaft lining. Notable sinkings. Costs. Provisions for safety to life while sinking.

EXPLOITATION : various methods of, with a discussion on their respective advantages. Considerations respecting the “laying-out” of the workings.

CUTTING AND BREAKING DOWN COAL.—Considerations of roof and floor. Coal-cutting machines. Blasting, and its substitutes. Costs. Provisions for safety.

TIMBERING.—Varieties of timber. Modes of timbering.

HAULAGE.—Underground tramways. Self-acting inclined planes. Haulage by horses. Hauling engines and position for their fixture. Discussion of the various methods of haulage. Hauling appliances. Signalling. Costs. Provisions for safety.

WINDING.—Drums. Brakes. Ropes. Caplings. Cages. Head gears. Conductors. Safety appliances. Signals. Loading and unloading arrangements.

DRAINAGE OF MINES.—Collection of water in shafts. Force and suction pumps, and their securement in shafts. Clacks, valves, and lost lifts. Drainage of dip workings. Construction of dams.

GASES FOUND IN MINES.—Physical properties : causes of their presence. Fire-damp detectors.

VENTILATION.—Natural, physical, and mechanical means of. Laws of air friction. Distribution of air in mines. Measurement of air currents. Comparative merits of various ventilators.

LIGHTING MINES.—Naked lights. Safety lamp and its typical varieties, with a comparison of their respective safeties, luminosities, weights, and costs. Electric lighting. The British and Continental Laws with regard to the lighting of fiery mines.

EXPLOSIONS IN MINES.—Gradual exudations and outbursts of fire-damp. Part played by coal dust. Available means for the prevention of explosions.

SPONTANEOUS COMBUSTION.—Causes, treatment, and prevention.

SURFACE ARRANGEMENTS.—Sorting, screening, grinding, washing, coking, and weighing coals. Shops. Labour costs.

GENERAL OBSERVATIONS.—Capitalising. Definite purposes. Cautious development. Depreciation of mining plant.

SURVEYING.—Surface and subterranean surveying. Levelling and laying out railways. Plan-making, and sources of error.

## THE CHEMISTRY OF COAL-MINING.

Professor W. A. TILDEN, D.Sc.Lond., F.R.S.

PHYSICAL CONSTITUTION OF A GAS.—Relation of gases to temperature and pressure. Thermometer. Barometer. Laws of diffusion of gases.

The properties of—

Oxygen.

Hydrogen.

Water.

Nitrogen.

The Air—Composition of—Moisture and carbonic acid in air.

Sulphur and Sulphuretted Hydrogen.

Carbon, its forms and modes of occurrence.

Compounds of Carbon and Oxygen.

Spontaneous combustion of coal.

Compounds of Carbon and Hydrogen.

After-damp.

## THE GEOLOGY OF COAL-MINING.

Professor CHARLES LAPWORTH, LL.D., F.G.S.

SANDSTONES.—Their great irregularity in thickness. Joints. Water-bearing qualities.

CLAYS.—Their uniformity as compared with sandstones. Brick clays. Fire clays.

COAL.—Way in which it was formed. Partings in coal seams. Increase in the thickness of partings. "Rockfaults."

LIMESTONES.—Theory of their formation.

BOULDER CLAYS.

VOLCANIC ROCKS.—Their various forms and their effects upon coal seams and the working of coal.

DIP.—How measured and observed. How to calculate the thickness of strata. How to find depth of coal below surface.

OUTCROP AND GEOLOGICAL MAPS.—How to trace the outcrop of a seam of coal upon the ground, and lay it down upon maps.

FAULTS.—Laws which govern their direction. Branch faults. Fault Stuff. Slikensides. Way in which outcrops are shifted by faults. Practical methods of detecting faults. Cautions to be observed in the neighbourhood of faults.

STRATIGRAPHICAL GEOLOGY.—The geology of the carboniferous rocks of Great Britain, especially the South Staffordshire, North Staffordshire, and other Midland collieries. Search for coal under the new red sandstone and other formations above carboniferous rocks; where it is hazardous, and where it may be attempted with a fair prospect of success.

## LECTURE HOURS AND FEES.

| FIRST YEAR.                |                                         |        |        |                   |
|----------------------------|-----------------------------------------|--------|--------|-------------------|
| SUBJECT.                   | TERM.                                   | DAY.   | HOURL. | FEES.             |
| Coal-Mining                | { 2nd and 3rd Terms<br>(Jan. to June) } | Monday | 6 p.m. | £ s. d.<br>" 10 6 |
| Chemistry ...              | { 2nd Term .....<br>(Jan. to March) }   | Monday | 5 p.m. | " 10 6            |
|                            |                                         |        |        | £1 1 0            |
| SECOND YEAR.               |                                         |        |        |                   |
| SUBJECT.                   | TERM.                                   | DAY.   | HOURL. | FEES.             |
| Coal-Mining<br>(Continued) | { 2nd and 3rd Terms<br>(Jan. to June) } | Monday | 6 p.m. | £ s. d.<br>" 10 6 |
| Geology .....              | { 2nd Term .....<br>(Jan. to March) }   | Monday | 5 p.m. | " 10 6            |
|                            |                                         |        |        | £1 1 0            |

### III.—SPECIAL COURSE FOR AUDITORS AND OTHERS.

This Course is arranged to give such instruction in Mining as would be useful to Auditors of Colliery Accounts and to investors in Colliery Properties.

It will comprise about six lectures.

The lectures will be given on each Monday, from 10th October to 14th November, at 5 o'clock p.m.

FEE, 10s. 6d.

### SYLLABUS.

Colliery leases.

Modes of occurrence of Coal. Influences affecting the yields of coal seams. Searching for Coal.

Shaft sinking. Modes of working Coal, and claims for surface damage.

Wear and tear of machinery and rolling stock.

Organisation of colliery labour. Time keeping and wages paying.

Criticisms of the methods employed in computing the depreciation of collieries.

Causes of failure of colliery investments.

### IV.—MINERS' COURSE.

These lectures, about twenty each winter, are intended for working miners and treat on subjects connected with the safety of their lives. The lectures will be given by the Professor of Mining, at nominal fees, in any of the larger mining centres of the South Staffordshire Coalfield on request from local Committees interested therein.

For details apply to the College Secretary or to the Professor in Mining, Mason College.

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## DEPARTMENT X.

## CIVIL AND MECHANICAL ENGINEERING.

Professor ROBERT H. SMITH, M.I.M.E., M.I.C.E.,

Mem. of the Order of Meiji of Japan,

Whitworth Scholar.

Demonstrator and Workshop Instructor,

J. HAMILTON, Whitworth Scholar.

Students are allowed to attend any particular Classes they may deem more especially important for themselves on condition of their paying the fees and obeying the general regulations of the College, and Certificates of Attendance and Merit will be given in each single class; but Engineering Diplomas will be given to those only who pursue systematically the regular course as stated in the Calendar.

The Programme of Study is arranged so that any one year of it may be taken with advantage by a student properly prepared for the work of that year. But the benefit that may be derived from the study of any one year is very much greater for the student who follows out the whole three years' course than for one who omits any part of it.

Students entering the First Year's Course must not be less than 16 years of age. They must have received previously a good education in the English Language, Arithmetic, and Elementary Mathematics.

*Certificates and Diplomas.*

The course prescribed for the Engineering Diplomas, includes the study of, and examination in, the following subjects in the ordinary classes of the respective professors of these subjects:—

|             |   |   |                     |
|-------------|---|---|---------------------|
| Mathematics | . | . | Professor Heath.    |
| Physics     | . | . | Professor Poynting. |
| Chemistry   | . | . | Professor Tilden.   |
| Geology     | . | . | Professor Lapworth. |
| Engineering | . | . | Professor Smith.    |

A tabular statement of this course, showing fees and class hours, will be found below, as also a detailed syllabus of the special Engineering Classes. Detailed information respecting the Classes in Mathematics, Physics, Chemistry, and Geology, is given in these respective sections of the Calendar.

At the end of the first year *Ordinary Class Certificates of Attendance and Proficiency* alone will be given. The "Junior Engineering Diploma" is given at the end of two years' study, and the "Senior Engineering Diploma" at the end of three years' study. The following are the conditions upon which these Diplomas are awarded :—

#### ENGINEERING DIPLOMA REGULATIONS.

##### ATTENDANCE.

*Junior Diploma.*—Attendance on the full course stated in the Calendar for the first and second years.

Students who, on entering the College, satisfy the Professors of Physics and Mathematics that they have already attained elsewhere the standard of a First Class in the Mason College Junior Classes, need not attend the Junior Class or Classes for the said subjects, *provided* that they present themselves for examination at each of the three terminal class examinations in the subject or subjects omitted; their position at the end of the Session being judged from these examinations in the ordinary way, and the fee for the three examinations in each subject being 10s. 6d.

*Senior Diploma.*—Attendance on the full third year's course, and the possession of a Junior Diploma, or full proof that the student has gained elsewhere an equivalent of the knowledge implied thereby.

##### POSITION IN EXAMINATIONS.

*Junior Diploma.*—Candidates must have obtained three first classes in the first year's course, and two first classes in the second year's course. In each year one of these first classes must be obtained in the Engineering Lecture class, and one in some non-engineering subject. Engineering Drawing and Laboratory count as separate classes.

*Senior Diploma.*—First class in the Special Class of Engineering for which the candidate is studying. A Thesis on some special Engineering question must be written and approved of. This thesis will ordinarily include a complete design of a machine or other work and set of drawings thereof.

## CASES OF FAILURE.

Students who have failed to reach the required standard in any subject may repeat the course in that subject, or may enter for the final examination at the end of the annual course on payment of an examination fee of 10s. 6d. In such cases students need only pass the examination in classes in which they have previously failed.

The instruction of the first two Sessions is such as *all* engineers ought to receive in order to be well educated. In the Third Session the Students are classified according to the special branch of engineering they intend to follow as their profession, and their studies are to a great extent distinct.

They are classified as follows :—

*Civil, Mechanical, and Electrical Engineers,*

and these distinctions will be recognised in the wording of the Senior Diplomas.

## RATIONAL METHOD OF STUDY.

From a perusal of the subjoined programmes it will be seen that the plan of instruction is, firstly, to describe the *facts* of engineering practice, that is, the tools, machinery and methods used by engineers; secondly, to develop the theoretical engineering science as based on these facts; and thirdly, to apply the scientific knowledge of facts and theory to practical problems in engineering design.

The whole of the teaching in Professor Smith's classes is practical and technical in its aim, no theory being introduced except such as has a direct bearing upon the problems of professional practice, and no theories being taught until the facts upon which they are based have been fully explained. The practical work in the Drawing, Exercise and Laboratory classes is designed to give familiarity with the processes, calculations, and materials used in Engineering Establishments and in Surveying. In the Laboratory the student makes experimental investigations of the properties of Tools, Machines, and Materials, such as he can have no opportunity of making during an

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apprenticeship at works. College study cannot, however, supersede the desirability of a formal or informal apprenticeship, but the apprenticeship may be shortened by two or three years if the student follows the Engineering course offered in Mason College.

#### SCHOLARSHIPS.

Besides the ordinary Entrance, First and Second Years' College Scholarships, which are open to Engineering students in common with all other students of the College, a Technical "Tangye" Scholarship in Engineering of the value of £30 is given annually to the student who has during the year preceding the award of the Scholarship taken the best place in the Middle or Second year Technical Engineering Classes. This Scholarship is given on the condition that the recipient will study Engineering at the Mason College during the year subsequent to the award.

The Whitworth Scholarships are open to Students of Mason College in competition with students from other parts of the country. Usually about twenty-five of these Scholarships are awarded each year, of values varying from £100 to £200. The course prescribed for the Mason College Junior Engineering Diploma is generally suitable for intending competitors for Whitworth Scholarships, but such intending candidates are recommended to consult the Professor of Engineering and receive his special advice and guidance in directing their studies.

#### LABORATORY AND WORKSHOP.

The Workshop is equipped with machine and hand tools, and with boiler and condensing engine, which latter are specially designed with fittings for the purpose of making experimental investigations on the working and economy of steam boilers and engines. The Laboratory is also furnished with apparatus for testing constructive materials, &c., according to various methods.

## MUSEUM.

The Engineering Museum contains specimens of a large variety of the different qualities and brands of the various materials used in Engineering Works, as well as collections of samples of the finished products of the Mechanical industries of the Birmingham district. Manufacturers are invited to add to this useful collection by presenting specimens of their own manufactures. Pieces of Mechanism illustrating machine design are especially needed.

## WORKSHOP INSTRUCTION.

During the Summer Vacation a Practical Workshop Class is held, in which Students are taught Machine-Tool and Vice Work. For Fees, &c., of this Class, see page 184.

## EVENING CLASSES.

Short Courses of Evening Lectures, each Course dealing with a Special Technical Subject, will be given at times that will be announced by advertisement in the newspapers. These will be of a character suited to Works' Managers, Foremen, Draughtsmen, and Apprentices. A Tutorial Class for Mechanical and Machine Drawing will be held at 7 p.m., on Tuesdays and Thursdays during the Winter and Spring Terms.

For detailed programme of these Evening classes, see page 189.

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CIVIL AND MECHANICAL ENGINEERS.  
JUNIOR or FIRST YEAR. *TABLE OF CLASS HOURS AND FEES.*

| SUBJECTS.                                                                                                                                                                                                                                                                          | Sessional Fees.<br>£ s. d.               | CLASS HOURS.                                    |                         |                       |                         |                                                    |                                                  | Total Class hours per week. |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------------------------------|-------------------------|-----------------------|-------------------------|----------------------------------------------------|--------------------------------------------------|-----------------------------|
|                                                                                                                                                                                                                                                                                    |                                          | Mon.                                            | Tues.                   | Wed.                  | Thurs.                  | Fri.                                               | Sat.                                             |                             |
| JUNIOR MATHEMATICS.—See page 90.<br>1st and 2nd Terms .....<br>3rd Term .....                                                                                                                                                                                                      | } 4 4 0                                  | 10.30<br>9.30                                   | .....<br>9.30           | 10.30<br>9.30         | .....<br>9.30           | 10.30<br>9.30                                      | .....<br>.....                                   | 4<br>...                    |
| JUNIOR PHYSICS.—See page 98.<br>Lectures.....<br>Laboratory—1st and 2nd Terms ..                                                                                                                                                                                                   | 2 12 6<br>1 11 6                         | .....—5<br>2.30—5                               | 11.30<br>.....          | .....<br>.....        | 11.30<br>.....          | .....<br>.....                                     | .....<br>.....                                   | 2<br>2½                     |
| INORGANIC CHEMISTRY.—See page 103.<br>Lectures—1st and 2nd Terms .....<br>Laboratory—3rd Term .....                                                                                                                                                                                | 2 2 0<br>2 12 6                          | .....<br>2—5                                    | .....<br>.....          | 11.30<br>2—5          | .....<br>.....          | 11.30<br>2—5                                       | .....<br>.....                                   | 2<br>9                      |
| ENGINEERING—<br>1st Term .....<br>Lectures { 2nd Term .....<br>{ 3rd Term .....<br>Laboratory..... { 1st Term .....<br>Visits to Works { 2nd Term .....<br>Surveying ..... { 3rd Term .....<br>Drawing { 1st and 2nd Terms .....<br>{ 3rd Term .....<br>Workshop Summer Class..... | } 5 5 0<br>} 4 4 0<br>} 4 4 0<br>} 3 3 0 | .....<br>12.30<br>12.30<br>12.30                | 12.30<br>12.30<br>12.30 | 12.30<br>12.30<br>2—5 | 12.30<br>12.30<br>..... | 12.30<br>12.30<br>.....<br>2.30—5<br>2.30—5<br>9—5 | .....<br>.....<br>.....<br>9—1<br>.....<br>..... | } 4<br>} 3<br>} 7<br>—      |
| * Total Sessional Fees for First Year ...                                                                                                                                                                                                                                          | £29 18 6                                 | Average Class Hours per week for First Year ... |                         |                       |                         |                                                    |                                                  | 25                          |

\* N.B.—For Terminal Fees see each Special Section of the Calendar.



CIVIL AND MECHANICAL ENGINEERS.  
MIDDLE or SECOND YEAR. *TABLE OF CLASS HOURS AND FEES.*

| SUBJECTS.                                                             | Sessional Fees.<br>£ s. d. | CLASS HOURS.                                    |        |        |        |        |       | Total Class hours per week. |
|-----------------------------------------------------------------------|----------------------------|-------------------------------------------------|--------|--------|--------|--------|-------|-----------------------------|
|                                                                       |                            | Mon.                                            | Tues.  | Wed.   | Thurs. | Fri.   | Sat.  |                             |
| MID. PURE MATHEMATICS—See page 91                                     | 4 4 0                      | 12.30                                           | 11.30  | .....  | 11.30  | 12.30  | ..... | 4                           |
| MIDDLE PHYSICS.—See page 98.<br>1st and 2nd Terms .....               | 3 3 0                      | 11.30                                           | .....  | 11.30  | .....  | 11.30  | ..... | 3                           |
| JUNIOR GEOLOGY.—See page 144.<br>1st and 2nd Terms—<br>Lectures ..... | 3 3 0                      | 10.30                                           | .....  | 10.30  | .....  | 10.30  | ..... | 3                           |
| Museum Practice .....                                                 | 0 10 6                     | .....                                           | 12.30  | .....  | .....  | .....  | ..... | 1                           |
| ENGINEERING—<br>Lectures and Exercises .....                          | 5 5 0                      | .....                                           | 9.30   | 9.30 * | 9.30   | 9.30   | ..... | 4                           |
| Laboratory—2nd and 3rd Terms ..                                       | 8 8 0                      | 2.30—5                                          | .....  | 2—5    | .....  | 2.30—5 | ..... | 8                           |
| { 1st Term .....                                                      | 4 4 0 {                    | 2.30—5                                          | 2.30—5 | .....  | 2.30—5 | 2.30—5 | ..... | 7                           |
| Drawing { 2nd and 3rd Terms .....                                     |                            | 2.30—5                                          | 2.30—5 | .....  | 2.30—5 | .....  | ..... |                             |
| Workshop Summer Class .....                                           | 3 3 0                      | 9—5                                             | 9—5    | 9—5    | 9—5    | 9—5    | ..... | —                           |
| † Total Sessional Fees for Second Year                                | £32 0 6                    | Average Class Hours per week for Second Year... |        |        |        |        |       | 25                          |

\* During Second Term this lecture is given at 9.30 on Monday instead of Wednesday.

† N.B.—For Terminal Fees see each Special Section of the Calendar.

The Time-Table for the Third Year's Class is made by arrangement at the beginning of each Session. Professor Smith's Lectures to the Senior Class are at 11.0 on Wednesdays and Fridays. Fee for Professor Smith's Engineering Third year's Classes, including Lectures, Designing, and direction of private Study is £12 12s. 0d. for the Session. Special Work in the Engineering Laboratory during the Third year is charged at the rate of £4 4s. 0d. per Term.

The Fees for the Two Years' Course, qualifying for the Junior Engineering Diploma, and including Mathematics, Physics, Chemistry, Geology, Drawing, Surveying, and Engineering Lectures, Laboratory and Summer Workshop Class amount to £61 19s. 0d.

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## JUNIOR CLASS.

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### MATHEMATICS.

Junior Pure Mathematics, See page 90.

Winter, Spring, and Summer Terms.

### PHYSICS.

Junior Class, with Laboratory Practice for two and a half hours per week. See page 98.

Lectures, Winter, Spring, and Summer Terms.

Laboratory, Winter and Spring Terms.

### INORGANIC CHEMISTRY.

Junior Class. See page 103.

Lectures, Winter and Spring Terms.

Laboratory, Summer Term.

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## ENGINEERING CLASSES.

## CLASS A.

## MECHANICAL SKETCHING AND DRAWING.

Winter and Spring Terms—seven-and-half hours per week; Summer Term—five ditto

In this class the Students have placed before them a Solid Body of Geometrical Form, whose dimensions they measure, and of which they make clear and fairly-proportioned sketches, on which they mark all its dimensions. From these sketches they make correct Scale Drawings of the body in different Right and Oblique Projections. The subjects taken will advance from simple timber joints to the common Detail Parts of Machines. The system of copying from other drawings is entirely discarded.

Fee for Class A, £1 11s. 6d. per Term; £4 4s. for the Session. Students may purchase at the College, at low prices, all necessary drawing instruments of Stanley's make. The College provides drawing boards, T squares, and straight edges. Students are required on entering the class to deposit with the Professor the sum of 6s., to cover the cost of drawing materials (paper, pencils, notebooks, colours, &c.) The unexpended balance will be returned when the student leaves the class.

The Drawing Class-room is open from 9.30 till 1 and from 2 till 5 every day except Saturday and Sunday. For a larger number of hours' drawing than the normal seven hours per week, the fees per term are—for ten hours per week, £2 2s. 0d.; for fifteen hours per week, £2 12s. 6d., and 10s. 6d. per term extra for each five hours or part of five hours over ten per week.

## CLASS B.

INSTRUMENTAL MEASUREMENT,  
VISITS TO WORKS, AND SURVEYING.

Winter Term two, Spring Term three, and Summer Term four hours per week.

During Winter and Spring Terms the practice will be in the modes of measurement described in the Lectures of the Winter Term (see Class C) with the exception of Land Surveying. It includes practice with all measuring instruments used in engineers' workshops and offices; angular measurement; measurement of flow of water; of cubic contents; of weights, &c.

During the Spring Term excursions are made to engineers' workshops, where the shop engines are indicated and tested under the superintendence of the Professor. The students are required each week to write in their note-books detailed descriptions of the machinery they have seen in the works visited.

During the Summer Term the whole of the working day of each Saturday is devoted to Field Practice in Surveying, and the Students have to plot their Surveys in their spare time during the week.

FEE for Class B, 1st Term, 10s. 6d. ; 2nd or 3rd Term, £2 2s. ; Session, £4 4s.

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### CLASS C. LECTURES.

Winter Term—three Lectures per week.

#### MEASURING INSTRUMENTS USED IN THE WORKSHOP, SURVEY FIELD, AND DRAWING OFFICE.

Instruments for Measuring Linear Dimensions, small and large, Callipers, Gauges, Templates, Tapes, Chains and Rods, Wealemeftas, &c.—Linear Units and Scales—Instruments for Measuring Angles and Areas, Levels, Inclinometers, Planimeters—Surveying Instruments, Theodolite, Level, Compass, Sextant, Omnimeter, &c.—Measurement of Cubic Contents, Mass, Weight, Force, Time, Speed, Energy, Rate of Working—Weighing Machines, Spring Balances, Pressure Gauges, Revolution Counters, Speed Indicators, Steam Engine Indicators, Traction and Rotary Dynamometers, Brakes, &c.—Flow of Fluids, Stress, Strain, and Flow of Solids—Current Meters, Anemometers, Testing Machines—Drawing Scales.

Spring Term—two Lectures per week, and two Exercise hours per week.

#### LECTURES ON, AND PRACTICE IN, PRACTICAL METHODS OF CALCULATION.

Abbreviation and Systematic Method in Arithmetic—Useful and Possible Degrees of Accuracy—Use of Tables—Instruments for Arithmetical Calculation—The Meaning and Usefulness of Formulas—Graphic Arithmetic—Graphic Kinematics, Statics, and Kinetics, with applications to Roof and Bridge Work and to the Varying Stresses, Motions, Velocities and Accelerations of Velocity in Machines—Graphic Tabulation on Sectional Paper of the Results of Formulas, Rules, and Experimental Observations—Elimination and Distribution of Errors of Observation.

Summer Term—Five Lectures per week.

DESCRIPTIVE LECTURES ON TOOLS AND DRIVING MACHINERY,  
AND ON WORKSHOP AND FIELD PRACTICE.

Hand and Machine Cutting Tools of the Workshop—Wood-cutting Hand Tools, Saws and Wood Working Machinery—Drilling, Milling, Shaping, Slotting, Planing Machines and Lathes—Punching, Shearing, Rivetting, and Hammering Machines—Lifting Machinery and Tackle—Water Wheels, Turbines, Wind Mills—Steam, Air, Gas, and Electric Motive Engines.

FEE for Class C, 1st Term, £1 11s. 6d. ; 2nd Term, £2 2s. 0d. ; 3rd Term, £2 12 6d. ; Session, £5 5s. 0d.

MIDDLE CLASS.

MATHEMATICS.

Middle Pure Mathematics. See page 91.

Winter, Spring, and Summer Terms.

PHYSICS.

Middle Class, without Laboratory Practice. See page 98.

Winter and Spring Terms.

GEOLOGY.

Junior Geology. See page 144.

Winter and Spring Terms.

ENGINEERING CLASSES.

CLASS A.

MACHINE MEASUREMENT SKETCHING  
AND DRAWING.

Winter, Spring, and Summer Terms. Ten hours per week during Winter Term ; five hours per week during Spring and Summer Terms.

The work of this class is similar to that of the first year's Drawing Class (see page 177), except that Machines instead of machine-parts are now the subjects of copy. In the last (Summer) Term, they will design detail parts of machines and structures. Everything is drawn from the Students' own sketches taken from the machines themselves. No copying from other drawings is allowed, except in exercises in tracing.

FEE for Class A, £1 11s. 6d. per Term, £4 4s. 0d. for the Session. A deposit of 6s. has to be made in this class similar to that in the Junior Class, see page 177.

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### CLASS B. LABORATORY.

Spring and Summer Terms. Eight hours per week.

Several of the following will be subjects of experiment each year :—Testing Strength and Stiffness of Materials. Strength of Struts and Pillars, Flat Plates, Tubes, Beams, and of Plate and Spiral Springs. Testing Strength of Soldered, Brazed, Screwed, Riveted, Pin, and other Joints. Experiments on Hardening and Annealing Steel and other Metals. Experiments on Surface Friction of Solids and Liquids. Tests of Lubricative Qualities of Oils. Measurement of Horse-power of Driving Engines. Measurement of Horse-power required to do various kinds of work. Experiments on Wind-pressure. Flow of Liquids through Pipes. Conduction of Heat through Surfaces and through Plates. Condensation of Steam and evaporation of Steam. Adhesion and Slip of Driving Belts. Leakage of Steam past Pistons and Valves.

The students prepare their own test pieces, and some of their experimental apparatus in the vice and lathe, and thus obtain practice in handwork and at the same time become familiar with the "workability" of different materials.

FEE for Class B, £4 4s. per Term.

Students wishing to spend more than eight hours per week in the Laboratory, may do so on the understanding that they receive instruction only during the regular hours stated in the time table. FEES for extra laboratory work, £4 4s. per term for eight hours per week, and £1 1s. per term extra for each four hours or part of four hours above eight per week.

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### CLASS C. LECTURES.

Winter, Spring, and Summer Terms. Four Lecture and Exercise Hours per week.

WORKSHOP TREATMENT AND MECHANICAL PROPERTIES OF  
CONSTRUCTIVE MATERIALS.

TIMBER.—Growth, Felling, Seasoning, Preservation, Reduction, Shrinkage, and Warping.

CAST IRON, WROUGHT IRON, and STEEL.—Blast Furnace. Puddling Furnace. Bessemer Converter. Crucible Steel. Impurities and Flaws in Iron and Steel. Hammering, Piling, Faggotting, Rolling. Hand, Steam, Hydraulic and Stamp Forging. Pattern-making and Moulding and Casting in the Foundry. Cutting, Hardening, and Tempering of Iron and Steel.

MASONRY.—Classification of Building Stones. Tensile and Compressive Strength, Absorptive, Abrasive and Weathering Qualities of Stone. Chiselling, Sawing, Planing, Turning, Dressing, and Polishing of Stone. Artificial Stones. Limes, Mortars, Cements, Concrete, and Beton. Manufacture of Brick by hand and by machine. Terra Cotta.

The Exercises consist in the careful Examination of Samples of the Materials in the Museum.

#### CALCULATED STRENGTH, STIFFNESS, AND DURABILITY OF CONSTRUCTIVE MATERIALS.

Twist, Elongation and Contraction Strains. Shear, Tensile and Compressive Stresses. Elasticity and Plasticity. Relation between the different Moduli of Elasticity. Torsion of Shafts. Tie-bars. Compression Blocks. Beams. Struts and Columns. Stability of, and Foundations for, Masonry and other Heavy Masses. Fatigue of Metals, Wear, Corrosion, Factors of Safety, the Relative Necessity of Strength, Stiffness or Pliability in the different parts of Machines and Structures.

The Exercises consist in working out Numerical Examples.

#### PRINCIPLES OF MECHANICS.

Energy and its Sources in Combustion and Gravity. Work, Force, Acceleration of Momentum, Strain. Elementary Thermodynamics. Hydraulics. Loss of useful effect by Dissipation of Energy by Friction, Vibration, Stiffness of Belts and Ropes, and Radiation and Conduction of Heat. Frictional Efficiency of Machines. Transmission of Power by Belts and Ropes, by Compressed Air, by High-pressure Water and Steam. Efficiency of these modes of Transmission. Storing up Energy. Water Reservoirs, Fly-wheels, Boiler capacity, Hydraulic and Electric Accumulators. Governing the supply of Energy. Speed and Strain Governors. Centrifugal Speed Governors. Mechanical and Electrical Relays for Governors.

The Exercises consist in working out Numerical Examples.

#### THE ELEMENTS OF DESIGN.

JOINTS IN STRUCTURES AND MACHINES.—Timber joints. Masonry joints. Joints for Transmission of Force and for Prevention of Leakage. Fixed and Sliding joints. Steam Piston, Pump and Gland Packings. Pins, Bolts, Studs, Cotter, Gibs, Rivets. Boiler, Bridge and Ship Rivetting.

## DETAILED DESIGN OF STEAM ENGINE DIMENSIONS.

The subjects of the Lectures will be followed up in the Drawing Class, in which "Proportion Diagrams" will be made by the Students, as well as special examples of design.

## STATIC DESIGNS.

Bridges. Roofs. Foundations. Walls and Piers.

FEE for Class C, £2 2s. per Term; £5 5s. for the Session.

## SENIOR CLASS.

Winter, Spring, and Summer Terms.

In this Year none but strictly Engineering Classes are taken, with the exception of the *Middle Geology* taken by Civil Engineers.

The Geology for Civil Engineers continues during the 2nd and 3rd Terms. 2nd Term Lecture hours 10.30 on Tuesday and Thursday; Laboratory 12.30 on Friday. 3rd Term, Lectures at 10.30 on Tuesday and Thursday; Surveying and Mapping 1 to 5 p.m., on Monday. Fee for the Course, £4 4s. See page 146.

Throughout the Session, Two Lectures per week, at 11 a.m. on Wednesday and Friday, will be given by Professor Smith to Senior Engineering Students. They will treat of the Detailed Design of Selected Classes of Structures and Machinery. The special subjects selected will be varied from year to year, in accordance, as far as possible, with the wishes of special students who present themselves. They will begin each year with a short course of Lectures on the Practical Thermodynamics of Furnaces, Boilers, and Steam Engines.

Each student may elect to study specially one or two, but not more than two, of the following Sub-Divisions of Civil and Mechanical Engineering.

*Civil Engineering.*—(a) Roads and Railways. (b) Canals, Rivers, Irrigation, Drainage, Sanitation, and Town Water Supply. (c) Harbours, Lighthouses, and Coast Works. (d) Surveying.

*Mechanical Engineering.*—(a) Land Engines, Pumping and Hydraulic Machinery. (b) Road and Railway Locomotives. (c) Marine Engines and Ship Building.



(*d*) Agricultural Machinery. (*e*) Machine Tools and Implements. (*f*) Mill Work and Factory Machinery.

So far as lectures and examinations are concerned, all the Students of Civil and Mechanical Engineering are expected to do the same work; there are no separate Lectures or Class Examinations for each sub-division. But the private work and course of reading are prescribed for each Student in accordance with the sub-division or sub-divisions to which he belongs. The bulk of the work of each Student will be private (*i.e.*, not class work), but will be done under the direction of the Professor. The merit of each Student's study in the sub-division of his subject will be judged, not from ordinary Class Examinations, but by the quality and amount of his private work throughout the Session, and by a Thesis given in at the end of the Session. The Diploma will mention in which sub-division or sub-divisions of Engineering the recipient has specially studied.

Arrangements will be made for the Civil Engineering Students for Field Practice in Surveying and Setting Out, and for the examination of works in progress. Similar arrangements will be made, as far as possible, for the Mechanical Engineering Students for the examination and testing of Engines, Boilers, and other Machinery in and near Birmingham. Similar opportunities will be sought to advance the practical knowledge of the other classes of Students.

Facilities will be given to the Students of the third year wishing to make original experimental investigations of special engineering subjects, and the Professor will do all in his power to encourage this sort of work, and to give assistance in it. Those studying a branch of Mechanical Engineering must work in the Engineering Laboratory during one Term, making a special experimental investigation connected with his particular branch of machine construction. Those studying Civil Engineering are not required to work in the Laboratory.

**FEES:**—Lectures, Drawing Office Work and Private Study, £5 5s. per Term, or £12 12s. for the Session. Laboratory, one Term £4 4s.

## CLASS D.

## WORK-SHOP INSTRUCTION.

A Summer Vacation Class is held for Practice in Forging; in Tool Work, at the Pattern-Makers' Bench and the Vice; in Machining, at the Lathe, Shaping, Milling, and Drilling Machines; and in Engine Driving. This class meets on the fourth Monday after the close of the Session, and is continued for eight weeks. The College supplies, without charge, all tools and materials. The work is done under the direction of the Workshop Instructor, Mr. J. Hamilton, with the assistance of a skilled mechanic, and under the supervision of, and according to instructions supplied by, the Professor of Engineering.

Students may join for the whole, or for a part only of the eight weeks. Attendance for eight weeks is necessary for the Engineering Diploma. The class works from 9-1 and 2-5 for five days per week.

Fee for the Term of Eight Weeks ..... £3 3s.

” ” ” Four ” ..... £2 2s.

Students in this class must be above fifteen years of age.

A limited number of students may be admitted to this class at half-fee, such students having to produce written proof that they are sons of artizans receiving wages of not more than fifty shillings per week. The number of such half-fee students admitted depends on the room available in the work-shop after all systematic College students desiring admission have been provided for.

## ELECTRICAL ENGINEERING.

A course suitable for students of Electrical Engineering has been established. Those passing through it successfully will be entitled to a Junior Diploma in Electrical Engineering at the end of two years' study, and a Senior Diploma at the end of three years' study. The course includes practice in the workshop and laboratories. It is as follows :—

**FIRST YEAR.**

Junior Mathematics, 1st, 2nd, and 3rd Terms. See page 90.

Junior Physics, Lectures and Laboratory, 1st, 2nd, and 3rd Terms. See page 98.

General Inorganic Chemistry Lectures, 1st and 2nd Terms; Laboratory, 3rd Term, from 2 to 5 p.m. on Monday, Wednesday, and Friday. See page 105.

Junior Engineering Lectures, 1st, 2nd, and 3rd Terms. See page 178.

Junior Mechanical Drawing, 1st and 2nd Terms. See page 177.

Junior Practical Engineering Classes in Instrumental Measurement and Visits to Works, 1st and 2nd Terms. See page 177.

Workshop. Eight weeks during Summer Vacation. See page 184.

| FEES:—                |     |     | £   | s. | d. |
|-----------------------|-----|-----|-----|----|----|
| Mathematics ...       | ... | ... | 4   | 4  | 0  |
| Physics ...           | ... | ... | 4   | 4  | 0  |
| Chemistry ...         | ... | ... | 7   | 17 | 6  |
| Engineering ...       | ... | ... | 5   | 5  | 0  |
| Drawing ...           | ... | ... | 3   | 3  | 0  |
| Practical Engineering | ... | ... | 2   | 2  | 0  |
| Workshop Summer Class | ... | ... | 3   | 3  | 0  |
|                       |     |     | £29 | 18 | 6  |

**SECOND YEAR.**

Middle Mathematics, 1st, 2nd, and 3rd Terms. See page 91.

Middle Physics, 1st, 2nd, and 3rd Terms, Lectures and Laboratory from 2.30 to 5 p.m. on Wednesday in 1st Term, on Tuesday and Thursday in 2nd Term, and on Monday, Wednesday, and Friday in 3rd Term. See page 98.

Middle Engineering Lectures, 1st and 2nd Terms, and Laboratory, 2nd Term. See page 180.

Middle Machine Drawing, 1st and 3rd Terms. See page 179.

Workshop. Eight weeks during Summer Vacation.  
See page 184.

| FEES :—               |     |     |     | £          | s.        | d.       |
|-----------------------|-----|-----|-----|------------|-----------|----------|
| Mathematics           | ... | ... | ... | 4          | 4         | 0        |
| Physics               | ... | ... | ... | 7          | 13        | 6        |
| Engineering           | ... | ... | ... | 9          | 9         | 0        |
| Drawing               | ... | ... | ... | 3          | 3         | 0        |
| Workshop Summer Class | ... | ... | ... | 3          | 3         | 0        |
|                       |     |     |     | <u>£27</u> | <u>12</u> | <u>6</u> |

### THIRD YEAR.

Senior Physics, 1st, 2nd, and 3rd Terms. Lectures on Heat and Electricity. These lectures include the subjects of Telegraphy and Telephony treated electrically. Laboratory, two afternoons per week throughout the Session.

Senior Engineering Lectures on Mechanical Engineering, Electric Machine Construction, and on the Mechanics of Telegraphy and Telephony.

Machine Drawing. Drawings of Electric Machines will be made in this Class. Two afternoons per week throughout the Session.

| FEES :—     |     |     |     | £          | s.       | d.       |
|-------------|-----|-----|-----|------------|----------|----------|
| Physics     | ... | ... | ... | 6          | 12       | 6        |
| Engineering | ... | ... | ... | 5          | 5        | 0        |
| Drawing     | ... | ... | ... | 4          | 4        | 0        |
|             |     |     |     | <u>£16</u> | <u>1</u> | <u>6</u> |

### ARCHITECTURE AND BUILDING.

A course has been arranged suitable for students of Architecture and Building. It is partly carried out in the Mason College and partly in the Birmingham Municipal School of Art. It includes ample practice in Drawing, Designing, Surveying, and Museum study. The first two years alone of the course are at present definitely arranged. These are intended to be taken by young men before entering on their apprenticeship. It has been found impossible to arrange a course of college

study which would be in any useful degree complete, and yet at the same time, not interfere with the commencement of the apprenticeship. Several leading Architects have expressed their willingness to shorten the time of apprenticeship in their offices in proportion to the time spent in following out this college course, provided the students pass their examinations satisfactorily.

Hereafter it is hoped, that with the assistance of the Association of Architects, a third year's course will be arranged. During this third year it is intended that the student should work regularly as an apprentice in an architect's or builder's office, and the course will involve attendance at a comparatively small number of lectures given late in the afternoon or in the evening. These lectures will be of an entirely technical character. It is intended that a class for practical estimating and taking out quantities should form part of this third year's work.

The whole course is designed to assist students in preparing for the Examinations of the Royal Institute of British Architects. To complete this preparation, of course, considerable private study and reading are necessary beyond what is contained in the present college course.

In the following Time Table the School of Art Evening Classes in Practical Geometry and Building Construction existing at present are inserted, but it is hoped that special Afternoon Classes in these subjects will be arranged for students in Building and Architecture.

The course is as follows :—

| FIRST YEAR.                                                              |  | FEES. |    |    |
|--------------------------------------------------------------------------|--|-------|----|----|
| MASON COLLEGE CLASSES.                                                   |  | £     | s. | d. |
| Junior Mathematics, 1st, 2nd, and 3rd Terms.                             |  |       |    |    |
| See page 90 .....                                                        |  | 4     | 4  | 0  |
| Junior Engineering Lectures, 1st, 2nd, and 3rd Terms. See page 178 ..... |  |       |    |    |
|                                                                          |  | 5     | 5  | 0  |
| Field Surveying Practice, 3rd Term (Saturday). See page 177 .....        |  |       |    |    |
|                                                                          |  | 2     | 2  | 0  |
| Middle French, 1st, 2nd, and 3rd Terms. See page 82 .....                |  |       |    |    |
|                                                                          |  | 3     | 13 | 6  |

|                                                |   | FEES. |    |    |
|------------------------------------------------|---|-------|----|----|
|                                                |   | £     | s. | d. |
| SCHOOL OF ART CLASSES. *                       |   |       |    |    |
| Freehand and Model Drawing. Whole Session.     |   |       |    |    |
| Thursday evening .....                         | } | 0     | 15 | 0  |
| Plane and Solid Geometry, Lectures and Drawing |   |       |    |    |
| Whole Session. Wednesday evening .....         |   |       |    |    |
| Junior Building Construction, Lectures and     |   |       |    |    |
| Drawing. Whole Session. Friday evening         |   |       |    |    |
| Junior Architecture, Lectures and Drawing.     |   |       |    |    |
| Whole Session. Tuesday and Thursday            |   |       |    |    |
| afternoons.....                                |   | 2     | 10 | 0  |
| Perspective Drawing, Lectures and Drawing.     |   |       |    |    |
| Whole Session. Wednesday afternoon.....        |   | 2     | 10 | 0  |
| Total .....                                    |   | £20   | 19 | 6  |

## SECOND YEAR.

## MASON COLLEGE CLASSES.

|                                                |   |    |   |  |
|------------------------------------------------|---|----|---|--|
| Middle Mathematics, 1st, 2nd, and 3rd Terms.   |   |    |   |  |
| See page 91 .....                              | 4 | 4  | 0 |  |
| Junior Geology, 1st and 2nd Terms. See         |   |    |   |  |
| page 144 .....                                 | 3 | 13 | 6 |  |
| Middle Engineering Lectures, 1st and 2nd       |   |    |   |  |
| Terms. See page 180.....                       | 3 | 3  | 0 |  |
| Engineering Laboratory, 3rd Term. See page 180 | 4 | 4  | 0 |  |
| Hygiene and Public Health, 3rd Term. Ten       |   |    |   |  |
| Lectures .....                                 | 0 | 10 | 6 |  |
| Sanitary Engineering, 3rd Term. Ten Lectures   | 0 | 10 | 6 |  |

## SCHOOL OF ART CLASSES. \*

|                                            |     |    |    |   |
|--------------------------------------------|-----|----|----|---|
| Light and Shade Drawing, 1st and 2nd Mason |     |    |    |   |
| College Terms, Monday afternoon ; 3rd      |     |    |    |   |
| Term, Thursday afternoon .....             | 2   | 10 | 0  |   |
| Advanced Plane and Solid Geometry. Whole   |     |    |    |   |
| Session. Wednesday evening .....           | }   | 0  | 15 | 0 |
| Advanced Building Construction. From Sep-  |     |    |    |   |
| tember to Easter. Monday evening .....     |     |    |    |   |
| Advanced Architecture. From September to   |     |    |    |   |
| Easter. Tuesday and Thursday afternoons    | 2   | 10 | 0  |   |
| History of Art, Lectures. Whole Session.   |     |    |    |   |
| Friday evenings .....                      | 1   | 10 | 0  |   |
| Total .....                                | £23 | 10 | 6  |   |

\* Each of these Classes meets for two hours.

### EVENING CLASSES.

During the Winter Term Professor ROBERT H. SMITH will give a course of ten lessons on "Stresses in Bridge and Roof Work by the Graphic Method." Each lesson will consist of half an hour's lecture and an hour and a half of drawing. The class will meet from 7 to 9 p.m. on 10th October, and the following Mondays.

FEE:—6s. for the Course.

The minimum number of students for which this class will be held is ten.

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### Mechanical and Engineering Drawing.

During the Winter and Spring Terms (*October to March*) an Evening Class for Mechanical and Engineering Drawing will be conducted by Mr. J. HAMILTON, Demonstrator, under the direction of Professor SMITH.

This Class will be conducted on the same principle as the Day Classes in Engineering Drawing. The Students sketch each model in fair proportion, and measure its dimensions before beginning the geometrical drawing of it. Every drawing is made from dimensions measured by the student from a model; no copying of other drawings is allowed. The subjects advance from simple blocks of geometrical shape to the details of machinery, and will be suited as far as possible to the state of advancement of each individual student. There is a large assortment of models kept in the College Drawing Class Room, and the more advanced students make drawings from the machinery in the College workshop.

The students may purchase instruments and paper at a cheap rate at the College. Drawing boards and T squares are provided by the College.

Tuesday and Thursday evenings, from 7 to 9, commencing October 4th, 1887.

FEE:—Ten shillings per Term. The minimum number of students for which this Class will be held is seven.

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| FACULTY OF ARTS.                                |       |       |       |       |      |       |
|-------------------------------------------------|-------|-------|-------|-------|------|-------|
| DEPARTMENTS AND CLASSES.                        | Mon.  | Tu.   | Wed.  | Th.   | Fri. | Sat.  |
| <b>1. GREEK.</b>                                |       |       |       |       |      |       |
| Junior Class . . . . .                          | 4.30  | ..    | 4.30  | ..    | 4.30 | ..    |
| Senior Class . . . . .                          | 2.30  | ..    | ..    | 2.30  | 4.30 | ..    |
| Greek Literature (Winter Term) . . . . .        | ..    | ..    | ..    | 4.30  | ..   | ..    |
| <b>LATIN.</b>                                   |       |       |       |       |      |       |
| Junior Class . . . . .                          | 3.30  | ..    | 3.30  | ..    | 3.30 | ..    |
| Senior Class . . . . .                          | ..    | 2.30  | ..    | ..    | 2.30 | ..    |
| Higher Senior Class . . . . .                   | ..    | 4.30  | ..    | 3.30  | ..   | ..    |
| Junior Class—Composition . . . . .              | ..    | 3.30  | ..    | ..    | ..   | ..    |
| Senior Class—Composition . . . . .              | ..    | ..    | 2.30  | ..    | ..   | ..    |
| <b>2. ENGLISH.</b>                              |       |       |       |       |      |       |
| 1. Matric.—Eng. Language (Winter & Spring)      | 9.30  | ..    | 9.30  | ..    | ..   | ..    |
| D. Inter., Honours—Period (Summer) . . . . .    | 9.30  | ..    | ..    | ..    | ..   | ..    |
| E. Inter., Honours—Special Works (Summer)       | ..    | ..    | 9.30  | ..    | ..   | ..    |
| G. B.A., Pass . Special Works . . . . .         | ..    | 9.30  | ..    | ..    | ..   | ..    |
| I. B.A., Honours—Special Works . . . . .        | ..    | ..    | ..    | 9.30  | ..   | ..    |
| 1. Matric.—Eng. Language (Summer) . . . . .     | 10.30 | ..    | 10.30 | ..    | ..   | ..    |
| D. Inter. Honours—Period (Winter & Spring)      | 10.30 | ..    | ..    | ..    | ..   | ..    |
| E. Inter. Honours—Spec. Works (Win. & Spr.)     | ..    | ..    | 10.30 | ..    | ..   | ..    |
| A. Matric.—English History . . . . .            | ..    | 10.30 | ..    | 10.30 | ..   | ..    |
| B. Inter., Pass—Period . . . . .                | 11.30 | ..    | 11.30 | ..    | ..   | ..    |
| F. B.A., Pass—Period . . . . .                  | ..    | 11.30 | ..    | ..    | ..   | ..    |
| Popular Afternoon Lectures . . . . .            | 3.30  | 3.30  | 3.30  | ..    | ..   | ..    |
| H. B.A., Honours—Period . . . . .               | 4.30  | ..    | ..    | ..    | ..   | ..    |
| C. Inter., Pass . Special Works . . . . .       | ..    | 4.30  | ..    | ..    | ..   | ..    |
| 3. Inter., Pass . English Composition . . . . . | ..    | ..    | 4.30  | ..    | ..   | ..    |
| 2. Inter. & B.A.—Anglo-Saxon & Early English    | 5.30  | ..    | 5.30  | ..    | ..   | ..    |
| <b>3. FRENCH.</b>                               |       |       |       |       |      |       |
| Junior Class . . . . .                          | ..    | 4.30  | ..    | 3.30  | 4.30 | ..    |
| Middle Class . . . . .                          | 4.30  | ..    | 4.30  | ..    | 4.30 | ..    |
| Senior Class . . . . .                          | 3.30  | ..    | ..    | 2.30  | ..   | ..    |
| Ladies' Class . . . . .                         | 2.30  | ..    | ..    | 4.30  | ..   | ..    |
| French Pronunciation (Winter Term) . . . . .    | ..    | ..    | 3.30  | ..    | ..   | ..    |
| <b>4. GERMAN.</b>                               |       |       |       |       |      |       |
| Elementary Class . . . . .                      | ..    | ..    | ..    | ..    | ..   | 10.30 |
| Junior Class . . . . .                          | ..    | 2.30  | ..    | 2.30  | ..   | ..    |
| Senior Class . . . . .                          | ..    | 3.30  | ..    | 3.30  | ..   | ..    |

(For Time Table of the Evening Classes, see p. 200.)



## SESSION 1887-88.

| FACULTY OF SCIENCE.                                           |        |        |        |        |        |        |
|---------------------------------------------------------------|--------|--------|--------|--------|--------|--------|
| DEPARTMENTS AND CLASSES.                                      | Mon.   | Tu.    | Wed.   | Th.    | Fri.   | Sat.   |
| <b>1. MATHEMATICS.</b>                                        |        |        |        |        |        |        |
| PURE—                                                         |        |        |        |        |        |        |
| Junior Class (Winter and Spring Terms)                        | 10.30  | ..     | 10.30  | ..     | 10.30  | ..     |
| Junior Class (Summer Term)                                    | 9.30   | 9.30   | 9.30   | 9.30   | 9.30   | ..     |
| Middle Class                                                  | 12.30  | 11.30  | ..     | 11.30  | 12.30  | ..     |
| Senior Class (Winter and Spring Terms)                        | 9.30   | ..     | 9.30   | ..     | 9.30   | ..     |
| Senior Class (Summer Term)                                    | 10.30  | ..     | 10.30  | ..     | 10.30  | ..     |
| Advanced Class ( <i>by arrangement with the Class</i> )       | ..     | ..     | ..     | ..     | ..     | ..     |
| APPLIED—                                                      |        |        |        |        |        |        |
| Junior Class                                                  | ..     | 10.30  | ..     | 10.30  | ..     | ..     |
| Senior Class ( <i>by arrangement with the Class</i> )         | ..     | ..     | ..     | ..     | ..     | ..     |
| Higher Senior Class ( <i>ditto</i> )                          | ..     | ..     | ..     | ..     | ..     | ..     |
| <b>2. PHYSICS.</b>                                            |        |        |        |        |        |        |
| Elementary Class (Winter Term)                                | ..     | 3.0    | ..     | ..     | 3.0    | ..     |
| Junior Class                                                  | ..     | 11.30  | ..     | 11.30  | ..     | ..     |
| Junior Practical Class                                        | 2.30-5 | ..     | ..     | ..     | ..     | ..     |
| Middle Class                                                  | 11.30  | ..     | 11.30  | ..     | 11.30  | ..     |
| Middle Practical Class                                        | ..     | ..     | 2.30-5 | ..     | ..     | ..     |
| Senior Class                                                  | 12.30  | ..     | ..     | ..     | 12.30  | ..     |
| Laboratory—open                                               | 10-5   | 10-5   | 10-5   | 10-5   | 10-5   | ..     |
| <b>3. CHEMISTRY.</b>                                          |        |        |        |        |        |        |
| Elementary Lectures (Winter and Spring Terms)                 | ..     | ..     | 11.30  | ..     | 11.30  | ..     |
| Elementary Lectures (Summer Term)                             | ..     | ..     | 11.30  | 4.30   | 11.30  | ..     |
| General Course (Winter and Spring Terms)                      | 9.30   | 9.30   | 9.30   | 9.30   | 9.30   | ..     |
| Organic Chemistry (Summer Term)                               | 9.30   | 9.30   | 9.30   | 9.30   | ..     | ..     |
| Mining (Spring Term)                                          | 5-6    | ..     | ..     | ..     | ..     | ..     |
| Laboratory—open                                               | 9.30-5 | 9.30-5 | 9.30-5 | 9.30-5 | 9.30-5 | 9.30-1 |
| Laboratory for Inter. and Prel. Sci.                          | 2-5    | ..     | 2-5    | ..     | 2-5    | ..     |
| Laboratory for Engineering Students<br>(Summer Term)          | 2-5    | ..     | 2-5    | ..     | 2-5    | ..     |
| Practical Chemistry for Medical Students in<br>Summer Session | ..     | 2-4    | ..     | 2-4    | ..     | ..     |
| <b>4. METALLURGY.</b>                                         |        |        |        |        |        |        |
| Lectures                                                      | ..     | ..     | ..     | 11.30  | ..     | ..     |
| Laboratory—open                                               | 9.30-5 | 9.30-5 | 9.30-5 | 9.30-5 | 9.30-5 | 9.30-1 |
| <b>5, 6, &amp; 7. BIOLOGY.</b>                                |        |        |        |        |        |        |
| Elementary Biology                                            | ..     | 4.0    | ..     | 4.0    | ..     | ..     |
| Demonstrations ( <i>by arrangement with the Class</i> )       | ..     | ..     | ..     | ..     | ..     | ..     |

SESSION 1887-88.

| FACULTY OF SCIENCE—(continued).                                                       |                                           |        |                                      |        |                                      |      |
|---------------------------------------------------------------------------------------|-------------------------------------------|--------|--------------------------------------|--------|--------------------------------------|------|
| DEPARTMENTS AND CLASSES.                                                              | Mon.                                      | Tu.    | Wed.                                 | Th.    | Fri.                                 | Sat. |
| <b>5. ZOOLOGY.</b>                                                                    |                                           |        |                                      |        |                                      |      |
| Junior (Winter and Spring Terms) . . .                                                | ..                                        | 12.30  | 12.30                                | 12.30  | ..                                   | ..   |
| Middle ( <i>by arrangement with the Class</i> ) . . .                                 | ..                                        | ..     | ..                                   | ..     | ..                                   | ..   |
| Senior (Summer Term) }<br>( <i>by arrangement with the Class</i> ) }                  | ..                                        | ..     | ..                                   | ..     | ..                                   | ..   |
| Comparative Embryology (Summer Term) . . .                                            | ..                                        | ..     | ..                                   | ..     | ..                                   | 11.0 |
| Tutorial Class ( <i>by arrangement with the Class</i> ) . . .                         | ..                                        | ..     | ..                                   | ..     | ..                                   | ..   |
| Laboratory—open . . . . .                                                             | 10-5                                      | 10-5   | 10-5                                 | 10-5   | 10-5                                 | ..   |
| <b>6. BOTANY.</b>                                                                     |                                           |        |                                      |        |                                      |      |
| A. ELEMENTARY COURSES—                                                                |                                           |        |                                      |        |                                      |      |
| I. Winter Term . . . . .                                                              | ..                                        | 2.45-5 | ..                                   | 2.45-5 | ..                                   | ..   |
| Summer Term . . . . .                                                                 | ..                                        | ..     | 4.0                                  | ..     | ..                                   | ..   |
| II. General Summer (May to July) . . .                                                | 10.30                                     | ..     | 4.0                                  | ..     | 10.30                                | ..   |
| " " Laboratory . . . . .                                                              | 11.30                                     | ..     | ..                                   | ..     | 11.30                                | ..   |
| " " Extra . . . . .                                                                   | 4.0                                       | ..     | ..                                   | ..     | 4.0                                  | ..   |
| B. MIDDLE COURSES—                                                                    |                                           |        |                                      |        |                                      |      |
| I. Biology (Winter and Spring Terms) . .                                              | 4.0                                       | ..     | 4.0                                  | ..     | 4.0                                  | ..   |
| " (Summer Term) . . . . .                                                             | ..                                        | ..     | ..                                   | ..     | ..                                   | 10.0 |
| " Laboratory . . . . .                                                                | ..                                        | ..     | ..                                   | ..     | ..                                   | 10-1 |
| II Systematic (Spring and Summer Terms) .                                             | ..                                        | 4.30   | ..                                   | 4.30   | ..                                   | ..   |
| C. ADVANCED COURSES—                                                                  |                                           |        |                                      |        |                                      |      |
| Winter and Spring Terms . . . . .                                                     | 10.30                                     | ..     | 10.30                                | ..     | 10.30                                | ..   |
| Summer Term . . . . .                                                                 | ..                                        | 10.30  | ..                                   | 10.30  | ..                                   | ..   |
| Laboratory ( <i>by arrangement with the Class</i> ) .                                 | ..                                        | ..     | ..                                   | ..     | ..                                   | ..   |
| Tutorial Class (Spring and Summer Terms) .                                            | ..                                        | ..     | 5.0                                  | ..     | ..                                   | ..   |
| <b>7. PHYSIOLOGY.</b>                                                                 |                                           |        |                                      |        |                                      |      |
| Elementary Course (Winter and Spring Terms) .                                         | ..                                        | ..     | 11                                   | ..     | ..                                   | ..   |
| Advanced Course (Winter and Spring Terms) .                                           | 11                                        | 11     | ..                                   | 11     | 11                                   | ..   |
| Practical Physiology (Summer Term) . . .                                              | {<br>9 to<br>10.30<br>or<br>11.30<br>to 1 | ..     | 9 to<br>10.30<br>or<br>11.30<br>to 1 | ..     | 9 to<br>10.30<br>or<br>11.30<br>to 1 | ..   |
| Advanced Practical Physiology (Session)<br>( <i>by arrangement with the Class</i> ) } |                                           | ..     | ..                                   | ..     | ..                                   | ..   |
| Laboratory—open . . . . .                                                             |                                           | 10-5   | 10-5                                 | 10-5   | 10-5                                 | ..   |
|                                                                                       |                                           |        |                                      |        |                                      |      |

SESSION 1887-88.

| FACULTY OF SCIENCE—(continued).                          |        |        |       |        |        |      |
|----------------------------------------------------------|--------|--------|-------|--------|--------|------|
| DEPARTMENTS AND CLASSES.                                 | Mon.   | Tu.    | Wed.  | Th.    | Fri.   | Sat. |
| <b>8. GEOLOGY.</b>                                       |        |        |       |        |        |      |
| Junior Course (Winter and Spring Terms)                  | 10.30  | ..     | 10.30 | ..     | 10.30  | ..   |
| Middle Course (Winter and Spring Terms)                  | ..     | 10.30  | ..    | 10.30  | 12.30  | ..   |
| Senior Course ( <i>by arrangement with the Class</i> )   | ..     | ..     | ..    | ..     | ..     | ..   |
| Practical Class ( <i>by arrangement with the Class</i> ) | ..     | ..     | ..    | ..     | ..     | ..   |
| Junior Physiography (Winter and Spring Terms)            | 11.30  | ..     | 11.30 | ..     | ..     | ..   |
| Mining (Spring Term)                                     | 5-6    | ..     | ..    | ..     | ..     | ..   |
| Elementary (Winter and Spring Terms)                     | ..     | ..     | 2.30  | ..     | ..     | ..   |
| Elementary Physiography (Spring Term)                    | ..     | 2.30   | ..    | ..     | ..     | ..   |
| Surveying (Summer Term)                                  | 1.0    | ..     | ..    | ..     | ..     | ..   |
| Junior Geology (Summer Term)                             | 10.30  | ..     | 10.30 | ..     | ..     | ..   |
| Local (Summer Term)                                      | ..     | ..     | 2.30  | ..     | ..     | ..   |
| Excursions (Summer Term)                                 | ..     | ..     | ..    | ..     | ..     | 1    |
| Laboratory ( <i>by arrangement with the Class</i> )      | ..     | ..     | ..    | ..     | ..     | ..   |
| <b>9. MINING.</b>                                        |        |        |       |        |        |      |
| FIRST YEAR COURSE—                                       |        |        |       |        |        |      |
| Chemistry (Spring)                                       | 5      | ..     | ..    | ..     | ..     | ..   |
| Coal-Mining (Spring and Summer)                          | 6      | ..     | ..    | ..     | ..     | ..   |
| SECOND YEAR COURSE—                                      |        |        |       |        |        |      |
| Geology (Spring)                                         | 5      | ..     | ..    | ..     | ..     | ..   |
| Coal-Mining (Spring and Summer)                          | 6      | ..     | ..    | ..     | ..     | ..   |
| Special Course for Auditors (Winter)                     | 5      | ..     | ..    | ..     | ..     | ..   |
| <b>10. ENGINEERING.</b>                                  |        |        |       |        |        |      |
| JUNIOR OR FIRST YEAR—                                    |        |        |       |        |        |      |
| Lectures { 1st Term                                      | ..     | 12.30  | 12.30 | 12.30  | ..     | ..   |
| { 2nd Term                                               | 12.30  | 12.30  | ..    | 12.30  | 12.30  | ..   |
| { 3rd Term                                               | 12.30  | 12.30  | 12.30 | 12.30  | 12.30  | ..   |
| Laboratory—1st Term                                      | 12.30  | ..     | ..    | ..     | 12.30  | ..   |
| Visits to Works—2nd Term                                 | ..     | ..     | 2-5   | ..     | ..     | ..   |
| Surveying—3rd Term                                       | ..     | ..     | ..    | ..     | ..     | 9-1  |
| Drawing { 1st and 2nd Terms                              | ..     | 2.30-5 | ..    | 2.30-5 | 2.30-5 | ..   |
| { 3rd Term                                               | ..     | 2.30-5 | ..    | 2.30-5 | ..     | ..   |
| Workshop Summer Class                                    | 9-5    | 9-5    | 9-5   | 9-5    | 9-5    | ..   |
| MIDDLE OR SECOND YEAR—                                   |        |        |       |        |        |      |
| Lectures and Exercises                                   | ..     | 9.30   | *9.30 | 9.30   | 9.30   | ..   |
| Laboratory—2nd and 3rd Terms                             | 2.30-5 | ..     | 2-5   | ..     | 2.30-5 | ..   |
| Drawing { 1st Term                                       | 2.30-5 | 2.30-5 | ..    | 2.30-5 | 2.30-5 | ..   |
| { 2nd and 3rd Terms                                      | ..     | 2.30-5 | ..    | 2.30-5 | ..     | ..   |
| Workshop Summer Class                                    | 9-5    | 9-5    | 9-5   | 9-5    | 9-5    | ..   |
| SENIOR OR THIRD YEAR—                                    |        |        |       |        |        |      |
| Lectures                                                 | ..     | ..     | 11.0  | ..     | 11.0   | ..   |

\* During the second term this lecture is given at 9.30 on Monday, instead of Wednesday.

## TIME TABLE

*Of Classes suitable for Students preparing to Matriculate  
at the UNIVERSITY OF LONDON, and for GENERAL  
ELEMENTARY STUDENTS.*

| SUBJECTS AND CLASSES.                | Mon.   | Tues. | Wed.  | Thur. | Fri.  |
|--------------------------------------|--------|-------|-------|-------|-------|
| GREEK—Junior .....                   | 4.30   | ...   | 4.30  | ...   | 4.30  |
| LATIN—Junior .....                   | 3.30   | ...   | 3.30  | ...   | 3.30  |
| LATIN COMPOSITION—Junior.....        | ...    | 3.30  | ...   | ...   | ...   |
| FRENCH—Junior.....                   | ..     | 4.30  | ...   | 3.30  | 4.30  |
| GERMAN—Junior .....                  | ...    | 2.30  | ...   | 2.30  | ...   |
| ENGLISH LANGUAGE (Winter & spring)   | 9.30   | ...   | 9.30  | ...   | ...   |
| „ „ (Summer) .....                   | 10.30  | ...   | 10.30 | ...   | ...   |
| ENGLISH HISTORY .....                | ...    | 10.30 | ...   | 10.30 | ...   |
| MATHEMATICS—Junior (Winter & Spring) | 10.30  | ...   | 10.30 | ...   | 10.30 |
| „ „ (Summer) ... ..                  | 9.30   | 9.30  | 9.30  | 9.30  | 9.30  |
| PHYSICS—Junior .....                 | ...    | 11.30 | ...   | 11.30 | ...   |
| „ Junior Practical .....             | 2.30–5 | ...   | ...   | ...   | ...   |
| CHEMISTRY—Elemen. (Winter & Spring)  | ...    | ...   | 11.30 | ...   | 11.30 |
| „ „ (Summer) .. .....                | ...    | ...   | 11.30 | 4.30  | 11.30 |

## TIME TABLE

*Of Classes suitable for Students preparing for the Intermediate Examination in Arts of the University of London.*

| SUBJECTS AND CLASSES.                                         | Mon.  | Tues. | Wed.  | Thur. | Fri.  |
|---------------------------------------------------------------|-------|-------|-------|-------|-------|
| GREEK—Senior .....                                            | 2.30  | ...   | ...   | 2.30  | 4.30  |
| LATIN—Senior .....                                            | ...   | 2.30  | ...   | ...   | 2.30  |
| LATIN COMPOSITION—Senior.....                                 | ...   | ...   | 2.30  | ...   | ...   |
| FRENCH—Middle ... ..                                          | 4.30  | ...   | 4.30  | ...   | 4.30  |
| GERMAN—Senior .....                                           | ...   | 3.30  | ...   | 3.30  | ...   |
| MATHEMATICS—Middle .....                                      | 12.30 | 11.30 | ...   | 11.30 | 12.30 |
| (LITERATURE (Pass) .....                                      | 11.30 | 4.30  | 11.30 | ...   | ...   |
| ANGLO-SAXON and<br>EARLY ENGLISH..... } .....                 | 5.30  | ...   | 5.30  | ...   | ...   |
| ENGLISH.. LITERATURE (Honours) }<br>(Winter & Spring) } ..... | 10.30 | ...   | 10.30 | ...   | ...   |
| ,, (Summer).....                                              | 9.30  | ...   | 9.30  | ...   | ...   |
| COMPOSITION .....                                             | ...   | ...   | 4.30  | ...   | ...   |

## TIME TABLE

*Of Classes suitable for Students preparing for the B.A.  
Examination of the University of London.*

| SUBJECTS AND CLASSES.                    | Mon.  | Tues. | Wed.  | Thur. | Fri.  |
|------------------------------------------|-------|-------|-------|-------|-------|
| GREEK—Senior .....                       | 2.30  | .     | ...   | 2.30  | 4.30  |
| LATIN—Senior.....                        | ...   | 2.30  | ...   | ...   | 2.30  |
| „ Senior—Composition .....               | ...   | ...   | 2.30  | ...   | ...   |
| FRENCH—Middle .....                      | 4.30  | ...   | 4.30  | ...   | 4.30  |
| „ Senior.....                            | 3.30  | ...   | ...   | 2.30  | ...   |
| GERMAN—Senior .....                      | ...   | 3.30  | ...   | 3.30  | ...   |
| ENGLISH .. { LITERATURE (Period) .....   | 4.30  | 11.30 | ...   | ...   | ...   |
| „ (Special Works) .....                  | ...   | 9.30  | ...   | 9.30  | ...   |
| { ANGLO-SAXON and<br>EARLY ENGLISH ..... | 5.30  | ...   | 5.30  | ...   | ...   |
| MATHEMATICS—Senior(Winter & Spring)      | 9.30  | ...   | 9.30  | ...   | 9.30  |
| „ „ (Summer) .....                       | 10.30 | ...   | 10.30 | ...   | 10.30 |

## TIME TABLE

*Of Classes suitable for Students preparing for the Intermediate Science and Preliminary Scientific Examinations of the University of London.*

| SUBJECTS AND CLASSES.                            | Mon.            | Tues. | Wed.           | Thur.  | Fri.  |       |
|--------------------------------------------------|-----------------|-------|----------------|--------|-------|-------|
| PURE MATHEMATICS—<br>Middle... }                 | 12.30           | 11.30 | ...            | 11.30  | 12.30 |       |
| APPLIED MATHEMATICS —<br>Junior... }             | ...             | 10.30 | ...            | 10.30  | ...   |       |
| PHYSICS {                                        | Middle .....    | 11.30 | ...            | 11.30  | ...   | 11.30 |
|                                                  | Practical ..... | ...   | ...            | 2.30—5 | ...   | ...   |
| CHEMISTRY—General ..... }<br>(Winter and Spring) | 9.30            | 9.30  | 9.30           | 9.30   | 9.30  |       |
| CHEMISTRY—Laboratory .....                       | 2—5             | ...   | 2—5            | ...    | 2—5   |       |
| BIOLOGY—General..... }<br>(Winter and Spring)    | 4               | 12.30 | 12.30<br>and 4 | 12.30  | 4     |       |
| „ (Summer) .....                                 | ...             | ...   | ...            | ...    | 10    |       |

## TIME TABLE

*Of Classes suitable for Students preparing for the B.Sc.  
Examination of the University of London.*

| SUBJECTS AND CLASSES.                             | Mon.                         | Tues.           | Wed.  | Thur. | Fri.  |
|---------------------------------------------------|------------------------------|-----------------|-------|-------|-------|
| MATHEMATICS { PURE ( <i>Winter &amp; Spring</i> ) | 9.30                         | ...             | 9.30  | ...   | 9.30  |
| Senior { „ ( <i>Summer</i> ).....                 | 10.30                        | ...             | 10.30 | ...   | 10.30 |
| APPLIED .....                                     |                              | By arrangement. |       |       |       |
| PHYSICS—Senior.....                               | 12.30                        | ...             | ...   | ...   | 12.30 |
| „ Laboratory .....                                |                              | By arrangement. |       |       |       |
| CHEMISTRY—( <i>Summer</i> ).....                  | 9.30                         | 9.30            | 9.30  | 9.30  | ...   |
| „ (Special Class) .....                           |                              | By arrangement. |       |       |       |
| BOTANY—Senior {                                   | ( <i>Winter and Spring</i> ) | 10.30           | ...   | 10.30 | ...   |
|                                                   | ( <i>Spring and Summer</i> ) | ...             | 4.30  | ...   | 4.30  |
|                                                   | ( <i>Summer</i> ).....       | ...             | 10.30 | ...   | 10.30 |
| ELEMENTARY ZOOLOGY—( <i>Winter and Spring</i> ) } | ...                          | 12.30           | 12.30 | 12.30 | ...   |
| ADVANCED ZOOLOGY—( <i>Summer</i> ).....           |                              | By arrangement. |       |       |       |
| PHYSIOLOGY—General Lecture Course..               | 11                           | 11              | ...   | 11    | 11    |
| GEOLOGY—Junior .....                              | 10.30                        | ...             | 10.30 | ...   | 10.30 |



# TIME TABLE FOR MEDICAL STUDENTS.

| SUBJECTS AND CLASSES.       | Mon.                     | Tues. | Wed.                     | Thur. | Fri.                     |
|-----------------------------|--------------------------|-------|--------------------------|-------|--------------------------|
| <i>Winter Session.</i>      |                          |       |                          |       |                          |
| (October to March.)         |                          |       |                          |       |                          |
| CHEMISTRY .....             | 9.30                     | 9.30  | 9.30                     | 9.30  | 9.30                     |
| PHYSIOLOGY (Elementary) ... | ...                      | ...   | 11                       | ...   | ...                      |
| „ (Advanced) .....          | 11                       | 11    | ...                      | 11    | 11                       |
| CHEMICAL PHYSICS .....      | ...                      | 3.0   | ...                      | ...   | 3.0                      |
| (October to December.)      |                          |       |                          |       |                          |
| <i>Summer Session.</i>      |                          |       |                          |       |                          |
| (May to July.)              |                          |       |                          |       |                          |
| PRACTICAL CHEMISTRY .....   | ...                      | 2—4   | ...                      | 2—4   | ...                      |
| PRACTICAL PHYSIOLOGY ...    | 9—10.30<br>or<br>11.30—1 | ...   | 9—10.30<br>or<br>11.30—1 | ...   | 9—10.30<br>or<br>11.30—1 |
| ADVANCED „ „ .....          | By arrangement.          |       |                          |       |                          |
| BOTANY—General Course ...   | 10.30                    | ...   | 4.0                      | ...   | 10.30                    |
| „ Laboratory .....          | 11.30                    | ...   | ...                      | ...   | 11.30                    |
| „ Descriptive .....         | 4.0                      | ...   | ...                      | ...   | 4.0                      |
| COMPARATIVE ANATOMY .....   | By arrangement.          |       |                          |       |                          |

## EVENING CLASSES.

## GENERAL TIME-TABLE, 1887—88.

| DAYS AND HOURS. | SUBJECTS.                                                        | LECTURERS.            |
|-----------------|------------------------------------------------------------------|-----------------------|
| Monday.         |                                                                  |                       |
| 6.0             | French (Elementary) .....                                        | } Prof. Loreille.     |
| 7.0             | French (Advanced) .....                                          |                       |
| 7—9             | Engineering ( <i>Winter</i> ) .....                              | Prof. Smith.          |
| Tuesday.        |                                                                  |                       |
| 7.0             | Chemistry ( <i>Winter</i> ) .....                                | Dr. Nicol.            |
| 7.0             | Chemistry ( <i>Spring</i> ) .....                                | Prof. Tilden.         |
| 7—9             | { Mechanical Drawing<br>( <i>Winter &amp; Spring</i> ) ..... }   | Mr. J. Hamilton.      |
| Wednesday.      |                                                                  |                       |
| 7.0             | Mathematics ( <i>Winter &amp; Spring</i> ) ...                   | Prof. Heath.          |
| 7—9             | Botany ( <i>Winter</i> ) ..                                      | Prof. Hillhouse.      |
| Thursday.       |                                                                  |                       |
| 7—9             | { Mechanical Drawing<br>( <i>Winter and Spring</i> ) ..... }     | Mr. J. Hamilton.      |
| 8.0             | Zoology ( <i>ditto</i> ) .....                                   | Prof. Bridge.         |
| Friday.         |                                                                  |                       |
| 7.0             | { Geology (Elementary)<br>( <i>Winter &amp; Spring</i> ) ..... } | } Prof. Lapworth..... |
| 8.0             | { Geology (Advanced)<br>( <i>Winter &amp; Spring</i> ) ..... }   |                       |

## STUDENTS OF THE MASON SCIENCE COLLEGE.

SESSION 1886-87.

EXCLUSIVE OF THOSE ATTENDING EVENING CLASSES.

## Admitted.

1885. Ainsworth, William Brown, *Birmingham*.  
1880. Albright, Maria Catharine, *Birmingham*.  
1885. Allan, Agnes, *Old Hill*.  
1885. Allan, Margaret, *Old Hill*.  
1887. Allen, Walter Henry, *Bilston*.  
1885. Allen, William, *Tipton*.  
1886. Allcock, George, *Birmingham*.  
1885. Amphlet, Samuel Wilson, *Birmingham*.  
1887. Arber, Edward Alexander Newell, *Birmingham*.  
1887. Arton, Alfred, *Birmingham*.  
1884. Ash, Clara Elizabeth, *Birmingham*.  
1887. Ashford, Isabel, *Birmingham*.  
1886. Aston, George Thomas, *Old Hill*.  
1885. Atkins, John Francis, *Matlock Bank*.  
1882. Avery, Alice Isabel, *Birmingham*.  
1885. Baker, Florence, *Birmingham*.  
1885. Baker, Ellen, *Birmingham*.  
1886. Baker, George Henry, *Birmingham*.  
1887. Baker, Nellie, *Birmingham*.  
1884. Baker, Thomas James, Junr., *Birmingham*.  
1887. Ballard, Ernest, *Malvern*.  
1883. Barclay, John, *Birmingham*.  
1885. Barnby, Ernest Marquois, *Birmingham*.  
1887. Barradale, Edith, *Birmingham*.  
1886. Baylis, Walter Henry, *Birmingham*.  
1887. Beattie, Jessie Flora May, *Birmingham*.  
1886. Beazeley, Tom William, *Leicester*.  
1886. Beck, Charles Ridgeway, *Burton-on-Trent*.  
1887. Belloc, Hilaire Joseph, *Birmingham*.  
1884. Bennett, William Edward, *Coventry*.

## Admitted.

1883. Bishop, Mabel, *Birmingham*.  
1886. Bishop, Thomas, *Sierra Leone*.  
1880. Blake, James Edward Huxley, *Birmingham*.  
1884. Blatch, Francis Joseph, *Birmingham*.  
1886. Blay, William Fred, *Birmingham*.  
1887. Blewitt, William Francis, *Brewood*.  
1886. Bliss, Ernest William, *Brierley Hill*.  
1887. Blood, Edith, *Birmingham*.  
1885. Bolton, Lee Ashby, *Birmingham*.  
1884. Bott, William, *Tipton*.  
1886. Boyd, Emma Dorcas, *Birmingham*.  
1886. Brindley, James Henry, *Birmingham*.  
1885. Brooks, Ethel, *Birmingham*.  
1886. Brooks, Margaret Ellen, *Birmingham*.  
1886. Broome, George Herbert, *Hednesford*.  
1885. Browett, Alfred, *Birmingham*.  
1885. Browett, Hilda, *Birmingham*.  
1881. Brown, Frances, *Birmingham*.  
1887. Brown, Gertrude Amelia, *Birmingham*.  
1886. Browne, Ellen, *Birmingham*.  
1883. Browne, Mrs. Langley, *West Bromwich*.  
1887. Buller, Ethel Mary, *Birmingham*.  
1887. Bullows, Wilfred Lawson, *Walsall*.  
1887. Burke, Francis Edmund, *Erdington*.  
1886. Butcher, Herbert Thomas, *Birmingham*.  
1886. Cadbury, Emma, *Birmingham*.  
1885. Cadbury, Sarah, *Birmingham*.  
1885. Cadbury, Caroline, *Birmingham*.  
1886. Caddick, Helen, *Birmingham*.  
1884. Cantrill, Thomas Crosbee, *Hagley*.  
1886. Capon, Arthur Lifford, *King's Norton*.  
1887. Carter, Francis Boake, *London*.  
1887. Challen, Ada Mary, *Birmingham*.  
1887. Chamberlain, Neville, *Birmingham*.  
1887. Chapman, Joshua Harrison, *Birmingham*.  
1882. Charles, Jessie, *Birmingham*.  
1887. Charles, Thomas Hessin, *Birmingham*.  
1886. Cherry, Karl Frederick, *Stafford*.  
1886. Chirm, Sarah May, *Birmingham*.  
1885. Claridge, Henry Arthur Herbert, *Sutton Coldfield*.  
1886. Clarke, Edgar Michael, *Birmingham*.

## Admitted.

- 1884. Clarke, Jessie Elizabeth, *Birmingham*.
- 1884. Clarke, Ellen Margaret, *Birmingham*.
- 1887. Clarke, John Henry Grayson, *Kenilworth*.
- 1886. Clarkson, Rev. William Frederick, B.A., *Birmingham*.
- 1886. Clarkson, Mrs. W. F., *Birmingham*.
- 1885. Clarkson, Edith Annie, *Birmingham*.
- 1883. Clarkson, Florence Mary, *Birmingham*.
- 1887. Coates, Charles Henry, *Acoc's Green*.
- 1887. Cohen, Hetty, *Birmingham*.
- 1885. Cohen, Jessie Elizabeth, *Birmingham*.
- 1883. Corah, Arthur, *Birmingham*.
- 1886. Corvesor, Edward, *Dudley*.
- 1887. Cox, Walter Mundy, *Birmingham*.
- 1885. Cudworth, Mrs. A. J., *Birmingham*.
- 1880. Cullis, Frederick John, *Gloucester*.
- 1886. Crump, Ernest Henry, *Kidderminster*.
- 1884. Dalby, Charles John, *Banbury*.
- 1887. Dammann, Mrs. Karl, *Birmingham*.
- 1885. Dando, Edward Arthur, *Dudley*.
- 1885. Daniell, George Frederick, *Birmingham*.
- 1887. Dare, Clara, *Birmingham*.
- 1886. Davies, Frederick Samuel, *Upper Gornal*.
- 1886. Deane, Annie Margaret, *Birmingham*.
- 1886. Deane, Katharine Mary, *Birmingham*.
- 1886. Dell, Henry Lawrence, *Birmingham*.
- 1880. Dewes, Henry, *Birmingham*.
- 1886. Dickinson, Harold, *Wolverhampton*.
- 1886. Digby, Henrietta Wingfield, *Coleshill*.
- 1886. Digby, Kathleen Lydia Wingfield, *Coleshill*.
- 1887. Diggory, William Frederick, *Wolverhampton*.
- 1884. Dixon, Thomas, *Bromsgrove*.
- 1887. Dresser, Elizabeth Caroline, *Birmingham*.
- 1885. Dudley, George James, *Dudley*.
- 1886. Earl, Margaret Eleanor, *Northfield*.
- 1882. Edwards, Jessie, *Birmingham*.
- 1886. Edwards, Philip Hugh, *Sutton Coldfield*.
- 1884. Ehrhardt, Dora, *Birmingham*.
- 1886. Evans, Catherine, *Leicester*.
- 1886. Ewen, Mrs. T. B., *Birmingham*.
- 1885. Exell, William Wallis, *Birmingham*.
- 1885. Fallows, Ada, *Birmingham*.

## Admitted.

1886. Fellowes, Howard Edward, *Walsall*.  
1885. Fisher, Eliza Jane, *Wolverhampton*.  
1887. Fisher, Henry Wickliffe, *Birmingham*.  
1885. Flint, Amy Blanche, *Birmingham*.  
1886. Flint, Mabel Constance, *Birmingham*.  
1885. Fowler, Henry, *Evesham*.  
1885. France, Emily Wilmer Cave, *Birmingham*.  
1884. Gamgee, Leonard Parker, *Birmingham*.  
1884. Gaul, Emily Charlotte, *Birmingham*.  
1883. Gaul, Lilian Jane, *Birmingham*.  
1886. George, Gertrude Horsey, *Birmingham*.  
1886. Gibbins, Mrs. J., *Birmingham*.  
1887. Gibbins, William, *Birmingham*.  
1886. Gibbins, Mrs. William, *Birmingham*.  
1887. Gibbins, Junr., William, *Birmingham*.  
1886. Gibbins, Mrs. Richard C., *Birmingham*.  
1886. Gill, Sutton Dudley, *West Bromwich*.  
1882. Glydon, Amy, *Birmingham*.  
1886. Godson, John Edward, *Bridgwater*.  
1885. Goodman, Annie, *Birmingham*.  
1886. Goodman, Emily Selina, *Birmingham*.  
1886. Gosling, Sarah, *Birmingham*.  
1883. Gough, Emmie Elizabeth, *Birmingham*.  
1886. Gower, Alfred Rowland, *Birmingham*.  
1886. Green, Charles Albert, *Birmingham*.  
1887. Green, George Harry, *Stourbridge*.  
1887. Green, John Henry, *Stourbridge*.  
1885. Green, Arthur Robert, *Bromsgrove*.  
1884. Greene, Arnold James, *Birmingham*.  
1886. Greenwood, Samuel, *Birmingham*.  
1886. Grisold, Clara, *Birmingham*.  
1886. Haines, Aubrey Wheeler, *Birmingham*.  
1884. Hale, Winifred, *King's Norton*.  
1885. Hancock, George Henry, *Worcester*.  
1887. Harcourt, Olive Isabelle, *Birmingham*.  
1886. Harris, Frederic John, *Birmingham*.  
1884. Harrison, John Alfred, *Washwood Heath*.  
1886. Harrison, Junr., William Jerome, *Birmingham*.  
1881. Harrison, George Herbert, *Hagley*.  
1886. Hartley, Alice Emily, *Birmingham*.  
1886. Harvey, Ruth, *Birmingham*.

## Admitted.

- 1886. Haycraft, Ellen Sara, *Brighton*.
- 1887. Hawley, Sidney Herbert, *Sutton Coldfield*.
- 1886. Heath, Charles Herbert, M.A., *Ward End*.
- 1886. Heathfield, Ernest, *Redditch*.
- 1885. Higgs, Thomas Frederic Walker, *Dudley*.
- 1884. Hill, Elizabeth, *Birmingham*.
- 1885. Hill, Thomas Henry, *Birmingham*.
- 1886. Hillyar, Cecil Bisshopp, *Tipton*.
- 1886. Hillyar, George Hewlett Stanhope, *Tipton*.
- 1886. Hogg, John Augustus, *Leamington*.
- 1886. Homfray, Kenyon, *Halesowen*.
- 1886. Hooson, Thomas James Stewart, *Quinton*.
- 1883. Hopkins, Edith Jane, *Birmingham*.
- 1886. Hopkins, Robert Castle, *Bromsgrove*.
- 1887. Horton, Arthur Villiers, *Bescot*.
- 1887. Horton, Henry John, *Bromsgrove*.
- 1882. Hough, Joseph, M.A., *Wolverhampton*.
- 1885. Houghton, Murtaugh James, *Coventry*.
- 1886. Housman, George Herbert, *Bromsgrove*.
- 1887. Hudson, Robert, *Brighton*.
- 1885. Hughes, William Richard, *Birmingham*.
- 1882. Hunt, Lucy Elizabeth, *Birmingham*.
- 1886. Hutchinson, Arthur James, *Wolverhampton*.
- 1886. Iles, Charles Hodgson, *Lichfield*.
- 1886. Illingworth, Agnes Mary Ellis, *Old Hill*.
- 1886. Jackson, Alfred Edward, *Birmingham*.
- 1887. James, Emily Mary, *Birmingham*.
- 1884. James, Thomas, *Birmingham*.
- 1887. James, Harold Bartlett, *Redditch*.
- 1887. Janson, Beatrice Mary, *Birmingham*.
- 1887. Jelfs, Charles Joseph, *Bromsgrove*.
- 1887. Jennings, Mabel, *Birmingham*.
- 1886. Jerome, George Percy, *Sutton Coldfield*.
- 1885. Johnson, Margaret Elizabeth, *Birmingham*.
- 1881. Johnston, George St., *Birmingham*.
- 1886. Jones, Oliver, *Birmingham*.
- 1866. Jones, Frederick Josiah, *Birmingham*.
- 1887. Jones, John William, *Birmingham*.
- 1887. Jones, George William, *Birmingham*.
- 1881. Jordan, Edith Furneaux, *Birmingham*.
- 1886. Keep, Alice Elizabeth, *Birmingham*.

## Admitted.

1886. Fellowes, Howard Edward, *Walsall*.  
1885. Fisher, Eliza Jane, *Wolverhampton*.  
1887. Fisher, Henry Wickliffe, *Birmingham*.  
1885. Flint, Amy Blanche, *Birmingham*.  
1886. Flint, Mabel Constance, *Birmingham*.  
1885. Fowler, Henry, *Evesham*.  
1885. France, Emily Wilmer Cave, *Birmingham*.  
1884. Gamgee, Leonard Parker, *Birmingham*.  
1884. Gaul, Emily Charlotte, *Birmingham*.  
1883. Gaul, Lilian Jane, *Birmingham*.  
1886. George, Gertrude Horsey, *Birmingham*.  
1886. Gibbins, Mrs. J., *Birmingham*.  
1887. Gibbins, William, *Birmingham*.  
1886. Gibbins, Mrs. William, *Birmingham*.  
1887. Gibbins, Junr., William, *Birmingham*.  
1886. Gibbins, Mrs. Richard C., *Birmingham*.  
1886. Gill, Sutton Dudley, *West Bromwich*.  
1882. Glydon, Amy, *Birmingham*.  
1886. Godson, John Edward, *Bridgwater*.  
1885. Goodman, Annie, *Birmingham*.  
1886. Goodman, Emily Selina, *Birmingham*.  
1886. Gosling, Sarah, *Birmingham*.  
1883. Gough, Emmie Elizabeth, *Birmingham*.  
1886. Gower, Alfred Rowland, *Birmingham*.  
1886. Green, Charles Albert, *Birmingham*.  
1887. Green, George Harry, *Stourbridge*.  
1887. Green, John Henry, *Stourbridge*.  
1885. Green, Arthur Robert, *Bromsgrove*.  
1884. Greene, Arnold James, *Birmingham*.  
1886. Greenwood, Samuel, *Birmingham*.  
1886. Grisold, Clara, *Birmingham*.  
1886. Haines, Aubrey Wheeler, *Birmingham*.  
1884. Hale, Winifred, *King's Norton*.  
1885. Hancock, George Henry, *Worcester*.  
1887. Harcourt, Olive Isabelle, *Birmingham*.  
1886. Harris, Frederic John, *Birmingham*.  
1884. Harrison, John Alfred, *Washwood Heath*.  
1886. Harrison, Junr., William Jerome, *Birmingham*.  
1881. Harrison, George Herbert, *Hagley*.  
1886. Hartley, Alice Emily, *Birmingham*.  
1886. Harvey, Ruth, *Birmingham*.



## Admitted.

- 1886. Haycraft, Ellen Sara, *Brighton*.
- 1887. Hawley, Sidney Herbert, *Sutton Coldfield*.
- 1886. Heath, Charles Herbert, M.A., *Ward End*.
- 1886. Heathfield, Ernest, *Redditch*.
- 1885. Higgs, Thomas Frederic Walker, *Dudley*.
- 1884. Hill, Elizabeth, *Birmingham*.
- 1885. Hill, Thomas Henry, *Birmingham*.
- 1886. Hillyar, Cecil Bisshopp, *Tipton*.
- 1886. Hillyar, George Hewlett Stanhope, *Tipton*.
- 1886. Hogg, John Augustus, *Leamington*.
- 1886. Homfray, Kenyon, *Halesowen*.
- 1886. Hooson, Thomas James Stewart, *Quinton*.
- 1883. Hopkins, Edith Jane, *Birmingham*.
- 1886. Hopkins, Robert Castle, *Bromsgrove*.
- 1887. Horton, Arthur Villiers, *Bescot*.
- 1887. Horton, Henry John, *Bromsgrove*.
- 1882. Hough, Joseph, M.A., *Wolverhampton*.
- 1885. Houghton, Murtaugh James, *Coventry*.
- 1886. Housman, George Herbert, *Bromsgrove*.
- 1887. Hudson, Robert, *Brighton*.
- 1885. Hughes, William Richard, *Birmingham*.
- 1882. Hunt, Lucy Elizabeth, *Birmingham*.
- 1886. Hutchinson, Arthur James, *Wolverhampton*.
- 1886. Iles, Charles Hodgson, *Lichfield*.
- 1886. Illingworth, Agnes Mary Ellis, *Old Hill*.
- 1886. Jackson, Alfred Edward, *Birmingham*.
- 1887. James, Emily Mary, *Birmingham*.
- 1884. James, Thomas, *Birmingham*.
- 1887. James, Harold Bartlett, *Redditch*.
- 1887. Janson, Beatrice Mary, *Birmingham*.
- 1887. Jelfs, Charles Joseph, *Bromsgrove*.
- 1887. Jennings, Mabel, *Birmingham*.
- 1886. Jerome, George Percy, *Sutton Coldfield*.
- 1885. Johnson, Margaret Elizabeth, *Birmingham*.
- 1881. Johnston, George St., *Birmingham*.
- 1886. Jones, Oliver, *Birmingham*.
- 1886. Jones, Frederick Josiah, *Birmingham*.
- 1887. Jones, John William, *Birmingham*.
- 1887. Jones, George William, *Birmingham*.
- 1881. Jordan, Edith Furneaux, *Birmingham*.
- 1886. Keep, Alice Elizabeth, *Birmingham*.

## Admitted.

1884. Keep, Florence, *Birmingham*.  
 1883. Keep, Margaret Jane, *Birmingham*.  
 1886. Kendrick, George, *Wednesfield*.  
 1885. Kenway, Mrs. G., *Birmingham*.  
 1885. Kerby, Annie Letitia, *Birmingham*.  
 1887. King, Germain Christian William, *Birmingham*.  
 1883. Kingsland, Alfred, *Birmingham*.  
 1886. Knowles, Ruth, *Birmingham*.  
 1886. Knowles, Kathleen, *Birmingham*.  
 1887. Knowles, Edward, *St. Bees*.  
 1886. Lake, Amy Lucy, *Leamington*.  
 1886. Landon, Joseph, *Birmingham*.  
 1885. Langford, William Morris, *Gloucester*.  
 1885. Langham, Emily Anna, *Birmingham*.  
 1884. Larner, Charles Proctor, *Birmingham*.  
 1887. Laurie, Charlotte Louisa, *Cheltenham*.  
 1884. Lazzaridis, Georgio Demetrius, *Salonika*.  
 1882. Ledsam, Henry Thomas Clutton Salt, *Birmingham*.  
 1885. Leslie, Bertha, *Birmingham*.  
 1885. Lewis, Jane Eden, *Birmingham*.  
 1886. Lewis, Herbert, *Birmingham*.  
 1885. Liverseege, John Francis, *Birmingham*.  
 1886. Lloyd, Ellen Mary, *Birmingham*.  
 1886. Lloyd, Alice Maria, *Wednesbury*.  
 1886. Lloyd, Sarah Cecilia, *Stourport*.  
 1883. Lloyd, Mrs. J. H., *Birmingham*.  
 1880. Lloyd, Edith Mary, *Birmingham*.  
 1884. Loreille, Marguerite Louisa, *Birmingham*.  
 1884. MacSwiney, Felix, *Birmingham*.  
 1884. Madin, William, *Shustoke*.  
 1886. Manly, William George, *Birmingham*.  
 1886. Marris, Sarah Murrell, *Birmingham*.  
 1887. Marsland, Agnes Elizabeth, *Birmingham*.  
 1887. Marson, Cyril Darby, *Stafford*.  
 1885. Marston, Charles, *Wolverhampton*.  
 1887. Martin, Oliver Owen, *Birmingham*.  
 1887. Martino, Edward Blunden, *Birmingham*.  
 1883. Mason, Harold, *Leamington*.  
 1887. Mason, William Quinton, *Birmingham*.  
 1881. Mathews, Marianne, *Birmingham*.  
 1885. May, Francis Hollingsworth, *Birmingham*.

## Admitted.

- 1885. Maycock, Bernard Joseph, *Birmingham*.
- 1886. Mayne, Arthur James, *Birmingham*.
- 1884. McBean, Grace Dora, *Birmingham*.
- 1886. McCallum, Kate Emily, *Birmingham*.
- 1886. McLeish, William James, *Birmingham*.
- 1886. McMichael, Arthur William, *Dudley*.
- 1886. Medd, Francis John Goldsmith, *Southport*.
- 1886. Meggison, Charlotte Maria, *Coleshill*.
- 1886. Miller, William Akerman, *Coventry*.
- 1886. Milligan, Mrs. J. W., *Birmingham*.
- 1886. Miners, Bernard Perry, B.A., *Birmingham*.
- 1887. Minshull, Herbert Barford, *Great Malvern*.
- 1886. Mole, Arthur Ernest, *Redditch*.
- 1882. Mole, Percy, *Redditch*.
- 1886. Morgan, Christopher Andrew, *Leamington*.
- 1886. Morrison, James, *Birmingham*.
- 1885. Moyles, Mrs. T., *Birmingham*.
- 1887. Moyles, Thomas Henry Cave, *Birmingham*.
- 1881. Naden, Constance Caroline Woodhill, *Birmingham*.
- 1886. Nayler, John William, *Dudley*.
- 1885. Neal, James, *Sandown, Isle of Wight*.
- 1887. Neal, John Richmond, *Sandown, Isle of Wight*.
- 1885. New, Anthony George, *Evesham*.
- 1887. Newey, Harriet Cliff, *Birmingham*.
- 1884. Nicholson, John, *Sheffield*.
- 1883. Nicklin, Samuel, *Tipton*.
- 1885. Norris, Benjamin Stuart, *Birmingham*.
- 1881. Nunneley, Alice, *Birmingham*.
- 1887. Orme, Walter George, *Wolverhampton*.
- 1885. Overton, Percy Edgar, *Coventry*.
- 1886. Page, Edward Ferdinand, *Solihull*.
- 1886. Palmer, Ambrose Henry, *Burton-on-Trent*.
- 1887. Parkes, Arthur Clifford, *Birmingham*.
- 1885. Parrott, John Ernest, *Birmingham*.
- 1886. Payton, Jessie Mary, *Birmingham*.
- 1886. Passman, Consett Howard, *Leamington*.
- 1886. Peacock, Mildred, *West Bromwich*.
- 1886. Pearson, Clara Elizabeth, *Birmingham*.
- 1886. Pearson, Jessie Arden, *Birmingham*.
- 1887. Pearson, Frank Shakespeare, *Birmingham*.
- 1885. Pegg, Joseph Edmund Jones, *Birmingham*.

## Admitted.

1885. Pemberton, Jane Elizabeth, *Birmingham*.  
1885. Perry, Sidney Herbert, *Birmingham*.  
1885. Phelps, Malet Peyton, *Birmingham*.  
1886. Phillips, Minnie Dora, *Birmingham*.  
1886. Phillips, William Grenfell, *Coventry*.  
1887. Phillips, George Richmond, *Coventry*.  
1886. Podesta, John James, *Birmingham*.  
1885. Pooler, Harry William, *Birmingham*.  
1887. Pope, Annie Golightly, *Birmingham*.  
1887. Postgate, Isabella Jane, *Birmingham*.  
1886. Price, Mabel, *Birmingham*.  
1883. Price, Rachel, *Birmingham*.  
1886. Price, Thomas Henry, *Dudley*.  
1887. Prinsep, Ernest Cecil, *Birmingham*.  
1886. Pritchatt, Ellen, *Birmingham*.  
1885. Quirke, John, *Birmingham*.  
1884. Rabone, Mrs. J., *Birmingham*.  
1886. Rae, Theodore Merz, *Birmingham*.  
1885. Rainsford, Edgar Joseph, *Birmingham*.  
1885. Rankine, Catherine Bremner, *Birmingham*.  
1885. Raspas, John Colin Tulloch, *Madeley*.  
1886. Ratcliff, Marianne Elizabeth, *Birmingham*.  
1885. Reynolds, Albert Heywood, *Birmingham*.  
1886. Robinson, George Burton, *Halesowen*.  
1887. Robinson, William Aspley, *Birmingham*.  
1885. Round, John, *Birmingham*.  
1884. Rowbotham, Herbert Barnwell, *Foleshill*.  
1886. Rowlands, William Herbert, *Birmingham*.  
1883. Russell, Lucy Anna, *Birmingham*.  
1884. Russell, James William, B.A., *Birmingham*.  
1886. Sargant, Elizabeth Maude, *Birmingham*.  
1886. Satchell, Ernest Percy, *Birmingham*.  
1887. Scott, John William, *Bromsgrove*.  
1887. Shenton, Edward, *West Bromwich*.  
1886. Sheppard, Eugenie, *Kingswood*.  
1885. Shore, Pharez Algernon, *Walsall*.  
1886. Sincox, Margaret Marion, *Birmingham*.  
1886. Sincox, Millicent Ellen, *Birmingham*.  
1886. Simpson, Frederick Hampson, *Birmingham*.  
1882. Smith, John Frederick, *Birmingham*.  
1883. Smithson, Agnes, *Birmingham*.

Admitted.

- 1885. Smyth, Reginald Mander, *Wolverhampton*.
- 1881. Southall, Gertrude Eliza, *Birmingham*.
- 1885. Southall, Geraldine, *Birmingham*.
- 1886. Southall, Rachel Baker, *Birmingham*.
- 1886. Southall, Edith Margaret, *Birmingham*.
- 1887. Spittle, Marcia Maxwell, *Birmingham*.
- 1885. Sproat, James Hugh, *Darlaston*.
- 1881. Stacey, Agatha, *Birmingham*.
- 1886. Stansbie, John Henry, *Birmingham*.
- 1887. Stead, Dryden, *Hednesford*.
- 1887. Stern, Florence, *Birmingham*.
- 1884. Stern, Arthur Landauer, *Birmingham*.
- 1886. Stevens, Alice, *Birmingham*.
- 1886. Stockton, Cecil, *Banbury*.
- 1886. Sudborough, John Joseph, *Birmingham*.
- 1886. Swan, Mary Lillie, *Birmingham*.
- 1885. Sydenham, Frederick William, *Walsall*.
- 1883. Thomas, Oswald Wynne, *Birmingham*.
- 1886. Thomson, Clara, *Birmingham*.
- 1886. Thorne, Kate, *Birmingham*.
- 1885. Thornley, John Edward, *Birmingham*.
- 1886. Thornton, Jeremiah, *Birmingham*.
- 1886. Tibbetts, Thomas Major, *Cradley Heath*.
- 1887. Tildesley, Josiah Percival, *Willenhall*.
- 1884. Titterton, Herbert Charles, *Birmingham*.
- 1887. Tonks, Osmund, *Knowle*.
- 1883. Townsend, Arthur Allen Deykin, *Birmingham*.
- 1886. Trout, Joseph Henry, *Birmingham*.
- 1886. Turner, Mrs. John, *Birmingham*.
- 1886. Tyndall, Helen Margaret, *Birmingham*.
- 1885. Udall, John, *Birmingham*.
- 1886. Vincent, Thomas Swale, *West Bromwich*.
- 1885. Wakley, Henry Bernard Clapcott, *Birmingham*.
- 1886. Walker, Joseph Griffin, *Dudley*.
- 1881. Walker, Thomas Sydney, *Birmingham*.
- 1882. Ward, Charles Frederick Myers, *Birmingham*.
- 1885. Ward, William Latimer Oakden, *Sutton Coldfield*.
- 1885. Warmington, Edward Augustus, *Dudley*.
- 1885. Warneford, Stanley Wilson Collingwood, *Birmingham*.
- 1886. Weekes, Ida Mary, *Birmingham*.
- 1886. Welshman, Ida, *Birmingham*.

## Admitted.

1886. West, John Thomas, *Coventry*.  
 1884. Wheatley, Arthur John, *Birmingham*.  
 1884. White, Dora Frances, *Birmingham*.  
 1884. Whitehouse, Michael James, *Tipton*.  
 1887. Whitehouse, Edwin St. John, *Bilston*.  
 1885. Wilkins, Mary Elizabeth, *Birmingham*.  
 1885. Wilkins, Thomas Halford, *Birmingham*.  
 1883. Wilson, Catharine, *Birmingham*.  
 1887. Wilson, Mary Louisa, *Birmingham*.  
 1887. Wilson, Anna Deborah, *Birmingham*.  
 1886. Wimberley, Edward Conrad, *Coventry*.  
 1884. Wood, George Croft Orwin, *Darlaston*.  
 1886. Woodbridge, Charles Frederick, *Birmingham*.  
 1881. Wright, Ellen Gertrude, *Birmingham*.  
 1886. Wright, Edward William Egerton Tylden, *Dudley*.  
 1887. Wright, David Percy, *Birmingham*.  
 1887. Wright, Edward Pitcairn, *Birmingham*.  
 1885. Wyatt, Alfred John, B.A., *Birmingham*.  
 1885. Youngerman, Ellen Margaret, *Birmingham*.
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*Number of Students attending Day Classes in the College  
 during the Session 1886-87.*

|                                                    |     |     |     |     |     |     |
|----------------------------------------------------|-----|-----|-----|-----|-----|-----|
| In the 1st Term                                    | ... | ... | ... | ... | ... | 271 |
| In the 2nd Term                                    | ... | ... | ... | ... | ... | 287 |
| In the 3rd Term                                    | ... | ... | ... | ... | ... | 254 |
| Number of individuals registered in the<br>Session | ... | ... | ... | ... | ... | 377 |

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*Students attending Evening Classes* ... 372

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## RESULTS OF EXAMINATIONS.

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GREEK.

## JUNIOR.

Class I.—(In order of merit.)

W. H. Baylis, *Birmingham* (Prize).G. R. Phillips, *Coventry*.O. Jones, *Birmingham*.

## SENIOR.

Class I.—(In order of merit.)

Jane E. Pemberton, *Birmingham*.

(Disqualified for Prize.)

Emily W. C. France, *Birmingham* (Prize).Lucy A. Russell, *Birmingham*.Jane E. Lewis, *Birmingham*.

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LATIN.

## JUNIOR.

Class I.—(In order of merit.)

Katharine M. Deane, *Birmingham* (Prize).O. Jones, *Birmingham*.Edith A. Clarkson, *Birmingham*.Annie L. Kerby, *Birmingham*.

Class II.—(In order of merit.)

T. H. Hill, *Birmingham*.W. F. Blewitt, *Brewood*.G. H. Green, *Stourbridge*.

## SENIOR.

Class I.—(In order of merit.)

W. H. Baylis, *Birmingham* (Prize).W. W. Exell, *Birmingham*.A. H. Reynolds, *Birmingham*.W. B. Ainsworth, *Birmingham*. } Equal.

## HIGHER SENIOR.

Class I.—(In order of merit.)

Emily W. C. France, *Birmingham* (Prize).Jane E. Pemberton, *Birmingham*.Jane E. Lewis, *Birmingham*.

## COMPOSITION.

## JUNIOR.

- Class I.*—(In order of merit.)  
 Edith A. Clarkson, *Birmingham* (Prize).  
 W. F. Blewitt, *Brewood*.  
 O. Jones, *Birmingham*.
- Class II.*—(In order of merit.)  
 T. H. Hill, *Birmingham*.  
 G. H. Green, *Stourbridge*.  
 O. Tonks, *Knowle*.

## SENIOR.

- Class I.*—(In order of merit.)  
 Jane E. Pemberton, *Birmingham* (Prize).  
 Emily W. C. France, *Birmingham*.  
 Jane E. Lewis, *Birmingham*.  
 A. H. Reynolds, *Birmingham*.  
 W. W. Exell, *Birmingham*.  
 W. H. Baylis, *Birmingham*.  
 } Equal.
- Class II.*—(In order of merit.)  
 W. B. Ainsworth, *Birmingham*.  
 C. P. Larner, *Birmingham*.  
 G. R. Phillips, *Coventry*.

## ENGLISH.

## LANGUAGE.

- Class I.*—(In order of merit.)  
 Katharine M. Deane, *Birmingham* (Prize).  
 O. Jones, *Birmingham*.  
 E. H. Crump, *Kidderminster*.

## HISTORY.

- Class I.*—  
 O. Jones, *Birmingham* (Prize).

## ANGLO-SAXON.

- Class I.*—(In order of merit.)  
 Amy Glydon, *Birmingham* (Prize).  
 Geraldine Southall, *Birmingham*.

## EARLY ENGLISH.

- Class I.*—(In order of merit.)  
 F. S. Davies, *Upper Gornal*. (Early English  
 Text Society's Prize.)  
 Amy Glydon, *Birmingham*.



## COMPOSITION.

## Class I.—

W. B. Ainsworth, *Birmingham* (Prize).

## LITERATURE.

( *Intermediate Pass Course.* )

## Class I.—(In order of merit.)

A. H. Reynolds, *Birmingham* (Prize).W. B. Ainsworth, *Birmingham*.F. S. Davies, *Upper Gornal*.

## FRENCH.

## JUNIOR AND LADIES' CLASSES.

## Class I.—(In order of merit.)

Grace D. McBean, *Birmingham*. (Disqualified  
for Prize.)O. Jones, *Birmingham* (Prize).W. F. Blewitt, *Brewood*.G. R. Phillips, *Coventry*.Geraldine Southall, *Birmingham*.

## Class II.—(In order of merit.)

Amy B. Flint, *Birmingham*.Mabel C. Flint, *Birmingham*.O. Tonks, *Knowle*.J. W. Scott, *Bromsgrove*.J. G. Walker, *Dudley*.E. B. Martino, *Birmingham*.

## MIDDLE CLASS.

## Class I.—(In order of merit.)

W. B. Ainsworth, *Birmingham* (Prize).A. H. Reynolds, *Birmingham*.C. P. Larner, *Birmingham*.W. W. Exell, *Birmingham*.W. G. Phillips, *Coventry*.Walter H. Baylis, *Birmingham*.Florence M. Clarkson, *Birmingham*.Jessie M. Payton, *Birmingham*.

## Class II.—(In order of merit.)

Annie M. Deane, *Birmingham*.Ida J. Welshman, *Birmingham*.

## SENIOR CLASS.

*Class I.*—(In order of merit.)Emily A. Langham, *Birmingham* (Prize).Ellen M. Lloyd, *Birmingham*.Margaret J. Keep, *Birmingham*.*Class II.*—Annie G. Pope, *Birmingham*.

## COMPOSITION.

*Class I.*—(In order of merit.)Annie G. Pope, *Birmingham* (Prize).Ellen M. Lloyd, *Birmingham* (Prize).A. H. Reynolds, *Birmingham*.W. B. Ainsworth, *Birmingham*.C. P. Larner, *Birmingham*.Emily A. Langham, *Birmingham*.Dora Ehrhardt, *Birmingham*.*Class II.*—(In order of merit.)Margaret J. Keep, *Birmingham*.W. W. Exell, *Birmingham*.Jessie M. Payton, *Birmingham*.Grace D. McBean, *Birmingham*.Annie M. Deane, *Birmingham*.Florence M. Clarkson, *Birmingham*.Geraldine Southall, *Birmingham*.Ida J. Welshman, *Birmingham*.

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GERMAN.

## JUNIOR.

## (In order of merit.)

Helen Caddick, *Birmingham* (Prize).Clara E. Ash, *Birmingham*.T. H. Hill, *Birmingham*.

## SENIOR.

## (In order of merit.)

Lillian J. Gaul, *Birmingham* (Prize.)Dora Ehrhardt, *Birmingham*.Emily C. Gaul, *Birmingham*.Ida J. Welshman, *Birmingham*.W. G. Phillips, *Coventry*.Annie L. Kerby, *Birmingham*.Annie M. Deane, *Birmingham*.Agnes E. Marsland, *Birmingham*.Jessie M. Payton, *Birmingham*.

## MATHEMATICS.

## (A.) PURE MATHEMATICS.

## JUNIOR.

## Class I.—(In order of merit.)

E. H. Crump, *Kidderminster* (Prize).  
Kate E. McCallum, *Birmingham*.  
A. E. Jackson, *Birmingham*.

## Class II.—(In order of merit.)

W. F. Blewitt, *Brewwood*.  
G. H. Green, *Stourbridge*.  
A. J. Mayne, *Birmingham*.  
H. B. James, *Redditch*.  
D. P. Wright, *Birmingham*.  
H. Dickinson, *Wolverhampton*.

## MIDDLE.

## Class I.—(In order of merit.)

J. J. Sudborough, *Birmingham* (Prize).  
Jessie Edwards, *Birmingham*.  
W. B. Ainsworth, *Birmingham*.

## Class II.—(In order of merit.)

F. J. Blatch, *Birmingham*.  
J. Barclay, *Birmingham*.  
N. Chamberlain, *Birmingham*.  
Ellen G. Wright, *Birmingham*.  
H. Fowler, *Evesham*.

## SENIOR.

## Class I.—(In order of merit.)

W. H. Baylis, *Birmingham* (Prize).  
G. F. Daniell, *Birmingham*.

## Class II.—(In order of merit.)

W. W. Exell, *Birmingham*.  
W. L. O. Ward, *Sutton Coldfield*.

## HIGHER SENIOR.

## Class I.—

A. H. Reynolds, *Birmingham*.

## Class II.—(In order of merit.)

A. I. Stern, *Birmingham*.  
T. J. Baker, *Birmingham*.

## (B.) APPLIED MATHEMATICS.

## JUNIOR.

Class I.—  
 W. H. Baylis, *Birmingham*.  
 J. J. Sudborough, *Birmingham*. } Equal.

Class II.—(In order of merit.)  
 J. J. Podesta, *Birmingham*.  
 F. J. Blatch, *Birmingham*.  
 J. Barclay, *Birmingham*.

## SENIOR.

Class II.—(In order of merit.)  
 A. H. Reynolds, *Birmingham*.  
 G. F. Daniell, *Birmingham*.

## PHYSICS.

## ELEMENTARY.

Class I.—  
 \* J. T. West, *Coventry*.  
 Class II.—  
 \* C. A. Green, *Birmingham*.

## JUNIOR.

Class I.—(In order of merit.)  
 Katharine M. Deane, *Birmingham*.  
 A. E. Jackson, *Birmingham*.  
 J. J. Podesta, *Birmingham*.  
 A. J. Wheatley, *Birmingham*. } Equal.

Class II.—  
 Edith A. Clarkson, *Birmingham*.

## MIDDLE.

Class I.—(In order of merit.)  
 G. T. Aston, *Old Hill* (Prize.)  
 J. J. Sudborough, *Birmingham*.

Class II.—(In alphabetical order.)  
 T. W. Beazeley, *Leicester*.  
 E. A. Warmington, *Dudley*.

*Examined on two terms' work only.*

Class I.—  
 A. J. Wheatley, *Birmingham*.

\* Also Students of Queen's College.

## SENIOR.

Class I.—

T. J. Baker, *Birmingham* (Prize).*Examined in Sessional Paper only.*

Class I.—

G. F. Daniell, *Birmingham*.

## LABORATORY.

Class I.—(In alphabetical order.)

G. T. Aston, *Old Hill*.T. J. Baker, *Birmingham*.G. F. Daniell, *Birmingham*.

Class II.—(In alphabetical order.)

J. F. Liverseege, *Birmingham*.E. A. Warmington, *Dudley*.

## CHEMISTRY.

ELEMENTARY COURSE (Winter and Spring).

Class II.—

Catherine Evans, *Leicester*.

ELEMENTARY COURSE (Summer).

Class I.—(In order of merit.)

Catherine Evans, *Leicester*.Edith A. Clarkson, *Birmingham*.

Class II.—(In order of merit.)

H. T. Butcher, *Birmingham*.W. F. Blewitt, *Brewood*.

GENERAL COURSE (October to March).

Class I.—(In order of merit.)

R. M. Smyth, *Wolverhampton*.J. Morrison, *Birmingham*.J. J. Sudborough, *Birmingham*. } Equal.A. E. Jackson, *Birmingham*. } Equal.T. M. Rae, *Birmingham*.

Class II.—(In order of merit.)

T. W. Beazeley, *Leicester*.J. Barclay, *Birmingham*.T. H. Hill, *Birmingham*.E. Ballard, *Malvern*.N. Chamberlain, *Birmingham*. } (One term only.)

*ORGANIC CHEMISTRY.**Class I.*—S. Nicklin, *Tipton*.*Class II.*—(In order of merit.)E. A. Warmington, *Dudley*.H. Mason, *Leamington*.*PRACTICAL CHEMISTRY.*

## I. QUALITATIVE ANALYSIS.

*Class I.*—(In order of merit.)T. J. Baker, *Birmingham*.E. Ballard, *Malvern*.A. R. Gower, *Birmingham*.E. A. Warmington, *Dudley*.C. R. Beck, *Burton-on-Trent*.A. J. Hutchinson, *Wolverhampton*.

} Equal.

*Class II.*—(In order of merit.)C. Marston, *Wolverhampton*.H. T. Butcher, *Birmingham*.E. Heathfield, *Redditch*.R. M. Smyth, *Wolverhampton*.J. Morrison, *Birmingham*.F. J. Blatch, *Birmingham*.N. Chamberlain, *Birmingham*.W. J. Harrison, Jun., *Birmingham*.W. G. Orme, *Wolverhampton*.

} Equal.

} Equal.

## II. QUANTITATIVE ANALYSIS.

*Class I.*—(In order of merit.)T. J. Baker, *Birmingham*.J. F. Liverseege, *Birmingham*.A. R. Gower, *Birmingham*.E. Ballard, *Malvern*.E. A. Warmington, *Dudley*.

} Equal.

} Equal.

## EXAMINATION FOR PRIZES.

*Senior First Prize* .....T. J. Baker, *Birmingham*.*Extra (Second) Prizes*... { E. Ballard, *Malvern*.  
A. R. Gower, *Birmingham*.*Junior Prize* .....C. R. Beck, *Burton-on-Trent*.

## ZOOLOGY.

## ELEMENTARY.

Class I.—(In order of merit.)

J. Morrison, *Birmingham* (Prize).  
 J. J. Sudborough, *Birmingham*.  
 R. M. Smyth, *Wolverhampton*. } Equal.  
 A. W. Haines, *Birmingham*.

Class II.—(In alphabetical order.)

J. Barclay, *Birmingham*.  
 T. W. Beazeley, *Leicester*.  
 T. C. Cantrill, *Hagley*.  
 J. Nicholson, *Sheffield*.

## ADVANCED.

Class II.—

J. Morrison, *Birmingham*.

## BOTANY AND VEGETABLE PHYSIOLOGY.

## I. ADVANCED COURSE.

## (A.) Paper.

Class II.—

W. L. O. Ward, *Sutton Coldfield*.

## (B.) Laboratory.

Class I.—

W. L. O. Ward, *Sutton Coldfield*.

## II. MIDDLE COURSE (Paper and Laboratory).

Class I.—(In order of merit.)

J. Morrison, *Birmingham*.  
 A. W. Haines, *Birmingham*. } Prizes.  
 J. J. Sudborough, *Birmingham*.

Class II.—(In order of merit.)

R. M. Smyth, *Wolverhampton*.  
 T. W. Beazeley, *Leicester*.  
 T. C. Cantrill, *Hagley*. } Equal.  
 J. Nicholson, *Sheffield*. }  
 W. M. Cox, *Birmingham*.  
 J. Barclay, *Birmingham*.

## III. SYSTEMATIC BOTANY.

Class II.—

J. Morrison, *Birmingham*.

## IV. GENERAL MEDICAL COURSE.

Class II.—

E. A. N. Arber, *Birmingham*.

## SYSTEMATIC PHYSIOLOGY.

## ADVANCED.

Class I.—(In order of merit.)

\* S. H. Perry, *Birmingham*.

\* G. J. Dudley, *Dudley*.

\*† S. W. C. Warneford, *Birmingham*.

Class II.—

\* H. B. Rowbotham, *Foleshill*.

## ELEMENTARY.

Class I.—

\* C. A. Greene, *Birmingham*.

\*† T. M. Tibbetts, *Cradley Heath*. } Equal.

Class II.—(In order of merit.)

\* L. P. Gamgee, *Birmingham*. } Equal.

G. B. Robinson, *Halesowen*.

\* J. T. West, *Coventry*.

\* A. W. McMichael, *Dudley*.

\* J. E. Godson, *Bridgwater*.

## PRACTICAL PHYSIOLOGY.

## ADVANCED.

Class I.—

\* A. J. Greene, *Birmingham*.

## ELEMENTARY.

Class I.—(In order of merit.)

\* A. W. McMichael, *Dudley*.

\* S. H. Perry, *Birmingham*.

\* L. P. Gamgee, *Birmingham*.

Class II.—

\* T. M. Tibbetts, *Cradley Heath*.

## GEOLOGY.

## ELEMENTARY.

Class I.—(In order of merit.)

Rachel Price, *Birmingham* (Prize).

Mary E. Wilkins, *Birmingham*.

Alice I. Avery, *Birmingham*.

Margaret Allan, *Old Hill*.

\* Also Students of Queen's College.

† These Students presented themselves at the *terminal* examination only.



*Class II.*—(In order of merit.)

Jessie A. Pearson, *Birmingham*.  
 Agnes M. E. Illingworth, *Old Hill*.  
 Annie Goodman, *Birmingham*.  
 Emmie E. Gough, *Birmingham*.  
 H. T. Butcher, *Birmingham*.

## ADVANCED.

*Class I.*—(In order of merit.)

J. Landon, *Birmingham*. (One term only.)  
 Marianne Mathews, *Birmingham*.  
 W. Gibbins, *Birmingham*.

*Class II.*—(In order of merit.)

Hilda Browett, *Birmingham*.  
 Agnes Smithson, *Birmingham*.

## JUNIOR.

*Class I.*—(In order of merit.)

W. M. Langford, *Gloucester* (Prize).  
 H. Fowler, *Evesham*.

*Class II.*—(In order of merit.)

E. M. Barnby, *Birmingham*.  
 A. G. New, *Evesham*.

## MIDDLE.

*Class I.*—

C. J. Dalby, *Banbury*.

*Class II.*—

T. James, *Birmingham*.

## JUNIOR PHYSIOGRAPHY.

*Class I.*—(In order of merit.)

Sarah C. Lloyd, *Stourport* (Prize).  
 C. J. Dalby, *Banbury*.  
 Ada Fallows, *Birmingham*.

*Class II.*—

Alice M. Lloyd, *Wednesbury*.

## COAL-MINING.

*Class I.*—

G. H. Broome, *Hednesford*.

## ENGINEERING.

## JUNIOR CLASS.

## LECTURES.

*Class I.*—(In order of merit.)

J. J. Podesta, *Birmingham*.  
 A. E. Jackson, *Birmingham*.  
 W. M. Langford, *Gloucester*. (Exam. only).

*Class II.*—(In order of merit.)

A. J. Mayne, *Birmingham*.  
 H. Dickinson, *Wolverhampton*.  
 C. Stockton, *Banbury*.  
 G. D. Lazzaridis, *Salonika*. (Exam. only).

## DRAWING.

*Class I.*—(In order of merit.)

A. E. Jackson, *Birmingham*.  
 A. J. Mayne, *Birmingham*.  
 W. G. Manly, *Birmingham*.  
 N. Chamberlain, *Birmingham*.  
 W. L. Bullsow, *Walsall*. } Equal.

*Class II.*—(In order of merit.)

H. B. James, *Redditch*.  
 H. Dickinson, *Wolverhampton*.  
 C. Stockton, *Banbury*.  
 J. J. Podesta, *Birmingham*. } Equal.  
 S. H. Hawley, *Sutton Coldfield*.  
 D. P. Wright, *Birmingham*.  
 J. H. G. Clarke, *Kenilworth*.  
 W. F. Diggory, *Wolverhampton*.  
 J. H. Green, *Stourbridge*.  
 E. W. E. T. Wright, *Dudley*. } Equal.  
 J. G. Walker, *Dudley*.  
 K. Homfray, *Halesoven*.  
 G. H. Baker, *Birmingham*. } Equal.

## PRACTICAL CLASS.

*Class I.*—

H. Dickinson, *Wolverhampton*.

*Class II.*—(In order of merit.)

J. J. Podesta, *Birmingham*.  
 A. J. Mayne, *Birmingham*.  
 D. P. Wright, *Birmingham*.  
 C. Stockton, *Banbury*.  
 J. G. Walker, *Dudley*.

## MIDDLE CLASS.

## LECTURES.

*Class I.*—(In order of merit.)

W. M. Langford, *Gloucester*.  
 E. M. Barnby, *Birmingham*.  
 H. Fowler, *Evesham*.

## DRAWING.

*Class I.*—(In order of merit.)

W. M. Langford, *Gloucester*. } Equal.  
 E. M. Barnby, *Birmingham*. }  
 G. D. Lazzaridis, *Salonika*.  
 H. Fowler, *Evesham*.

*Class II.*—

A. G. New, *Evesham*.

## LABORATORY.

*Class I.*—

W. M. Langford, *Gloucester*.

*Class II.*—(In order of merit.)

H. Fowler, *Evesham*.  
 A. G. New, *Evesham*.

## SENIOR CLASS.

*Class I.*—

A. J. Wheatley, *Birmingham*.  
 G. C. O. Wood, *Darlaston*.

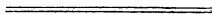
*Prize in Junior Class*:—A. E. Jackson, *Birmingham*.

*Prizes in Senior Class*: { A. J. Wheatley, *Birmingham*.  
                                   { G. C. O. Wood, *Darlaston*.

Recommended by Professor { A. J. Wheatley, *Birmingham*.  
 for *Junior Diploma*: { W. M. Langford, *Gloucester*.  
                                   { H. Fowler, *Evesham*.

Recommended by Professor { A. J. Wheatley, *Birmingham*.  
 for *Senior Diploma*: { G. C. O. Wood, *Darlaston*.

Recommended by Professor { W. M. Langford, *Gloucester*.  
 for *Tangye Scholarship*: }



## UNIVERSITY OF LONDON.

LIST OF STUDENTS WHO HAVE PASSED EXAMINATIONS OF THE  
UNIVERSITY.

---

D.Sc.

1886. Riley, John Thomas.

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B.Sc.

1881. Barratt, John Oglethorpe Wakelin.

1882. Barrodale, Samuel.

1885. Chambers, Jesse Mary.

1886. Ehrhardt, Ernest Francis.

1882. Riley, John Thomas.

1886. Roberts, Thomas Vaughan.

1886. Snell, Ernest Hugh.

1882. Williams, Walter Collingwood.

---

B.A.

1883. Harris, Harry.

1882. Lean, Charles Albert.

1884. Pope, Launcelot John.

---

INTERMEDIATE MEDICINE.

1887. \*Barber, George Thomas Congreve.

1883. \*Barratt, John Oglethorpe Wakelin.

1883. \*Barwise, Sidney.

1887. \*Clayton, John Hazelwood.

1884. \*Featherstone, William Barltrop.

1886. \*Freer, Gerald Dudley.

1882. \*Joberns, William.

1884. \*Jordan, Walter Ross.

1887. \*Kingsland, Alfred.

1887. \*Mason, Harold.

1883. \*Melson, George Hyde.

1887. \*Nicklin, Samuel.

1882. \*Purslow, Charles Edwin.

1885. \*Sadler, Ernest Alfred.

1882. \*Shillito, Henry.

1885. \*Snell, Ernest Hugh.

1882. \*Vince, John Foster.

---

\* Also Students of Queen's College.

## PRELIMINARY SCIENTIFIC (M.B.).

1883. Baine, Laurence Augustus.  
1885. \*Barber, George Thomas Congreve.  
1887. Barclay, John.  
1881. Barwise, Sidney.  
1887. Beazeley, Tom William.  
1883. Blake, James Edward Huxley.  
1884. Clayton, John Hazelwood.  
1887. Cooper, Arthur James.  
1887. Cox, Walter Mundy.  
1881. Ehrhardt, Julius Martin.  
1882. Evans, Isabel Clare.  
1882. Featherstone, William Barltrop.  
1884. Freer, Gerald Dudley.  
1886. Harris, Frank Drew.  
1886. \*Hill, George Leonard.  
1884. Irvine, Arthur Gerard.  
1887. Jerome, George Percy.  
1883. Johnston, Charles St.  
1884. Johnston, George St.  
1883. Jordan, Walter Ross.  
1884. Kingsland, Alfred.  
1884. Mason, Harold.  
1887. Morrison, James.  
1886. \*Neal, James.  
1885. \*Nicklin, Samuel.  
1886. Perry, Sidney Herbert.  
1881. Purslow, Charles Edwin.  
1886. Richards, Richard Walter.  
1887. \*Rowbotham, Herbert Barnwell.  
1883. Royce, Mary.  
1883. Sadler, Ernest Alfred.  
1885. Sheppard, Amy.  
1883. Smyth, Nugent Edward.  
1887. Smyth, Reginald Mander.  
1883. Snell, Ernest Hugh.  
1887. \*Sproat, James Hugh.  
1886. Staley, Mildred Ernestine Kaholomoana.  
1882. Stokes, Frederick William.  
1885. Sturge, Mary Darby.  
1887. \*Tibbetts, Thomas Major.

---

\* Also Students of Queen's College.

PRELIMINARY SCIENTIFIC (M.B.)—(*Continued*).

1887. Vincent, Thomas Swale.  
1887. Ward, Charles Frederick Myers.
- 

## INTERMEDIATE SCIENCE.

1887. Andrews, Samuel, B.A.  
1886. Baker, Thomas James.  
1887. Blatch, Francis Joseph.  
1887. Chapman, Joshua Harrison.  
1885. Charles, Jessie.  
1887. Chattaway, Frederick Daniel.  
1884. Ehrhardt, Ernest Francis.  
1883. Evans, Isabel Clare.  
1883. Groom, Percy.  
1881. Heys, Rowland George, B.A.  
1884. Kellett, Alfred Featherstone.  
1881. Riley, John Thomas.  
1884. Snell, Ernest Hugh.  
1887. Stansbie, John Henry.  
1885. Stern, Arthur Landauer.  
1887. Sudborough, John Joseph.  
1886. Ward, William Latimer Oakden.  
1881. Williams, Walter Collingwood.
- 

## INTERMEDIATE ARTS.

1887. Ainsworth, William Brown.  
1881. Bellasis, Henry Lewis.  
1887. Edwards, Jessie.  
1886. Exell, William Wallis.  
1882. Harris, Harry.  
1882. Kenny, Thomas Meikle.  
1887. Lake, Amy Lucy.  
1886. Lay, Charles Johnson.  
1886. Ledsam, Henry Thomas Clutton Salt.  
1887. MacSwiney, Felix.  
1887. Maycock, Bernard Joseph.  
1887. McLeish, William James.  
1883. Penn, William Charles.  
1883. Pope, Launcelot John.  
1887. Reynolds, Albert Heywood.  
1883. Tunstall, Charles Onions.
-

## MATRICULATION.

1887. Aston, George Thomas.  
1884. Barclay, John.  
1882. Barrodale, Thomas Henry.  
1883. Beale, Mary Evelyn.  
1887. Belloc, Joseph Hilaire Pierre.  
1887. Bettney, Elizabeth.  
1881. Blake, James Edward Huxley.  
1885. Blatch, Francis Joseph.  
1887. Buller, Ethel Mary.  
1886. Cantrill, Thomas Crosbee.  
1883. Charles, Jessie.  
1884. Chattaway, Frederick Daniel.  
1883. Clarke, Mary Beatrice.  
1887. Cohen, Jessie Elizabeth.  
1884. Cooper, Arthur James.  
1887. Cotterill, John William.  
1887. Crump, Ernest Henry.  
1887. Deane, Katharine Mary.  
1885. Edwards, Jessie.  
1884. Evans, William Arthur.  
1884. Forbes, Henry Thomas Smith.  
1883. Gibson, Walcot.  
1887. Harris, Frederic John.  
1887. Hill, William Alfred Rowland.  
1887. Hill, Thomas Henry.  
1886. Hope, John Arthur.  
1883. Johnston, George St.  
1882. Jordan, Edith Hannah.  
1886. Larner, Charles Proctor.  
1885. Ledsam, Henry Thomas Clutton Salt.  
1886. MacSwiney, Felix.  
1886. Martin, Arthur James.  
1886. Mason, Howard Ernest.  
1885. Maycock, Bernard Joseph.  
1885. McCardie, William Joseph.  
1883. McCroben, Francis Hesselgrave.  
1886. Moore, Julia Isabel.  
1886. Nicholson, John.  
1886. Perry, Hannah.  
1883. Pridmore, Eric Norman.  
1887. Ritchie, Henry Edward.

MATRICULATION—(*continued*).

- 1881. Sadler, Ernest Alfred.
  - 1886. Smyth, Reginald Mander.
  - 1884. Staley, Mildred Ernestine Kaholomoana.
  - 1885. Stephens, Helena Sophia.
  - 1887. Stewart, Katharine Alexandra.
  - 1882. Stokes, Frederick William.
  - 1882. Sturge, Wilson Henry.
  - 1882. Sturge, Mary Darby.
  - 1885. Sunderland, Oswald.
  - 1884. Thomas, Oswald Wynne.
  - 1885. Ward, Charles Frederick Myers.
  - 1884. Wilson, Alfred.
- 

SPECIAL DISTINCTIONS GAINED BY STUDENTS OF  
THE MASON SCIENCE COLLEGE, AT THE  
UNIVERSITY OF LONDON.

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## I. SCHOLARSHIPS.

## AT B.Sc. DEGREE.

- 1881. Barratt, John Oglethorpe Wakelin, *Chemistry*.
- 

## II. HONOURS.

## AT B.Sc. DEGREE.

- 1881. Barratt, John Oglethorpe Wakelin, *Chemistry*.
- 1886. Chambers, Jesse Mary, *Experimental Physics*.
- 1882. Riley, John Thomas, *Experimental Physics*.
- 1886. Roberts, Thomas Vaughan, *Chemistry*.
- 1882. Williams, Walter Collingwood, *Chemistry and  
Experimental Physics*.



II. HONOURS—(*continued*).

## AT INTERMEDIATE SCIENCE AND PRELIMINARY SCIENTIFIC (M.B.).

- 1887. Andrews, Samuel, B.A., *Experimental Physics*.
- 1886. Baker, Thomas James, *Chemistry*.
- 1883. Blake, James Edward Huxley, *Botany*.
- 1884. Clayton, John Hazelwood, *Chemistry*.
- 1885. Charles, Jessie, *Chemistry and Botany*.
- 1887. Chattaway, Frederick Daniel, *Chemistry*.
- 1887. Cooper, Arthur James, *Chemistry*.
- 1884. Ehrhardt, Ernest Francis, *Chemistry*.
- 1882. Evans, Isabel Clare, *Botany*.
- 1884. Mason, Harold, *Chemistry*.
- 1887. Morrison, James, *Botany and Zoology*.
- 1887. Stansbie, John Henry, *Chemistry*.
- 1885. Stern, Arthur Landauer, *Chemistry*.
- 1887. Ward, Charles Frederick Myers, *Chemistry and Zoology*.
- 1881. Williams, Walter Collingwood, *Chemistry and  
Experimental Physics*.

## AT INTERMEDIATE ARTS.

- 1887. Edwards, Jessie, *English*.
- 1886. Exell, William Wallis, *French*.
- 1882. Harris, Harry, *English and French*.
- 1886. Lay, Charles Johnson, *French*.
- 1887. MacSwiney, Felix, *French*.
- 1883. Penn, William Charles, *English*.

## AT MATRICULATION.

- 1887. Aston, George Thomas.
- 1887. Belloc, Joseph Hilaire Pierre.
- 1886. Cantrill, Thomas Crosbee.
- 1883. Charles, Jessie.
- 1887. Deane, Katharine Mary.
- 1886. Moore, Julia Isabel.

---

**WHITWORTH SCHOLARSHIP.**

- 1886. Padmore, Edward Stanhope.
-

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| THE COUNCIL OF OWENS' COLLEGE.....                                                                             | 1     |
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| THE COUNCIL OF THE ROYAL HISTORICAL SOCIETY .....                                                              | 2     |
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| THE COUNCIL OF THE ASSOCIATION FOR THE IMPROVEMENT<br>OF GEOMETRICAL TEACHING.....                             | 1     |
| THE COUNCIL OF THE CHESTERFIELD AND DERBYSHIRE<br>INSTITUTE OF MINING, CIVIL AND MECHANICAL<br>ENGINEERS ..... | 1     |

|                                                                            | VOLS.  |
|----------------------------------------------------------------------------|--------|
| THE COUNCIL OF THE JOHNS HOPKINS UNIVERSITY,<br>(U.S.A.).....              | 2      |
| THE COUNCIL OF THE DAVENPORT ACADEMY OF NATURAL<br>SCIENCES (U.S.A.) ..... | 1      |
| THE EDITOR OF "IRON" .....                                                 | 2      |
| THE EDITOR OF "THE ENGINEER" .....                                         | 2      |
| THE EDITOR OF "THE JOURNAL OF EDUCATION".....                              | 2      |
| THE EDITOR OF "THE ANALYST" .....                                          | 1      |
| THE EDITORS OF "ENGINEERING".....                                          | 2      |
| THE PROPRIETORS OF THE "COLLIERY GUARDIAN" .....                           | 2      |
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| MESSRS. THE NEW BRITISH IRON COMPANY, LIMITED.....                         | 1      |
| MESSRS. J. VEITCH AND SONS.....                                            | 1      |
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| MESSRS. W. SWAN SONNENSCHNEIN AND COMPANY.....                             | 2      |
| MESSRS. CORNISH BROTHERS .....                                             | 2      |
| VARIOUS DONORS (PAMPHLETS) .....                                           | 1      |
| Total.....                                                                 | 290    |
| Total number of Volumes in the Library, July 12th, 1886...                 | 17,725 |
| Purchased since .....                                                      | 195    |
| Total number of Volumes in the Library, July 12th, 1887...                 | 18,210 |

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**REPORT OF THE COUNCIL TO THE TRUSTEES,**

FOR THE YEAR ENDED "FOUNDER'S DAY,"

23RD FEBRUARY, 1887.

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**GOVERNING BODY.**

No changes have occurred in the Governing Body Governing Body.  
during the past year.

**A.—Trustees appointed by Sir Josiah Mason, and  
Co-Optative Trustees.**

1. JAMES GIBBS BLAKE, Esq., M.D.
2. JOHN THACKRAY BUNCE, Esq., J.P.
3. GEORGE JAMES JOHNSON, Esq., J.P.
4. WILLIAM MATHEWS, Esq., M.A.
5. OLIVER PEMBERTON, Esq., F.R.C.S.
6. ROBERT LAWSON TAIT, Esq., F.R.C.S.

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**B.—Official Trustees elected by the Town Council.**

1. THOMAS AVERY, Esq., J.P. (Alderman).
2. THE RIGHT HON. JOSEPH CHAMBERLAIN, M.P.
3. RICHARD CHAMBERLAIN, Esq., M.P.
4. GEORGE DIXON, Esq., M.P.
5. ROBERT FRANCIS MARTINEAU, Esq. (Councillor).

The following were the OFFICERS AND COMMITTEES for the year :—

Officers and  
Committees.

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**BAILIFF, JOHN THACKRAY BUNCE, Esq.**

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**HOUSE, EDUCATION, AND DISCIPLINE  
COMMITTEE.**

---

JOHN THACKRAY BUNCE, Esq. (Chairman).

JAMES GIBBS BLAKE, Esq., M.D.

GEORGE JAMES JOHNSON, Esq.

WILLIAM MATHEWS, Esq., M.A.

ROBERT LAWSON TAIT, Esq., F.R.C.S.

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**FINANCE AND GENERAL PURPOSES  
COMMITTEE.**

---

GEORGE JAMES JOHNSON, Esq. (Chairman).

THOMAS AVERY, Esq.

JOHN THACKRAY BUNCE, Esq.

ROBERT FRANCIS MARTINEAU, Esq.

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**LIBRARY COMMITTEE.**

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JAMES GIBBS BLAKE, Esq., M.D. (Chairman).

JOHN THACKRAY BUNCE, Esq.

OLIVER PEMBERTON, Esq., F.R.C.S.



Thirty meetings of the Trustees and Council and Committees of Council have been held during the year, the attendance at which has been as follows :—

Attendances at  
Meetings

| NAME.                              | Summoned to Meetings. | Attended. |
|------------------------------------|-----------------------|-----------|
| MR. ALDERMAN AVERY ... ..          | 15                    | 13        |
| DR. JAMES GIBBS BLAKE.....         | 29                    | 28        |
| JOHN THACKRAY BUNCE, ESQ. ....     | 30                    | 26        |
| RT. HON. J. CHAMBERLAIN, M.P.....  | 1                     | —         |
| RICHARD CHAMBERLAIN, ESQ., M.P.... | 14                    | 2         |
| GEORGE DIXON, ESQ., M.P. ....      | 1                     | —         |
| MR. ALDERMAN JOHNSON.....          | 26                    | 19        |
| MR. COUNCILLOR MARTINEAU.....      | 15                    | 12        |
| WILLIAM MATHEWS, ESQ. ....         | 25                    | 19        |
| OLIVER PEMBERTON, ESQ. ....        | 18                    | 11        |
| ROBERT LAWSON TAIT, ESQ. ....      | 25                    | 11        |

### TEACHING STAFF.

The Teaching Staff at the commencement of the current or Spring Term was as follows :—

Teaching Staff

#### PROFESSORS :

W. A. TILDEN, ESQ., D.Sc., F.R.S.  
*Chairman of the Academic Board.*  
 EDWARD ARBER, ESQ., F.S.A.  
 W. E. BENTON, ESQ., Assoc.R.S.M., F.G.S.  
 T. W. BRIDGE, ESQ., M.A.  
 KARL DAMMANN, ESQ., PH.D.  
 J. B. HAYCRAFT, ESQ., M.B., B.Sc., F.R.S.(Edin.)  
 R. S. HEATH, ESQ., M.A., D.Sc.  
 W. HILLHOUSE, ESQ., M.A., F.L.S.  
 C. LAPWORTH, ESQ., LL.D., F.G.S.  
 Mons. E. LOREILLE, B. ès-L.  
 J. H. POYNTING, ESQ., M.A.  
 R. H. SMITH, ESQ., M.I.M.E., Assoc.M.I.C.E.  
 E. A. SONNENSCHN, ESQ., M.A.

#### LECTURERS :

W. W. J. NICOL, ESQ., M.A., D.Sc.  
 T. TURNER, ESQ., Assoc.R.S.M., F.C.S.

*DEMONSTRATORS:*J. HAMILTON, Esq., *Whitworth Scholar.*

E. F. J. LOVE, Esq., B.A.

R. T. WILLIAMSON, Esq., M.B.,

Attendance of  
Students.

We append statistical tables showing the attendance of students in the day and evening classes, with the corresponding figures for the two previous sessions. It will be seen that the number of *individual* students again shows a small increase, 529 as against 523 in 1884-85. The attendance during the current session is also encouraging, and we hope to be in a position to announce in our next report that the number has again been increased.

Report by the  
Chairman of the  
Academic Board.

We also append the annual review by the Chairman of the Academic Board (Professor Tilden, F.R.S.) of the work of the College on its academic side during the past twelve months.

Changes in  
Teaching Staff.

Mr. E. Teichelmann, Demonstrator in Physiology, having resigned his appointment, we elected Dr. R. T. Williamson to fill the vacancy. Upon the recommendation of Professor Poynting, we have appointed Mr. R. H. Housman (an Associate of the College) Junior Demonstrator in the Physics Department. We have also appointed Mr. C. H. New (a Student-teacher assisted by the Science and Art Department) Junior Demonstrator in the Chemical Department.

Re-appointment  
of Professors, &c

In accordance with the terms upon which Professor Benton was appointed, we have taken into consideration the propriety of renewing his engagement, and have had much pleasure in re-appointing him for a further term of three years. We have also re-appointed Mr. Thomas Turner Lecturer in Metallurgy, and Mr. E. F. J. Love Demonstrator of Physics.

Metallurgical  
Department.

We have approved of a scheme prepared by Professor Tilden for the extension of the Metallurgical Department,

including the appointment of Mr. Thomas Turner, Demonstrator in Chemistry, as Lecturer on Metallurgy and Instructor in Assaying.

The free popular Monday Evening Lectures to artizans Free Lectures to Artizans. have been continued by the teaching staff during the winter. It has been found necessary to re-deliver each Lecture in order to accommodate the number of applicants for tickets.

The Birmingham Natural History and Microscopical Society continues to occupy rooms in the College. During the year we have granted the use of the Lecture Theatres and class-rooms on several occasions for meetings of Societies, including the Birmingham Section of the Society of Chemical Industry, the University Examinations Society, and the Birmingham Branch of the Goethe Society. Use of College Buildings by Societies, &c.

In connection with the Meeting of the British Association for the Advancement of Science, held in Birmingham in September last, the College buildings were very extensively used, accomodation being provided for the meetings of three Sections. Several members of the Professorial staff took an active part in the proceedings of the meeting, Professor Tilden, F.R.S. (the Chairman of the Academic Board), being one of the Vice-Presidents. British Association Meeting in Birmingham.

The Overseers of the Poor having delivered demand notes for the Poor Rate and Improvement Rate, showing an increase in the rateable value from £1,000 to £2,040, we instructed the solicitors to give notice of appeal pending an interview with the Overseers. The President subsequently attended with the solicitors before the Overseers and discussed the matter, when the rateable value was reduced to £1,700. The increase of the assessment adds about £200 per annum to the expenditure.

Rating Assessment.

Appended to this report are the Balance-sheet and Income and Expenditure Accounts for the financial year

Statement of Accounts.

which ended on the 30th September last, certified by the Auditors (Messrs. Laundry and Co.). It will be seen that the income fell short of the expenditure by the sum of £1,646 9s. 11d. After deducting the following items, or what may be termed extraordinary expenditure, viz. : books and binding, general apparatus, furniture, and alteration of buildings, &c., there remains a deficiency between general income and general expenditure amounting to the sum of £1,074 13s. We desire to remind the Trustees that the annual deficits, which since 1881 have been charged against the "Accumulated Surplus," have now reduced this fund to the sum of £1,419 5s. 11d., and that the estimates for the current financial year anticipate that the balance of the fund will be required. We are strongly of opinion that endeavours should be made to increase the income of the College by the establishment of annual subscriptions, or otherwise, with a view to provide an annual sum at least sufficient to balance the income account. It is absolutely necessary that these recurring deficiencies shall be avoided, and further, that the Council shall be in a position to keep the instruction up to a high level by liberal grants for additional apparatus, and for the more complete equipment of the various museums, and by increasing the annual value of some of the Professorial appointments and adding to the staff of qualified Assistants. With the exception of the donations to the Additional Endowment Fund, the income from which is absorbed for scholarships, the noble endowment provided by Sir Josiah Mason has not yet been added to. Handsome donations have quite recently been given to the University Colleges of Liverpool, Dundee, and other towns; and we earnestly hope that before long our accounts may testify that the citizens of Birmingham and the district are unwilling that the opportunities for higher education brought to their doors by the munificence of

the Founder shall be in any way interfered with by the want of sufficient funds. The endowment of Chairs, Scholarships, or the Library, would be especially appropriate during the year 1887.

We have accepted a surrender of the lease to Mr. G. D. Clarke, of No. 21, Easy Row.

Estate

### LIBRARY.

During the past year we have granted special permission to twenty-three gentlemen to use the Library for the purposes of study and reference.

Library

The following statement shows the additions which have been made since our last Report:—

|                                        |             |
|----------------------------------------|-------------|
| Total number of volumes in the Library |             |
| on the 23rd of February, 1886 ...      | 17,554      |
| Presented during the year ...          | 246         |
| Purchased ... ..                       | 154         |
|                                        | <hr/>       |
| Total number of volumes in the Library |             |
| on the 23rd of February, 1887 ...      | 17,954      |
|                                        | <hr/> <hr/> |

We are indebted to an anonymous donor for the handsome contribution of £100, to be applied in continuing the very valuable collection of serials, the cost of which was borne, during his lifetime, by the late Dr. Heslop.

### GEOLOGICAL MUSEUM.

Since our last Report twenty-seven specimens of Minerals and Fossils have been bequeathed to the Museum by Mrs. Henson; and the Committee of the Birmingham Stock Exchange have presented six specimens of Gold Quartz from the De Kaap Gold Fields of South Africa.

Geological  
Museum

|                                  |             |
|----------------------------------|-------------|
| Total number of specimens in the |             |
| Museum on 23rd February, 1886    | 19,115      |
| Presented during the year ... .. | 33          |
|                                  | <hr/>       |
|                                  | 19,148      |
|                                  | <hr/> <hr/> |

**EXHIBITIONS AND SCHOLARSHIPS.**

Exhibitions and  
Scholarships.

Mr. CHARLES JOHNSON LAY has gained an open Scholarship at St. Catherine's College, Cambridge.

Miss ELIZABETH BETTNEY, Miss JULIA ISABEL MOORE, and Mr. FREDERICK DANIEL CHATTAWAY, have gained Scholarships at University College, Aberystwith.

Three Exhibitions of the value of £30 each, tenable for three years, awarded by the Governors of King Edward's School, Birmingham, are held by

JAMES MORRISON (High School).

JOHN JOSEPH SUDBOROUGH (Camp Hill School).

WALTER HENRY BAYLIS (Five Ways School).

An additional Exhibition of the value of £50, tenable for four years, is held by ELLEN MARY LLOYD (High School).

Mr. GEORGE T. ASTON, Mr. WILLIAM F. BLAY, Mrs. E. L. TURNER, Mr. A. R. GOWER, Mr. W. J. HARRISON, jun., Mr. JOSEPH HOUGH, and Mr. J. H. STANSBIE (Science Teachers) were selected by the Science and Art Department to attend in the Laboratories on two days a week during the present session, the Department paying three-fourths of the fees.

Upon the recommendation of the Academic Board, the Council awarded the following Scholarships, tenable during the current Session:—

An Entrance Scholarship of £25, to WALTER HENRY BAYLIS.

An Entrance Scholarship of £25, to ERNEST HENRY CRUMP.

A First-year Scholarship of £30, to WILLIAM LATIMER OAKDEN WARD.

A Second-year Scholarship of £30, to ARTHUR LANDAUER STERN.

A Second-year Scholarship of £30, to WILLIAM WALLIS EXELL.

A Tangye Scholarship in Engineering of £30, to GEORGE CROFT ORWIN WOOD.

A Tangye Scholarship in Chemistry of £30, to THOMAS JAMES BAKER.

## DEGREES AND EXAMINATIONS FOR DEGREES. UNIVERSITY OF LONDON.

THOMAS VAUGHAN ROBERTS passed the B.Sc. Examination, obtaining third class honours in Chemistry. ERNEST FRANCIS EHRHARDT and ERNEST HUGH SNELL also passed the B.Sc. Examination, the former in the first division, and the latter in the second division.

Examinations.  
University of  
London.

THOMAS JAMES BAKER and WILLIAM LATIMER OAKDEN WARD passed the Intermediate Examination in Science. At the Examination for honours Mr. BAKER was placed in the second class in Inorganic Chemistry.

GERALD DUDLEY FREER passed the Intermediate Examination in Medicine in the second division.

FRANK DREW HARRIS and SIDNEY HERBERT PERRY passed the Preliminary Scientific (M.B.) Examination (July, 1886) in the first division. GEORGE LEONARD HILL, JAMES NEAL, MILDRED ERNESTINE KAHOLOMOANA STALEY, and RICHARD WALTER RICHARDS, who had previously passed in one or two subjects, completed the Examination. At the Examination in January, 1887, HERBERT BARNWELL ROWBOTHAM, THOMAS MAJOR TIBBETTS, and THOMAS SWALE VINCENT, who had previously passed in two subjects of the Examination, passed in the remaining subject.

WILLIAM WALLIS EXELL, CHARLES JOHNSON LAY, and HENRY THOMAS CLUTTON SALT LEDSAM passed the Intermediate Examination in Arts, the two former

obtaining third class honours in French, and Mr. LEDSAM being placed in the second division.

JULIA ISABEL MOORE and THOMAS CROSBEE CANTRILL passed the Matriculation Examination (June, 1886) in the honours division; JOHN ARTHUR HOPE and ARTHUR JAMES MARTIN in the first division; and JOHN NICHOLSON in the second division. At the Matriculation Examination in January, 1887, JOHN WILLIAM COTTERILL and WILLIAM ALFRED ROWLAND HILL passed in the first division.

Mr. JOHN THOMAS RILEY, formerly Demonstrator of Physics in the College, has passed the D.Sc. Examination (Br. VI.) of the University of London.

Professor J. H. POYNTING, M.A., and Professor C. LAPWORTH, LL.D., have been elected Examiners in Physics and Geology respectively in the Natural Sciences Tripos of the University of Cambridge.

The Council of the Geological Society of London have awarded the Bigsby Medal to Professor C. LAPWORTH, LL.D., and the Lyell Medal, together with a portion of the fund, to Mr. SAMUEL ALLPORT, F.G.S.

## ATTENDANCE OF STUDENTS.

SESSION 1885-86.

### DAY CLASSES.

Statistics of  
Attendance of  
Students.

The following statement shows the number of individual students who attended the Day Classes during the Sixth Session :—

|                | Students.  |     | Session 1884-85.<br>Students. |     | Session 1883-84.<br>Students. |
|----------------|------------|-----|-------------------------------|-----|-------------------------------|
| 1. Male .....  | 229        | ... | 233                           | ... | 226                           |
| 2. Female..... | 131        | ... | 119                           | ... | 120                           |
|                | <u>360</u> | ... | <u>352</u>                    | ... | <u>346</u>                    |



|                                   | Students. | Session 1884-85.<br>Students. | Session 1883-84.<br>Students. |
|-----------------------------------|-----------|-------------------------------|-------------------------------|
| During the Winter Term there were | 268       | 261                           | 265                           |
| During the Spring Term there were | 278       | 282                           | 260                           |
| During the Summer Term there were | 241       | 251                           | 209                           |

The attendance of Students in the various departments was as follows:—

|                      |     |     |     |
|----------------------|-----|-----|-----|
| Greek .....          | 19  | 30  | 22  |
| Latin .....          | 46  | 38  | 49  |
| English Language...  | 19  | 28  | 44  |
| English Literature.. | 20  | 9   | 15  |
| French .....         | 54  | 51  | 24  |
| German .....         | 32  | 40  | 30  |
| Mathematics...       | 52  | 60  | 54  |
| Physics.....         | 74  | 69  | 64  |
| Chemistry.....       | 113 | 122 | 115 |
| Metallurgy .....     | 2   | 9   | 5   |
| Zoology .....        | 26  | 32  | 35  |
| Botany .....         | 38  | 58  | 50  |
| Physiology .....     | 104 | 76  | 91  |
| Geology .....        | 44  | 41  | 20  |
| Mining.....          | 6   | 16  | 27  |
| Engineering .....    | 30  | 32  | 23  |
| Logic .....          | 17  | —   | —   |

#### *EVENING CLASSES.*

|                  |    |    |    |
|------------------|----|----|----|
| Greek .....      | 16 | —  | —  |
| Latin .....      | 36 | 6  | —  |
| English.....     | 26 | 41 | 27 |
| French .....     | 62 | 9  | 10 |
| German .....     | 21 | 7  | 9  |
| Mathematics..... | 13 | 11 | —  |
| Physics.....     | 25 | 11 | 17 |

|                   | Students. | Session 1884-85. | Students. | Session 1883-84. | Students. |
|-------------------|-----------|------------------|-----------|------------------|-----------|
| Chemistry .....   | 16        | ...              | 40        | ...              | 41        |
| Zoology .....     | 6         | ...              | 25        | ...              | 5         |
| Botany .....      | 4         | ...              | 15        | ...              | 12        |
| Physiology .....  | 5         | ...              | 20        | ...              | 14        |
| Geology .....     | 24        | ...              | 18        | ...              | 7         |
| Engineering ..... | 59        | ...              | 47        | ...              | 48        |

The number of individual students attending the Evening Classes was:—

|                |       |     |       |     |       |
|----------------|-------|-----|-------|-----|-------|
| 1. Male .....  | 164   | ... | 155   | ... | 131   |
| 2. Female..... | 41    | ... | 44    | ... | 36    |
|                | <hr/> |     | <hr/> |     | <hr/> |
|                | 205   | ... | 199   | ... | 167   |
|                | <hr/> |     | <hr/> |     | <hr/> |

NOTE.—As thirty-six Students attended some Day and some Evening Classes, the number of *individual* Students registered during the Session 1885-86, as attending Day or Evening Classes, was 529, as compared with 523 in 1884-85, and 496 in 1883-84.

### COLLEGE PRIZES.

College Prizes. Prizes, consisting of books, were awarded upon the results of examinations in the various departments as follows:—

|                      |                                                                                                                |
|----------------------|----------------------------------------------------------------------------------------------------------------|
| <i>Greek</i> .....   | EMILY WILMER CAVE FRANCE and<br>JANE ELIZABETH PEMBERTON.                                                      |
| <i>Latin</i> .....   | GERTRUDE HORSEY GEORGE, EMILY<br>WILMER CAVE FRANCE, EDITH<br>FURNEAUX JORDAN and JANE<br>ELIZABETH PEMBERTON. |
| <i>Logic</i> .....   | JESSIE CHARLES.                                                                                                |
| <i>English</i> ..... | EDITH ANNIE CLARKSON, JESSIE<br>EDWARDS, ALFRED JOHN WYATT,<br>WILLIAM WALLIS EXELL and MARY<br>EVELYN BEALE.  |
| <i>French</i> .....  | GRACE DORA McBEAN, CHARLES JOHNSON<br>LAY, RIEKA COHEN, ELIZABETH<br>BETTNEY and RACHEL COHEN.                 |

|                          |                                                                             |
|--------------------------|-----------------------------------------------------------------------------|
| <i>German</i> .....      | FREDERIC JOHN HARRIS, ANNIE LETITIA KERBY and ELIZABETH BETTNEY.            |
| <i>Mathematics</i> ..... | HENRY FOWLER, GEORGE CROFT ORWIN WOOD and ARTHUR LANDAUER STERN.            |
| <i>Physics</i> .....     | WILLIAM LATIMER OAKDEN WARD and GEORGE CROFT ORWIN WOOD.                    |
| <i>Chemistry</i> .....   | GEORGE HENRY HANCOCK, EDWARD AUGUSTUS WARMINGTON and ARTHUR LANDAUER STERN. |
| <i>Zoology</i> .....     | CONSTANCE CAROLINE WOODHILL NADEN.                                          |
| <i>Botany</i> .....      | JESSIE CHARLES and WILLIAM LATIMER OAKDEN WARD.                             |
| <i>Physiology</i> .....  | MARY DARBY STURGE.                                                          |
| <i>Geology</i> .....     | CHARLES JOHN DALBY, JOSEPH LONDON and MARIANNE MATHEWS.                     |
| <i>Engineering</i> ..... | HENRY FOWLER and GEORGE CROFT ORWIN WOOD.                                   |

Mr. GEORGE CROFT ORWIN WOOD was awarded the Junior Engineering Diploma.  
 “Junior Engineering Diploma.”

The Prize of Two Guineas presented by Mr. G. A. “Panton Prize.” Panton, F.R.S.E., to the best student in the Class of Local Geology, was divided between Miss MARIANNE MATHEWS and Mr. JOSEPH LONDON.

We are pleased to be able to announce that Mr. ALDERMAN AVERY has promised to contribute the sum of Ten Guineas annually for prizes, and that Mr. LAWSON TAIT has agreed to contribute Two Guineas annually for the same object.

#### DONORS TO THE CHEMICAL DEPARTMENT. Donors.

Messrs. W. AND T. AVERY (per Mr. Alderman AVERY).  
 Mr. G. H. HANCOCK.  
 Mr. ARTHUR CLIFFORD.  
 Mr. HENRY F. OSLER.  
 Mr. W. BLACKWELL.  
 Messrs. HENRY WIGGIN AND CO.  
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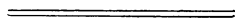
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J. THACKRAY BUNCE,

*President of the Council.*

GEO. H. MORLEY,

*Secretary and Registrar.*



EXTRACTS FROM THE  
REPORT  
BY THE  
CHAIRMAN OF THE ACADEMIC BOARD  
UPON THE  
SEVERAL DEPARTMENTS OF INSTRUCTION IN  
ARTS AND SCIENCE,

*For the Year ending 23rd February, 1887.*

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TO THE PRESIDENT OF THE COUNCIL.

Sir, I beg to submit the following Report of the work in the College during the past year, and in regard to the Day Classes I am glad to be in a position to state that in nearly all the departments a satisfactory standard of teaching and attainment has been maintained, and satisfactory progress made in respect to the number of students in attendance. The conduct of the students has throughout been excellent, and the energy and enthusiasm manifested in the business of the Union and the several other College societies which are managed by the students has been most praiseworthy.

The Free Evening Lectures to artisans continue to attract large audiences, and the provision of a Lecture-room of dimensions suitable to occasions of this kind is a subject which, I think, must engage the notice of the Council. At present every lecture has to be repeated, and the number of tickets distributed is much smaller than would be the case if sufficient space were provided.

The first business which fell to my lot upon entering on the office of Chairman of the Board on February 23rd last was a source of mingled pain and pleasure. I refer to the presentation, on behalf of the subscribers, of the marble bust of the late Dr. Heslop to the Trustees of the College. The promptitude with which a comparatively large sum of money was raised by the contributions chiefly of the students, past and present, is a strong testimony to the existence of a feeling of attachment to the College, and a lively sense of gratitude for the benefit conferred by such labours and such benefactions as those of Dr. Heslop. The proceeds of a legacy to the College, bequeathed by Dr. Heslop, having been assigned by the Council to the foundation of a Gold Medal, to be awarded annually, and the conditions proposed by the Academic Board having been approved, the first award will take place in June next.

The most important event of the past year was the Meeting of the British Association for the Advancement of Science, this occasion being the fourth on which the meeting has been held in Birmingham.

I was honoured by election to the position of a Vice-President of the Association, and the following Members of the Staff and Students also took part in the proceedings :—

|                     |     |                                                      |
|---------------------|-----|------------------------------------------------------|
| Professor POYNTING  | -   | Secretary of Section A.                              |
| Professor TILDEN    | - - | Vice-President of Section B.                         |
| Dr. W. W. J. NICOL  | -   | Secretary of Section B.                              |
| Professor LAPWORTH  | -   | Vice-President of Section C.                         |
| Professor BRIDGE    | - - | Secretary of Section D.                              |
| Professor HILLHOUSE | -   | Secretary of Section D.                              |
| Professor SMITH     | - - | Vice-President of Section G.                         |
| Mr. G. H. MORLEY    | -   | Joint Secretary to the Local<br>Executive Committee. |

Messrs. E. F. EHRHARDT and A. L. STERN, students, read papers in the Chemical Section, and Mr. P. GROOM, a past student, gave a Botanical Paper.

Since the date of the last report the following distinctions have been conferred upon Members of the Staff:—

The Order of the Rising Sun (Fourth Class) has been conferred by the Emperor of Japan upon Professor SMITH in consideration of his services as Professor of Engineering in the Imperial College.

The Geological Society of London has awarded to Professor LAPWORTH the Bigsby Gold Medal, and to Mr. ALLPORT, the Lyell Medal and a portion of the Grant, for their researches in geology and petrology.

Professors POYNTING and LAPWORTH have been appointed by the University of Cambridge, Examiners in Physics and Geology respectively, in the Natural Sciences Tripos.

On the 22nd December last the Annual Meeting of the Principals of Modern University Colleges, was by permission of the Council, held in the Board Room of the College. Representatives of King's College, London, and of the University Colleges of Bangor, Bristol, Leeds, Liverpool, Newcastle-on-Tyne, and Nottingham, and myself, representing the Mason College, were present.

I will now proceed to refer to some particulars concerning the several Departments.

### FACULTY OF ARTS.

*Greek and Latin.*—Two lady students, Miss Lewis and Miss France, have passed the First Examination for Women at Oxford. Together with Miss Pemberton



(who had passed the Cambridge Higher Examination, which is accepted at Oxford as a substitute for the First Examination) they are now studying for Honours at the Women's Second Examination which they propose to take in 1888. These ladies are believed to be the first from a provincial college to take advantage of the Statute of 1884, by which women are admitted to the same examinations as men without residence.

The Professor proposes to give next year a popular course on "Greek Literature, illustrated by Ancient Monuments and Works of Art."

*French.*—A considerable increase in the attendance has occurred, and the Department is in a flourishing condition.

*German.*—There is a fair attendance and some good work. The Professor invites attention to the Students' German Circulating Library, and would gladly receive assistance in its development.

### FACULTY OF SCIENCE.

In the Departments of *Mathematics* and *Physics* the Professors report favourably as to the work and conduct of their classes. Mr. R. H. Housman, a former student and an Associate of the College, has officiated as Honorary Assistant Demonstrator in the Physical Department.

In the *Chemical Department* the most notable change is the equipment of a small Metallurgical Laboratory apart from the Chemical Laboratory, and the appointment of Mr. Turner as Lecturer and Instructor in Assaying. Though the number of entries is at present very small there is reason to hope, from the very large audience assembled at the first of Mr. Turner's short course of lectures on "CAST IRON," that an increase may shortly be expected. Mr. C. H. New, a former student, has acted

from the commencement of the present session as Honorary Assistant Demonstrator. Though there is no marked increase in the number of students in the department, the amount of time given and the amount of work done is steadily growing.

In the Department of *Zoology* the number of students attending by way of preparation for University Examinations has been larger than in any previous year, and the success equally gratifying. The special grant made by the Council in July, 1885, has enabled the Professor to extend the Zoological Museum by the purchase of many valuable specimens. In making these additions the requirements of the students preparing for the Examinations of the University of London have been specially kept in view. The total number of additions to the Museum during the year ending February 23rd, 1887, by donations and purchase, is 213, which may be classified as follows:—Skeletons, 15; dissections, 35; specimens in spirit, shells, skins, etc., 163.

The Professor desires to express his obligations to the zeal and efficiency of the Museum Assistant, Mr. F. W. Crispe.

In the *Botanical Department* there appears to be a slow but steady increase in the number of students pursuing systematic study throughout the session, and the Professor reports favourably as to the character of their work.

In regard to the Summer Course, the changes in the Medical Curriculum have naturally reduced the number of medical students attending from Queen's College.

In the Department of *Physiology* the Professor reports an increased attendance, both in the Advanced and the Elementary Practical Classes. He also hopes to establish a class for investigation.

In *Geology*, owing to the requirements of the Associateship Scheme, a new Junior Class in Physiography has been started, and two students are working through the complete courses, in preparation for the Associateship in that division.

Owing to the unfortunate illness of Professor Benton a serious interruption has occurred in the classes for Mining Engineers since Christmas.

The Professor of *Engineering* reports that changes have been introduced into the curriculum for the Diploma, whereby the work demanded of the students has been lightened, the fees somewhat decreased, and the students' time in the summer usefully occupied in learning handicrafts. The Mechanical Museum of the College has been largely extended by gifts from manufacturers, and especially from exhibitors at the recent Exhibition in Bingley Hall, to whom our most cordial thanks are due.

In the Engineering and several other departments the need for a more liberal provision of material, apparatus, and assistance is most urgently felt.

I am, Sir, your obedient servant,

WILLIAM A. TILDEN.

*Chairman of the Academic Board.*

7th February, 1887.

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## UNIVERSITY OF LONDON EXAMINATIONS.

OUTLINE OF THE REGULATIONS FOR DEGREES IN ARTS  
AND SCIENCE.

(For fuller details consult the London University Calendar.\*)

The following Examinations of the University will be held in the Mason Science College :

|                                                                                     | COMMENCING       |   |
|-------------------------------------------------------------------------------------|------------------|---|
| Intermediate Examination in Arts ...                                                | 16th July, 1888. |   |
| Intermediate Examination in Science<br>(except Practical Biology) ...               | "                | " |
| Preliminary Scientific M.B. (except<br>Practical Zoology), Pass and<br>Honours..... | "                | " |

These examinations will be entrusted to sub-Examiners specially appointed by the Senate of the University. They will be carried on simultaneously with the examinations in London, the several papers and regulations being precisely the same. Candidates who prefer to sit at the examinations in Birmingham should notify their intention to the Registrars of the University of London and of the Mason Science College. In addition to the ordinary University fees, such candidates are required to pay a further fee towards the expenses attending the provincial examinations, viz. :—Intermediate Examination in Arts, £1 10s. ; Intermediate Examination in Science, £1 10s., or Preliminary Scientific M.B., £1 10s. each. Candidates failing to pass any examination repeat the payment of the provincial fee on again coming up. One fee only is charged to those who take the Intermediate Examination in Science and Preliminary Scientific Examinations together.

NOTE.—Every Candidate who fails to pass any examination at his first entry thereto will be required to pay an additional fee, equal to half the original fee, for every subsequent entry to the same examination.

## MATRICULATION.

[N.B.—Candidates for any degree granted by the University are required to have passed the Matriculation examination. The Matriculation examination is accepted (1) by the Council of Military Education in lieu of the Entrance examination otherwise imposed on candidates for admission to the Royal Military College, Sandhurst, except in Geometrical Drawing ; and (2) by the College of Surgeons in lieu of the Preliminary examination otherwise imposed on candidates for its Fellowship. It is also among those examinations of which some one must be passed

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\* To be obtained through any bookseller, price 4s.

(1) by every medical student on commencing his professional studies; and (2) by every person entering upon Articles of Clerkship to an Attorney, any such person matriculating in the Honours, or in the First Division being entitled to exemption from one year's service.]

There are two examinations for Matriculation in each year (*the Queen's College, Birmingham, has been appointed a Local Centre for these Examinations*) one commencing on the second Monday in January, and the other on the third Monday in June. No candidate is admitted to the examination unless he has at least *one calendar month* previous to the commencement of the examination transmitted to the Registrar of the University a certificate showing that he has completed his sixteenth year. A certified copy from the Baptismal Register, or a certificate from the Registrar-General in London, or from the Superintendent Registrar of the district, will be required in every case in which it can possibly be procured. In other cases the best evidence procurable is admitted.

The Matriculation fee is £2, payable when the candidate enters his name on the Register of the University, the time for which is notified.

#### SUBJECTS FOR EXAMINATION.

1. Latin.—The Subjects for 1888 are—For January: *Horace*, Odes, Books III. and IV.—For June: *Cæsar*, Gallic War, Book VII.

The paper in Latin will contain passages to be translated into English, with questions arising out of the subjects of the book selected. Short and easy passages will also be set for translation from other books not so selected. A separate paper will be set containing questions in Latin Grammar, with simple and easy sentences of English to be translated into Latin.

2. *One* of the following languages—Greek, French, German, and either Sanskrit or Arabic.

N.B. Candidates who desire to be examined in either Sanskrit or Arabic must give at least two calendar months' notice, and must mention the other optional language which they select.

The Greek subjects for 1888 are—For January: *Euripides*, *Andromache*.—For June: *Xenophon*, *Cyropaedia*, Book I.

The paper in Greek will contain passages to be translated into English, with questions in Grammar, History, and Geography arising out of the subjects of the books selected. Short and easy passages will also be set for translation from other books not so selected.

In French, passages will be given for translation into English and questions set in Grammar, limited to the *Accidence*.

The paper in German will contain passages for translation into English, and questions in Grammar limited (except when German is taken as an alternative of Greek) to the Accidence.

N.B.—No credit will be given for more than one of these languages.

3. English Language, English History, and Modern Geography.

Orthography ; Writing from Dictation ; Grammatical Structure of the Language.

History of England to the end of the seventeenth century, with questions in Modern Geography.

4. Mathematics.—Arithmetic, Algebra to simple Equations, Geometry, Euclid I—IV., or the subjects thereof.

5. Mechanics.

6. *One* of the three following subjects :—Chemistry, Heat and Light, or Magnetism and Electricity.

On Monday afternoon, at two o'clock, in the week next but two ensuing, the Examiners will publish the names of all the candidates who have passed, arranged in alphabetical order ; and on the Monday afternoon next following, at two o'clock, the Examiners will publish a list of the candidates who have passed, arranged in three divisions : in the Honours Division in order of proficiency ; in the First and Second Divisions in alphabetical order. A pass certificate, signed by the Registrar, will be delivered to each candidate who shall apply for it. If in the opinion of the Examiners any candidates in the Honours Division of not more than twenty years of age shall possess sufficient merit, the first among such candidates will receive an Exhibition of Thirty Pounds per annum for the next two years ; the second among such candidates will receive an Exhibition of Twenty Pounds per annum for the next two years ; and the third will receive an Exhibition of Fifteen Pounds per annum for the next two years ; such exhibitions to be paid in quarterly instalments, provided that on receiving each instalment the Exhibitioner shall declare his intention of presenting himself either at the two examinations for B.A., or at the two examinations for B.Sc., or at the first LL.B. examination, or at the Preliminary Scientific and First M.B. examinations, within three academical years from the time of his passing the Matriculation examination. Under the same circumstances the fourth among such candidates will receive a Prize to the value of Ten Pounds in books, philosophical instruments, or money ; and the fifth and sixth will each receive a Prize to the value of Five Pounds in books, philosophical instruments, or money.

Any candidate who may obtain a place in the Honours Division at the Matriculation examination in January will be admissible to the First B.A. or to the First B.Sc. examination in the following

July, but such candidate will not be admissible to the Second B.A. or to the Second B.Sc. examination in the ensuing year, unless he shall have attained the age of eighteen years.

### BACHELOR OF ARTS.

Candidates are required to have passed the Matriculation examination and to pass two subsequent examinations. Nevertheless, Bachelors of Science of the University will be admitted to the degrees of Bachelor of Arts after passing at the two B.A. examinations in the subjects in which they have not previously been examined.

*Intermediate Examination in Arts*, held once a year, commencing on the third Monday in July. No candidate is admitted within one year of the time of his passing Matriculation, except such as have obtained honours in the preceding January Matriculation examination. Certificates of good conduct\* to be sent to the Registrar of the University one month previously. Fee £5.

### SUBJECTS FOR EXAMINATION.

1. Latin and Roman History.—For 1888 : *Livy*, Book VI. ; *Virgil*, *Æneid*, Books II. and III. Simple passages of Latin from books not previously named, to be translated into English, and of English to be translated into Latin, will also be given out. Questions in Geography, Grammar, and History.

2. Greek.—For 1888 : *Xenophon*, *Hellenics*, Book I. Easy questions in Grammar will be set.

3. English Language, Literature, and History.—Writing out the substance of a paragraph previously read by the Examiner : The Grammatical Structure of the Language : Composition : Special Subjects in 1888—History of England from 1700 to 1740. History of English Literature during the same period. *Pope* : Essay on Criticism, Rape of the Lock, and Essay on Man. *The Spectator* : Nos. 1–50. *Morris* : Specimens of Early English. Part I., Specimens X. to XVI.

4. Mathematics.—Arithmetic, Algebra, Geometry, Trigonometry.

5. Either French or German. Translation into English, with questions in Grammar.

*B.A. Examination*, held once a year commencing on the fourth Monday in October. No candidate is admitted to this examination within one year of the time of his passing the Intermediate Examination in Arts, unless he have previously taken the degree of B.Sc. Candidates who have been admitted to the Intermediate

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\* The necessary certificates for this and for the subsequent examination will be granted to students of the Mason Science College whose attendance and general conduct have been satisfactory.

Examination in Arts within six months after passing the Matriculation examination must have completed their eighteenth year. Certificates of good conduct are to be sent up one month before the examination. Fee £5.

#### SUBJECTS FOR EXAMINATION.

Candidates are required to show a competent knowledge in Branches 1, 2, and 3, and in either Branch 4 or Branch 5.

1. Latin and Roman History.—For 1888: *Tacitus*, Histories, Book III.; and *Virgil*, Georgics. History—Outlines of Roman History from the Death of Sulla to the Death of Cæsar. Geography. Questions in Grammar, with passages for translation into English from Books not previously named, and passages of English to be translated into Latin, will also be set.

2. Greek and Greek History.—For 1888: *Sophocles*, Electra. *Demosthenes*, Adversus Androtonem. History—The Persian Wars. Geography—Questions in Grammar and passages for translation into English from Books not previously named will also be set.

3. English, French, German, Italian, Arabic, Sanskrit.

Candidates can obtain credit for only *One* of these Languages.

(a) English Language and Literature.—The History, structure, and development of the English Language. The elements of Anglo-Saxon Grammar. Special subjects for 1888: History of English Literature during the 15th Century. *Skcat*: Specimens of English Literature from 1394–1579, Specimens I.—X. *Shakespeare*: Henry VI., three Parts. *Sweet*: Extracts from Alfred's Orosius, pp. 1–53, with the Grammar part of the Anglo-Saxon Primer.

(b) French, German, or Italian Language.—Translation from English into French, German, or Italian. Retranslation and Grammar.

(c) Arabic or Sanskrit Language.—Translation from Arabic or Sanskrit into English, with questions in Grammar.

4. Mathematics.—Candidates can obtain credit for only *one* of the two following divisions.

(a) Pure Mathematics.—Algebra, Trigonometry, Geometry.

(b) Mixed Mathematics.—Dynamics, Astronomy.

5. Mental and Moral Science.—Psychology, Logic, Ethics.

The names of the candidates who have passed the B.A. examination, are published on the Saturday in the week next but one following each examination, arranged in two divisions, each in alphabetical order.

Examinations for Honours are held after both the Intermediate examination in Arts and the B.A. examination, and various Scholarships, Exhibitions, and Prizes are offered for competition.



## MASTER OF ARTS.

Examinations held yearly, commencing on the first Monday in June. Candidates to be not less than twenty years of age, and B.A. of at least one year's standing in the University. Certificates to be sent up *one calendar month* before the examination. Fee £10.

No candidate will be approved by the Examiners unless he show a competent knowledge in one of the following branches of knowledge :—

I. Classics.

II. Mathematics and Natural Philosophy.

III. Mental and Moral Science, Political Philosophy, History of Philosophy, Political Economy.

IV.—Any *two* of the following subjects :—English Language and Literature, including Anglo-Saxon Language and Literature; French Language and Literature, German Language and Literature, Italian Language and Literature, Hebrew Language and Literature, with Syriac Language and Literature; Sanskrit Language and Literature, Arabic Language and Literature.

## DOCTOR OF LITERATURE.

Candidates are required to have passed the M.A. Examination in Branch I., and also in either Branch III. or Branch IV.

Examinations held once a year, commencing on the first Tuesday in December. *Candidates must give notice of their intention to compete on or before the 1st of October.* They are required to have passed the M.A. examination at least one year previously. Fee, £10, to be paid on or before the 1st of October.

Candidates are required to transmit, not later than October 1st, an original printed Essay or Thesis upon some special subject within the purview of Branch I., or III., or IV., of the M.A. Examination. (For further particulars see Calendar.)

## BACHELOR OF SCIENCE.

Candidates are required to have passed the Matriculation Examination, and to pass two subsequent examinations.\*

*Intermediate Examination in Science*, held annually, commencing on the third Monday in July. No candidate (except those who have obtained Honours at the preceding January Matriculation) is admitted to this examination within one academical year of his Matriculation. Certificates of good conduct to be sent to the Registrar one month previously. Fee £5.

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\* Bachelors of Arts of the University who are candidates for the Degree of B.Sc. will be exempted from examination in Pure and Mixed Mathematics at the Intermediate examination in Science, and from payment of the Fee of Five Pounds at the B.Sc. examination.

## SUBJECTS FOR EXAMINATION.

1. Pure and Mixed Mathematics.
2. Experimental Physics.
3. Inorganic Chemistry.
4. General Biology.

N.B.—The written examination in the first week will be followed in the week after by a *practical examination* in Chemistry and Biology.

*B.Sc. Examination*, held once a year, commencing on the third Monday in October, and extending over three weeks. Candidates are required to have passed the Intermediate Examination in Science at least one year previously; and those who have been admitted to the Intermediate Examination in Science within six months after passing the Matriculation examination must have completed their eighteenth year. Certificates of good conduct to be sent up one month before the examination. Fee £5.

Candidates will be required to show a competent knowledge of *any three* which they may select out of the Nine following subjects :—

1. Pure Mathematics.
2. Mixed Mathematics.
3. Experimental Physics.
4. Chemistry (Theoretical and Practical).
5. Botany (Theoretical and Practical),
6. Zoology (Theoretical and Practical).
7. Animal Physiology (Theoretical and Practical).
8. Physical Geography and Geology (Theoretical and Practical).
9. Mental and Moral Science.

The names of the candidates who have passed the Intermediate examination in Science and the B.Sc. examination, and the Prel. M.B. examination (see below) are published on the Saturday in the week following the last week of each examination, arranged in two divisions, each in alphabetical order.

Examinations for Honours are held after both the Intermediate and B.Sc. Examinations and after the Prel. M.B. Examination, and various Scholarships and Exhibitions are offered for competition.

## DOCTOR OF SCIENCE.

Examination held annually, within the first twenty-one days of June. Candidates must be B.Sc. of two years standing.

Candidates must give notice of their intention to compete to the Registrar of the University on or before the 1st of February.  
£10.

## DEGREES IN MEDICINE.

## PRELIMINARY SCIENTIFIC (M.B.) EXAMINATION.

Examinations held *twice* in each year—once for Pass and Honours, commencing on the third Monday in July, and once for Pass only, commencing on the third Monday in January.

Candidates are required to have passed the Matriculation examination or taken a degree in Arts as mentioned above. *One calendar month's* notice must be sent to the Registrar. Fee £5.

*Candidates for the degree of M.B. are required by the Senate to pass the Preliminary Scientific Examination before commencing their medical studies, and are recommended to devote a preliminary year to preparation for it.*

## SUBJECTS FOR EXAMINATION.

[Candidates who pass in all the subjects of the examination and also *at the same time* in the Mathematics of the Intermediate examination in Science are considered as having passed both the Prel. Sc. and the Intermediate examination in Science and those who pass in all the subjects of the Prel. Sc. (M.B.) examination, and have *previously* passed the Intermediate examination in Arts, are admissible to the B.Sc. examination].

1. Inorganic Chemistry by *vivâ voce* and experiment as well as by printed papers. [Qualitative Analysis of the more commonly occurring Bases and Inorganic acids in solutions, containing one of each].

2. Experimental Physics.

3. General Biology.

Candidates for the degree of BACHELOR OF MEDICINE are required :—

1. To have passed the Matriculation examination or to have taken a degree in Arts in some one of the Universities of Sydney, Melbourne, Calcutta, or Madras (provided, in the last case, that Latin has been one of the subjects which has been taken.)

2. To have been subsequently engaged during four years at one or more of the Medical Institutions recognised by the University ; one year at least of the four to have been spent in one or more of the recognised Institutions of the United Kingdom.

3. To have passed the Preliminary Scientific examination.

4. To pass the Intermediate examination in Medicine, the subjects of which are :—

(1) Anatomy.

(2) Physiology and Histology.

(3) Materia Medica and Pharmaceutical Chemistry.

(4) Organic Chemistry.

The examination commences—for Pass and Honours, on the second Monday in July and for Pass only on the third Monday in January. Fee £5.

5. To pass the M.B. examination, the subjects of which are :—

- (1) General Pathology, General Therapeutics, and Hygiene.
- (2) Surgery.
- (3) Medicine.
- (4) Obstetric Medicine.
- (5) Forensic Medicine.

The examination commences on the last Monday in October  
Fee £5.

The higher degrees in Medicine and Surgery granted by the University of London are those of MASTER IN SURGERY, and DOCTOR OF MEDICINE.

The London University Calendar should be consulted for the details of these examinations.

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## INSTITUTE OF CHEMISTRY OF GREAT BRITAIN AND IRELAND.

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### QUALIFICATIONS REQUIRED OF CANDIDATES FOR ADMISSION TO THE INSTITUTE OF CHEMISTRY AS ASSOCIATES.

Every Candidate for the Associateship is required to produce evidence of the following qualifications :—

(1) That he is not less than twenty-one years of age.

(2) That he has passed satisfactorily through a course of three years' study in any of the Universities or chartered or incorporated Colleges or Schools previously approved by the Council (whereof the Mason College is one) in the subjects of Theoretical and Analytical Chemistry, Physics, and Elementary Mathematics.

(3) That he has passed such examinations in these subjects at such Universities, Colleges, and Schools as the Council may from time to time direct.

When, however, a Candidate for the Associateship cannot adduce evidence of having passed an examination in Theoretical and General Chemistry, Physics, and Mathematics, satisfactory to the Council, he may be required to pass an Examination, such Examination to be by printed or written questions, to which the Candidate shall return written answers, without access to books, MSS., or memoranda.

## PRACTICAL EXAMINATION.

Every Candidate for the Associateship will be required to pass a Practical Examination in Analytical Chemistry as follows :—

Qualitative Analysis.....Two days.

Quantitative Analysis .....Two days.

With a brief *visà voce* Examination on the morning of the fifth day, when considered needful by the Examiner.

On the days set apart for the Quantitative work, the Candidate will be more especially examined in such departments of Quantitative Analytical Chemistry as he may select; previous notice of these must be given to the Secretary, so that the Examiner may have time to prepare the necessary materials and apparatus required.

SYLLABUS OF SUBJECTS OF EXAMINATION IN PRACTICAL  
CHEMISTRY.

(1) *Qualitative Analysis*.—Analysis of a mixture which may contain any of the commonly occurring inorganic acids and bases, and also any of the following organic acids :—Acetic, formic, oxalic, tartaric, hydrocyanic, hydroferrocyanic, and hydroferriecyanic.

The qualitative examination of gaseous mixtures which may contain two or more of the following :—Hydrogen, oxygen, nitrogen, carbonic anhydride, carbonic oxide, sulphuretted hydrogen, hydrochloric acid, ammonia, sulphurous anhydride, nitric oxide, ethylene, and marsh gas.

(2) *Quantitative Analysis*.—The Candidate will be required to make gravimetric and volumetric estimations of substances commonly occurring, and the determination of carbon, hydrogen, and nitrogen, in an organic compound, either solid or liquid, to the satisfaction of the Examiner.

The volumetric determination of each constituent in a mixture which may contain hydrogen, oxygen, carbonic anhydride, carbonic oxide, ethylene, marsh gas, and nitrogen.

The Candidates will be allowed to consult books in the quantitative part of the Examination only.

The Fee for this Examination is Two Guineas. In the event of the Candidate failing to pass, the Fee will not be returned to him, but he will be admitted to one subsequent examination on payment of one guinea.

Professor Tilden has been appointed by the Council of the Institute Examiner for Birmingham and district.

# † THE QUEEN'S COLLEGE, BIRMINGHAM.

*Incorporated by Special Act of Parliament.*

## FACULTY OF MEDICINE.

*Warden.*

The REV. W. H. POULTON, M.A.

*Hon. Secretary.*

Professor WINDLE, M.D.

### PROFESSORS AND LECTURERS.

#### WINTER SESSION.

*The Classes marked \* are held in the Mason Science College.*

|                                    |     |     |                                                                                     |
|------------------------------------|-----|-----|-------------------------------------------------------------------------------------|
| ANATOMY, DESCRIPTIVE AND PRACTICAL | ... | ... | { Bertram C. A. Windle, M.A.,<br>M.D., B.Ch., Dublin.                               |
| *PHYSIOLOGY, SYSTEMATIC            | ... | ... | { F. J. Allen, M.A., M.B.,<br>Cantab., M.R.C.S., L.R.C.P.                           |
| *CHEMISTRY                         | ... | ... | { W. A. Tilden, D.Sc. Lond.,<br>F.R.S.                                              |
| *CHEMICAL PHYSICS                  | ... | ... | J. H. Poynting, D.Sc. Cantab.                                                       |
| MEDICINE...                        | ... | ... | { Sir Walter Foster, M.D.,<br>F.R.C.P.<br>Sir James Sawyer, M.D. Lond.,<br>F.R.C.P. |
| SURGERY                            | ... | ... | { Oliver Pemberton, F.R.C.S.<br>B. May, M.B., B.S. Lond.,<br>F.R.C.S.               |
| *ZOOLOGY AND COMPARATIVE ANATOMY   | ... | ... | { T. W. Bridge, M.A. Cantab.                                                        |

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† The complete Course of Instruction provided in the Medical Faculty of the Queen's College is here added, as some of the Lectures are given by arrangement in the one College, and some in the other.

SUMMER SESSION.

|                                                  |   |                                                         |
|--------------------------------------------------|---|---------------------------------------------------------|
| PRACTICAL ANATOMY ... ..                         | { | Bertram C. A. Windle, M.A.,<br>M.D., B.Ch. Dublin.      |
| *HISTOLOGY AND PRACTICAL<br>PHYSIOLOGY ... ..    | { | F. J. Allen, M.A., M.B.,<br>Cantab., M.R.C.S., L.R.C.P. |
| *BOTANY ... ..                                   | { | William Hillhouse, M.A.,<br>Cantab., F.L.S.             |
| *CHEMISTRY, PRACTICAL... ..                      | { | W. A. Tilden, D.Sc. Lond.,<br>F.R.S.                    |
| *ZOOLOGY AND COMPARATIVE<br>ANATOMY ... ..       | { | T. W. Bridge, M.A. Cantab.                              |
| PATHOLOGY AND PRACTICAL<br>MORBID ANATOMY ... .. | { | Gilbert Barling, M.B., B.S.<br>Lond., F.R.C.S.          |
| MATERIA MEDICA ... ..                            | { | Edwin Rickards, M.A., M.B.<br>Oxon, F.R.C.P.            |
| FORENSIC MEDICINE ... ..                         | { | C. W. Suckling, M.D. Lond.                              |
| TOXICOLOGY ... ..                                | { | J. St. S. Wilders, M.R.C.S.                             |
| MIDWIFERY, &c. ... ..                            | { | A. Bostock Hill, M.D.                                   |
| OPHTHALMIC SURGERY ... ..                        | { | John Clay, M.R.C.S.                                     |
| LUNACY AND MENTAL DISEASE                        | { | J. Vose Solomon, F.R.C.S.                               |
| DEMONSTRATORS IN PRACTICAL<br>SURGERY... ..      | { | E. B. Whitcombe, M.R.C.S.<br>( Vacant.)                 |

*Medical Tutor :*

Edgar Hogben, B.A., M.B., B.Ch. Dublin.

*Secretary :*

Joseph Lewis, 21, Paradise Street.

By an arrangement between the Councils of Queen's College and the Mason Science College, Medical Students of the former College attend the classes in Chemistry, Chemical Physics, Physiology, Botany, and Comparative Anatomy, in the Mason College.

The Library and Museums and the Students' Common Room of the Mason College are open for the use of all Students of that College. A Library Fee of 10s. 6d. is charged to Medical Students who are not attending classes.

There are two Sessions in the academical year, the Winter Session from October 1st to March 31st, and the Summer Session from May 1st to July 31st.

All applications for admission must be made to the Warden at the College.

The Sands Cox Prize of £20, the Russell Memorial Prize, and the Ingleby, Sydenham, and Queen's Scholarships, are offered annually. Certain Scholarships offered by the Council of the Mason Science College are tenable by Queen's College students, who are also students of Mason College.

## COLLEGE FEES.—MEDICAL DEPARTMENT.

The Composition (*not perpetual*) Fee is Sixty Guineas. It may be paid either in one sum or half at the beginning of the first year and the remainder at the beginning of the second year.

(This fee admits to the full courses of Lectures required by the University of London, the Royal University of Ireland, the Royal Colleges of Physicians, the Royal Colleges of Surgeons, and the Apothecaries Society. Two years out of the four years required for obtaining the Degree of Bachelor of Medicine of the University of Edinburgh may be spent at the Queen's College, Birmingham).

Students who have paid the above Composition Fee, and desire to repeat their attendance on any class beyond the ordinary requirements of the above-named examining bodies will be allowed to do so on payment (for each class attended) of one-half of the fees payable by Students who do not compound. The Composition Fee also does not include the small special charges for the use of apparatus, re-agents, &c., which are made in the practical classes; neither does it include the Fees for Hospital Practice.

A Fee of £1 1s. will be charged for apparatus in the class of Practical Physiology, and a fee of about 15s. will be charged for the same purpose in the class of Chemistry.

In addition to the above Fees every dissecting student has also to pay a Dissecting Fee of One Pound Ten Shillings at the commencement of each Winter Session. He will receive as many parts as the supply of subjects for dissection will allow.

Students who wish to take single classes may do so on payment of the following fees:—

|                                    |                           |
|------------------------------------|---------------------------|
| ANATOMY .....                      | } £6 6s. for each Course. |
| PHYSIOLOGY .....                   |                           |
| MEDICINE, INCLUDING PATHOLOGY ...  |                           |
| SURGERY, INCLUDING PATHOLOGY ...   |                           |
| DEMONSTRATIONS AND DISSECTIONS...  | } £5 5s. for each Course. |
| CHEMISTRY.....                     |                           |
| MIDWIFERY .....                    |                           |
| MATERIA MEDICA.....                |                           |
| MEDICAL JURISPRUDENCE .....        | } £4 4s. for each Course. |
| BOTANY .....                       |                           |
| PRACTICAL CHEMISTRY .....          |                           |
| PRACTICAL PHYSIOLOGY .....         |                           |
| PATHOLOGY, INCLUDING PRACTICAL DO. |                           |

## HOSPITAL PRACTICE.

The practices of The General and Queen's Hospitals, Birmingham, are amalgamated for the purposes of Clinical Instruction under the direction of the Birmingham Clinical Board. The Hospitals have a total of upwards of 400 beds. 4,500 in-patients and 45,000 out-patients are treated annually.



Students now have access for the purpose of Clinical Instruction to the Wards of the Borough Lunatic Asylum, the Borough Infirmary, the Birmingham Eye Hospital, and the Orthopædic and Spinal Hospital.

#### SCALE OF FEES.

Fees for attendance for 4 years (the period required by the University of London, and the Colleges of Physicians and Surgeons, &c.) on the Medical and Surgical Practice and on the Clinical Lectures at both Hospitals... } £42.

N.B.—This payment may be made in two equal sums, the first on entrance, and the second at the commencement of the second year.

|                           |     |     |     |     |     |      |
|---------------------------|-----|-----|-----|-----|-----|------|
| One Year's Attendance ... | ... | ... | ... | ... | ... | £21. |
| Six Months' "             | ... | ... | ... | ... | ... | £14. |
| Three Months' "           | ... | ... | ... | ... | ... | £10. |

N.B.—All Fees (with the exception of those for Hospital Practice) in the Medical Department are payable to the Warden. Moreover, every Student on entrance will be required to subscribe a declaration that he will conform to the regulations of the College. Each Student will also have to pay a Fee of One Guinea to the Library Fund.

#### DENTAL DEPARTMENT.

The teaching of Dentistry is undertaken by the Queen's College, acting in association with the Birmingham Dental Hospital and the Birmingham Clinical Board.

The Dental Hospital is situated near the College, and is open daily (Sundays excepted). The number of patients treated there during the year 1882 was upwards of 7,000.

The General and Queen's Hospitals offer every advantage for the study of General Surgery and Medicine, the arrangements for which are carried out under the direction of the Birmingham Clinical Board.

Any further particulars as to fees or otherwise, may be obtained on application to John Humphreys, Esq., L.D.S., Hon. Sec. to the Dental Board, 21, Newhall Street.

NOTE.—Syllabuses and all further particulars respecting the courses of instruction in Queen's College may be obtained by application to Prof. Windle, M.D., Hon. Sec., at the College. For particulars relating to Hospital Practice, application should be made to Mr. Jordan Lloyd, 22, Broad Street, Honorary Secretary to the Clinical Board.

N.B.—A list of those gentlemen who are prepared to receive Medical Students as Resident Boarders is kept at the College. For further information apply to the Warden.



## Appendix.



# THE MASON SCIENCE COLLEGE.

## GREEK.

JUNIOR CLASS.

Midsummer, 1887.

XENOPHON, ANABASIS II.

1. Translate :—

Ταῦτα εἰπὼν ἔδοξε τῷ Κλέαρχῳ ἀληθῇ λέγειν· καὶ εἶπεν· Οὐκοῦν, ἔφη, οὔτινες τοιούτων ἡμῖν εἰς φιλίαν ὑπαρχόντων πειρῶνται διαβάλλοντες πολεμίους ποιῆσαι ὑμᾶς ἄξιοί εἰσι τὰ ἔσχατα παθεῖν; Καὶ ἐγὼ μὲν, ἔφη ὁ Τισσαφέρνης, εἰ βούλεσθέ μοι οἷ τε στρατηγοὶ καὶ οἱ λοχαγοὶ ἐλθεῖν, ἐν τῷ ἐμφανεῖ λέξω τοὺς πρὸς ἐμὲ λέγοντας ὡς σὺ ἐπιβουλεύεις ἐμοί τε καὶ τῇ σὺν ἐμοὶ στρατιᾷ. Ἐγὼ δέ, ἔφη ὁ Κλέαρχος, ἄξω πάντας, καὶ σοὶ αὐτὸ ἐγὼ δηλώσω ὅθεν ἐγὼ περὶ σοῦ ἀκούω. Ἐκ τούτων δὴ τῶν λόγων ὁ Τισσαφέρνης φιλοφρονούμενος τότε μὲν μένειν τε αὐτὸν ἐκέλευσε καὶ σύνδειπνον ἐποίησατο. Τῇ δὲ ὑστεραίᾳ ὁ Κλέαρχος ἐλθὼν ἐπὶ τὸ στρατόπεδον δηλὸς τ' ἦν πάννυ φιλικῶς οἰόμενος διακείσθαι τῷ Τισσαφέρνει καὶ ἂν ἔλεγεν ἐκείνος ἀπήγγελλεν· ἔφη τε χρῆναι ἵεναι παρὰ Τισσαφέρνην οὓς ἐκέλευσε, καὶ οἱ ἂν ἐξελεγχθῶσι διαβάλλοντες τῶν Ἑλλήνων, ὡς προδότας αὐτοὺς καὶ κακόνους τοῖς Ἑλλήσιν ὄντας τιμωρηθῆναι. Ὑπώπτει δὲ εἶναι τὸν διαβάλλοντα Μένωνα, εἰδὼς αὐτὸν καὶ συγγεγεννημένον Τισσαφέρνει μετ' Ἀριαίου καὶ στασιάζοντα αὐτῷ καὶ ἐπιβουλεύοντα, ὅπως τὸ στράτευμα ἅπαν πρὸς αὐτὸν λαβὼν φίλος ᾗ Τισσαφέρνει. Ἐβούλετο δὲ καὶ ὁ Κλέαρχος ἅπαν τὸ στράτευμα πρὸς ἐαυτὸν ἔχειν τὴν γνώμην καὶ τοὺς παραλυποῦντας ἐκποδῶν εἶναι. Τῶν δὲ στρατιωτῶν ἀντέλεγον τινες αὐτῷ μὴ ἵεναι πάντας τοὺς λοχαγοὺς καὶ στρατηγοὺς μηδὲ πιστεύειν Τισσαφέρνει. Ὁ δὲ Κλέαρχος ἰσχυρῶς κατέτεινεν, ἔστε διεπράξατο πέντε μὲν στρατηγοὺς ἵεναι, εἴκοσι δὲ λοχαγοὺς· συνηκολούθησαν δὲ ὡς εἰς ἀγορὰν καὶ τῶν ἄλλων στρατιωτῶν ὡς διακόσιοι.

## 2. Retranslate :—

Proxenos the Boeotian had from his youth up desired to become a man capable of achieving greatness : and on account of this passion he gave money to Gorgias the Leontine. And after associating with him, considering himself already fit to hold command, he entered upon this undertaking in company with Cyrus : and he expected to gain from it great renown and power and much wealth.

3. Give the principal parts of the following verbs : ἄγω, διδράσκω, εὐρίσκω, κράζω, ἔχω ? Give the third person plural of the present imperative active of—τίθημι, εἶμι, φιλέω, ὀρμάω, δεικνυμι.

4. What cases are governed by the following prepositions, and with what meanings :—διά, περί, ἔνεκα, μετά, πρός, παρά ?

5. Parse :—ἴσθι, ὑπομνήσαι, παρηγγύα, ἀντεξήκει, ὀφθείη, ἀνεμίνως, ἀλώσσεσθαι, ἐπήνεσεν, μήκους.

6. Compare :—ἄγχι, ἴσος, ταχύς, σῶφρων, εὖνους.

E. A. SONNENSCHIEIN.

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SENIOR CLASS.

Midsummer, 1887.

PLATO, REPUBLIC I., II.

## 1. Translate :—

(A) Ἐγώ γε, εἶπον, ὦ μὴν σε τοῦτο λέγειν, ὅτε τοὺς ἄρχοντας ὁμολόγεις οὐκ ἀναμαρτήτους εἶναι, ἀλλὰ τι καὶ ἔξαμαρτάνειν. Συκοφάντης γὰρ εἶ, ἔφη, ὦ Σώκратες, ἐν τοῖς λόγοις· ἐπεὶ αὐτίκα ἱατρὸν καλεῖς σὺ τὸν ἔξαμαρτάνοντα περὶ τοὺς κάμνοντας κατ' αὐτὸ τοῦτο, ὃ ἔξαμαρτάνει; ἢ λογιστικόν, ὃς ἂν ἐν λογισμῷ ἁμαρτάνῃ, τότε ὅταν ἁμαρτάνῃ, κατὰ ταύτην τὴν ἁμαρτίαν; ἀλλ' οἶμαι, λέγομεν τῷ ῥήματι οὕτως, ὅτι ὁ ἱατρὸς ἐξήμαρτε καὶ ὁ λογιστὴς ἐξήμαρτε καὶ ὁ γραμματιστής· τὸ δ', οἶμαι, ἕκαστος τούτων, καθ' ὅσον τοῦτ' ἔστιν, ὃ προσαγορεύομεν αὐτόν, οὐδέποτε ἁμαρτάνει· ὥστε κατὰ τὸν ἀκριβῆ λόγον, ἐπειδὴ καὶ σὺ ἀκριβολογεῖ, οὐδεὶς τῶν δημιουργῶν ἁμαρτάνει. ἐπιλειπούσης γὰρ ἐπιστήμης ὁ ἁμαρτάνων ἁμαρτάνει, ἐν ᾧ οὐκ ἔστι δημιουργός· ὥστε δημιουργὸς ἢ σοφὸς ἢ ἄρχων οὐδεὶς ἁμαρτάνει τότε, ὅταν ἄρχων ᾖ, ἀλλὰ πᾶς γ' ἂν εἴποι, ὅτι ὁ ἱατρὸς ἡμαρτε καὶ ὁ ἄρχων ἡμαρτε. τοιοῦτον οὖν

δή σοι καὶ ἐμὲ ὑπόλαβε νῦν δὴ ἀποκρίνεσθαι. τὸ δὲ ἀκριβέστατον ἐκείνο τυγχάνει. ὃν, τὸν ἄρχοντα, καθ' ὅσον ἄρχων ἐστὶ, μὴ ἁμαρτάνειν, μὴ ἁμαρτάνοντα δὲ τὸ αὐτῷ βελτιστον τίθεσθαι, τοῦτο δὲ τῷ ἀρχομένῳ ποιητέον. ὥστε, ὅπερ ἐξ ἀρχῆς ἔλεγον, δίκαιον λέγω τὸ τοῦ κρείττονος ποιεῖν ξυμφέρον.

Comment upon the Socratic argument against Thrasymachus.

(B) Κατὰ τίνα οἶν ἔτι. λόγον δικαιοσύνην ἂν πρὸ μεγίστης ἀδικίας αἰροίμεθ' ἂν; ἢν ἂν μετ' εὐσχημοσύνης κιβδηλὸν κτησώμεθα, καὶ παρὰ θεοῖς καὶ παρ' ἀνθρώποις πράξομεν κατὰ νοῦν ζῶντές τε καὶ τελευτήσαντες, ὥς ὁ τῶν πολλῶν τε καὶ ἄκρων λεγόμενος λόγος. ἐκ δὴ πάντων τῶν εἰρημένων τίς μηχανή, ὦ Σώκρατες, δικαιοσύνην τιμᾶν ἐθέλειν, ᾧ τις δύναμις ὑπάρχει ψυχῆς ἢ χρημάτων ἢ σώματος ἢ γένους, ἀλλὰ μὴ γελᾶν ἐπαινουμένης ἀκούοντα; ὥς δὴ τοι εἴ τις ἔχει ψευδῇ μὲν ἀποφῆναι ἃ εἰρήκαμεν, ἱκανῶς δὲ ἔγνωκεν, ὅτι ἄριστον δικαιοσύνη, πολλήν ποῦ συγγνώμην ἔχει καὶ οὐκ ὀργίζεται τοῖς ἀδίκους, ἀλλ' οἶδεν, ὅτι, πλὴν εἴ τις θείᾳ φύσει δυσχεραίνων τὸ ἀδικεῖν ἢ ἐπιστήμην λαβὼν ἀπέχεται αὐτοῦ, τῶν γε ἄλλων οὐδεὶς ἐκὼν δίκαιος, ἀλλ' ὑπὸ ἀναδρίας ἢ γήρως ἢ τινος ἄλλης ἀσθενείας ψέγει τὸ ἀδικεῖν, ἀδυνατῶν αὐτὸ δρᾶν. ὥς δέ, δῆλον· ὁ γὰρ πρῶτος τῶν τοιούτων εἰς δύναμιν ἐλθὼν πρῶτος ἀδικεῖ, καθ' ὅσον ἂν οἶός τ' ᾖ.

## 2. Retranslate :—

Then I will repeat the question which I asked before, in order that our examination of the relative nature of justice and injustice may be carried on regularly. A statement was made that injustice is more powerful than justice; but now justice having been identified with wisdom and virtue, is easily shown to be stronger than injustice, if injustice is ignorance; no one can any longer be blind to that. But I want to view the matter, Thrasymachus, in a new way. You would not deny that a state may be unjust and may be unjustly attempting to enslave other states?

E. A. SONNENSCHIEIN.

## JUNIOR LATIN.

Midsummer, 1887.

VIRGIL GEORGIC II.

## 1. Translate—

- (a) Adde tot egregias urbes, operumque laborem,  
 Tot congesta manu præraptis oppida saxis,  
 Fluminaque antiquos subterlabentia muros.  
 An mare, quod supra, memorem, quodque alluit infra ?  
 Anne lacus tantos ? te, Lari maxime, teque,  
 Fluctibus et fremitu assurgens, Benace, marino ?  
 An memorem portus, Lucrinoque addita claustra,  
 Atque indignatum magnis stridoribus æquor,  
 Julia qua ponto longe sonat unda refuso,  
 Tyrrhænusque fretis immittitur æstus Avernis ?  
 Hæc eadem argenti rivos ærisque metalla  
 Ostendit venis, atque auro plurima fluxit.
- (b) Non alios prima crescentis origine mundi  
 Illuxisse dies, aliumve habuisse tenorem  
 Crediderim : ver illud erat ; ver magnus agebat  
 Orbis, et hibernis parcebant flatibus Euri,  
 Quum primæ lucem pecudes hausere, virûmque  
 Terrea progenies duris caput extulit arvis,  
 Immissæque feræ silvis et sidera cælo.  
 Nec res hunc teneræ possent preferre laborem,  
 Si non tanta quies iret frigusque caloremque  
 Inter, et exciperet cæli indulgentia terras.

## 2. Translate with grammatical note on the italicized words :—

- (a) *Pars* autem posito *surgunt* de semine : ut *altae*  
*Castaneæ*, *nemorumque* Jovi quæ *maxima* frondet  
*Aesculus*, atque habitæ *Gratiis* oracula quercus.
- (b) Quid *majora sequar* ?
- (c) Hic *stupet* attonitus rostris ; hunc *plausus* hiantem  
 Per *cuneos* *geminatus enim* plebisque patrumque  
*Corripuit*.
- (d) Sic *fortis* Etruria crevit.

E. A. SONNENSCHNEIN.

## SENIOR LATIN.

Midsummer, 1887.

CICERO, DE NATURA DEORUM I.

## 1. Translate—

- (a) Quid ? solis numquidnam aut lunæ aut quinque errantium  
 siderum simile vidisti ? Sol duabus unius orbis ultimis partibus  
 definiens motum cursus annuos conficit. Huius hanc lustrationem  
 eiusdem incensa radiis menstruo spatio luna complet. Quinque



autem stellae eundem orbem tenentes, aliae propius a terris, aliae remotius, ab isdem principiis disparibus temporibus eadem spatia efficiunt. Numquid tale, Epicure, vidisti? Ne sit igitur sol, ne luna, ne stellae: quoniam nihil esse potest, nisi quod attigimus aut vidimus. Quid? deum ipsum numne vidisti? Cur igitur credis esse? Omnia tollamus ergo quae aut historia nobis aut ratio nova affert. Ita fit, ut mediterranei mare esse non credant. Quae sunt tantae animi angustiae? Ut, si Seriphi natus esses nec umquam egressus ex insula, in qua lepusculos vulpeculasque saepe vidisses, non crederes leones et pantheras esse, quum tibi quales essent diceretur, si vero de elephanto quis diceret, etiam rideri te putares. Et tu quidem, Vellei, non vestro more, sed dialecticorum, (quae funditus gens vestra non novit,) argumentis sententiam conclusisti: beatos esse deos sumpsisti. Concedimus. Beatum autem sine virtute neminem esse posse. Id quoque damus, et libenter quidem. Virtutem autem sine ratione constare non posse. Conveniat id quoque necesse est. Adiungis, nec rationem esse nisi in hominis figura. Quem tibi hoc daturum putas? Si enim ita esset, quid opus erat te gradatim istuc pervenire? sumpsisses tuo iure. Qui autem est istuc gradatim? Nam a beatis ad virtutem, a virtute ad rationem video te venisse gradibus. A ratione ad humanam figuram quo modo accedis? Praecipitare istuc quidem est, non descendere.

TERENCE, PHORMIO.

- (b) CH. 'Tum autem Antiphonem uideo ab sese amittere inuitum eam' inque. DE. Tum autem uideo filium inuitum sane mulierem ab se amittere.  
Sed transi sodes ad forum atque illud mihi argentum rursum iube rescribi, Phormio.  
PH. Quodne ego discipuli porro illis quibus debui?  
DE. Quid igitur fiet? PH. Si uis mi uxorē dare quam despondisti, ducam: sin est ut uelis manere illam apud te, dos hic maneat, Démipho. Nam non est aequom me propter uos decipi, quom ego uostri honoris causa repudium alterae remissem, quae dotis tantundem dabat.  
DE. In in malam rem hinc cum istac magnificētia, fugitiue? etiam nunc credis te ignorarier aut tua facta adeo? PH. Inritor. DE. Tunc hanc duceres,  
si tibi daretur? PH. Fac periculum.

Comment upon possible ways of translating the last line and a half.

2. Translate and comment upon the following phrases:—

*Aduorsum stimulum calces, Inieci scrupulum, Una injurias tecum, Hinc illae lacrimae, Initiare, Qui illum di omnes perduint, Cena dubia, Justa, nunc quom maxime, Enim, Audio.*

3. Scan the following lines, marking the quantity of every syllable:—

- (a) Te fallere. G E. Ergo ausculta. D.A. Hanc operam tibi dico.
- (b) Quid hic conterimus operam frustra? Quin abeo? PH.  
Et quidem ego? AN. Obsecro.
4. Translate, with syntactical notes on the italicized words:—
- (a) *cia*, sudabis satis  
Si cum illo *inceptas* homine; *ea* eloquentiast.
- (b) Seni fidelis dum *sum*, scapulas perdidit.
- (c) Non, si *redisset*, ei pater veniam *daret*?
- (d) Ita me di bene ament, *ut* mihi *liccat* tam diu quod amo frui  
Jam deprecisci morte cupio.

E. A. SONNENSCHIEIN.

## HIGHER SENIOR LATIN.

Midsummer, 1887.

PLAUTUS: MOSTELLARIA.

VIRGIL: ÆNEID VII.

## 1. Translate—

- (a) TRANIO.—Quí homo timidus érit in rebus dúbiis, nanci  
nón erit.

Átque equidem, quid id ésse dicam uérbum nanci, néscio :  
Nám erus me postquám rus misit, filium ut suum accérserem,  
Ábii illac per ángiportum ad hórtum nostrum clánculum.  
Óstium quod in ángiportust horti patefecí foris,  
Éaque eduxi omném legionem, *quí* maris *qua* féminas.  
Póstquam ex opsidióne in tutum eduxi manuplaris meos,  
Cápio consilium, ut senatum cóngerronum cónuocem.  
Quóm *eum* conuocáui, atque illi se éx senatu ségregant.  
'Vbi ego omnem uideó rem uorti in meó foro, quantúm potest,  
Fácio idem quod plúrumi alií, quibus res timida aut túrbidast :  
Pérgunt turbare úsque, ut ne quid *póssit* conquiescere.  
Nám scio equidem nullo pacto iám esse posse haec clam senem.

What is the reading of the MSS. in lines 6 and 9? How may the emendations in the text be justified?

- (b) TR. Male hercle factum.  
TR. Quid est negoti?  
TR. Non potest  
Dici, quam indignum facinus fecisti et malum.  
TR. Quid iam?  
TR. Fuge opsecro atque apscede ab acdibus.  
Fuge huc, fuge ad me propius. Tetigisti foris?  
TR. Quo modo pultare potui, si non tangerem?

- TR. Occidisti hercle —  
 TH. Quem mortalem ?  
 TR. Omnis tuos.  
 TH. Di te deaque omnes faxint cum istoc omine —  
 TR. Metuo, te atque istos expliare ut possies.  
 TH. Quam ob rem ? aut quam subito rem mihi adportas  
       nouam ?  
 TR. Ere, heus, iube illos illinc ambo apscedere.  
 TH. Apscedite.  
 TR. Aedis ne attigatis. Tangite  
       Vos quoque terram.  
 TH. Opsecro hercle, quin *intro imus huc* ?

How might this passage be emended ? Arrange it in metrical order and mark the *ictus metricus*.

- (c) Ab Jove principium generis ; Jove Dardana pubes  
 Gaudet avo : Rex ipse, Jovis de gente suprema,  
 Troius Æneas tua nos ad limina misit.  
 Quanta per Idæos sævis effusa Mycenis  
 Tempestas ierit campos ; quibus actus uterque  
 Europæ atque Asiæ fatis concurrerit orbis :  
 Audiit, et si quem tellus extrema refuso  
 Submovet Oceano, et si quem extenta plagarum  
 Quattuor in medio dirimit plaga Solis iniqui.  
 Diluvio ex illo tot vasta per æquora vecti  
 Dis sedem exiguum patriis litusque rogamus  
 Innocuum, et cunctis undamque auramque patentem.

2. Translate, with notes and explanations on the italicised words (marking scansion of Plautine passages)—

- (a) Melius anno hoc mihi non fuit domi,  
       *Nec quod una* esca me iuuerit magis.  
 (b) Jam pridem ecastor frigida non laui magis libenter,  
       *Nec quom* me melius, mea Scapha, rear esse defecatam.  
 (c) Dic te daturum, ut abeat.  
       TH. Egon *dicam dare* ?  
 (d) Atque *eccum* optume.  
 (e) Jam *minoris* omnia alia facio, *præ quam* quibus modis  
       Ludificast me.  
 (f) Scelestiozem ego annum argento *facnori*  
       Numquam ullum vidi.  
 (g) *Quidquid est*, errabo potius quam perductet quispiam.

What other use of *quidquid est* do you know ? Illustrate the above usage from Virgil.

- (h) Augebis *ruri numerum*, *genus ferratile*.  
 (k) Aurea nunc solio stellantis regia cæli  
       Accipit et *numerus* divorum altaribus *auget*.

- (l) *Quod scelus aut Lapithas tantum, aut Calydonæ merentem.*  
 (m) *Veri effeta senectus.*  
 (n) *Quadrifidam quercum cuneis ut forte coactis*  
*Scindebat.*  
 (o) *Nec dextræ erranti deus afuit.*  
 (p) *lucosque sub alta*  
*Consulit Albunca : nemorum quæ maxima sacro*  
*Fonte sonat.*

E. A. SONNENSCHNEIN.

## LATIN COMPOSITION.

JUNIOR.

Midsummer, 1887.

So on a fixed day each of the two brothers took up a high position for himself, and watched the sky. Soon Remus saw six great vultures; but a little while afterwards Romulus saw twelve. The former said he ought to be chosen because he had seen the birds first. But the latter, having seen the greater number of birds, claimed the kingdom for himself. This made Remus very angry. After assuming the kingship, Romulus built a low wall, only three feet high, round the city. Remus contemptuously jumped over it. Then Romulus pierced him through and through with his sword, and said: "So perish every one who shall leap over the walls of my city."

E. A. SONNENSCHNEIN.

SENIOR.

Midsummer, 1887.

Cato was unfortunate enough to live at a time when avarice, luxury, and ambition prevailed at Rome, when religion and the laws were disregarded, and when the whole appearance of the state was so changed and disfigured that if one of the former generation had risen from the dead he would hardly have recognised the Roman people. Cato was one of a few who supported the cause of virtue, who could neither be allured by promises nor terrified by threats, and who would not flatter the great at the expense of the truth. Though his countrymen were too depraved to be influenced by his example, they could not do otherwise than admire him in their hearts.

E. A. SONNENSCHNEIN.

## ENGLISH LANGUAGE.

Friday, July 1st, 1887.—Morning, 10 to 1.

(Not more than Ten questions are to be answered, of which  
 Nos. 15 and 16 must be Two.)

1. What is understood by the Aryan or Indo-European Family of Languages?

2. Where did the English Language come from? To which languages is it most nearly related?

3. Tell all you know of the history of the English Alphabet.

4. Define *Grammar*, and also the names of all its several divisions.

5. Which are considered to be unnecessary Letters in English, and why? Give the three values of the letter *y*.

6. Define the Parts of Speech. Show, by examples, how the same word, in the same sentence, may belong to different Parts of Speech.

7. Discuss *oxen*, *sempstress*, *shoon*, *he-goat*, *children*, *chickens*, *vixen*, *heronries*, *men of war*, the *Miss Browns* and the *Misses Brown*.

8. Give the history of *its*.

9. Decline the three Personal Pronouns, in Anglo-Saxon and in modern English. Account for their differences.

10. Give examples of the different methods of Word-building. Show how while Prefixes change the meanings of words, Suffixes alter their syntactical functions.

11. Classify English Verbs, giving examples.

12. Which Verbs are not followed by *to* with the Infinitive?

13. Discriminate between the Infinitive and the Gerund in modern English.

14. State, with examples, the present three-fold use of Prepositions.

15. Analyse—

Knowledge is now no more a fountain sealed;  
 Drink deep, until the habits of the slave,  
 The sins of emptiness gossip and spite  
 And slander die. Better not be at all,  
 Than not be noble!—*Tennyson*.

16. Correct or justify—

It was one of the most important alliances that ever was formed.

Let me see who do I know among them.

The four artists hated each other.

It is I.

The then King.

EDWARD ARBER.

## OUTLINES OF ENGLISH HISTORY.

Friday, July 1st, 1887.—Afternoon, 2 to 5.

(*Not more than Ten questions are to be answered.*)

1. Write a short history of Britain before the arrival of the Anglo-Saxons.
2. Describe the various settlements of the Jutes, Saxons, Angles, and Danes in England.
3. Explain the meaning of the following words:—*tún, byrh, hundred, scirgerefa, witenagemót*. What was the Hide of land? Give the etymology of Chester, Birmingham, York, and Whitby.
4. Describe the successive stages of the Conquest of England by WILLIAM the Conqueror.
5. Write short lives of King ALFRED, King HAROLD, Archbishop LANFRANC, and Archbishop THOMAS-A-BECKET.
6. What was the Feudal System? State all the incidental charges of Tenure of land by Knight Service.
7. Describe the battles of Bannockburn, Sluys, Crecy, Najera, and Otterburn.
8. How did the Wars of the Roses originate? What were their principal events?
9. What was the principle involved in the Divorce Question of HENRY VIII.? How was that matter the occasion of the Reformation in England?
10. Describe Sir F. DRAKE's Voyage round the World.
11. Was MARY Queen of Scots justly or unjustly put to death? State your reasons.
12. Trace the connection between the Millenary Petition in 1603, the Hampton Court Conference in 1604, and the Authorized Version of the Scriptures in 1611.
13. What was the Spanish Match Journey?
14. What was the *Grand Remonstrance*? Describe the attempted arrest of the Five Members, of which it was the occasion.
15. How did JAMES II's *Declaration of Indulgence* attack the laws of England. Describe the Trial of the Seven Bishops which resulted from it.

EDWARD ARBER.

## ANGLO-SAXON.

Friday, July 1st, 1887.—Afternoon, 2 to 5.

1. Translate literally into English the following passages:—

A. *ÆLFRIC.*

*The Old Testament.*

Se ælmihtiga Scippend, ǽ ǽ hé englas gesceóp, ǽ geworhte hé þurh his wísdóm tyn engla werod on ǽam forman dæge on

micelre fægernisse fela þúsenda on ðám frumscafte, ðæt hí on his wuldre hine wurðedon ealle líchamleáse, leóhte and strange, búton eallum synnum on gesáððe libbende, swá wlitiges gecyndes swá wé secgan ne magon, and nán yfel þing næs on ðám englum ðá git, ne nán yfel ne com þurh Godes gesceapennisse, for ðan ðe hé sylf is eallgód and álc gód cymð of him; and ðá englas ðá wunodon on ðám wuldre mid Gode. Hwæt, ðá binnan six dagum ðe se sóða God ðá gesceafta gesceóp ðe hé gescippan wolde, gesceáwode se án engel, ðe ðær ænlicost wæs, hú fæger hé silf wæs and hú scínende on wuldre, and cunnode his mihte, ðátt hé mihtig wæs gesceapen, and him wel gelicode his wurðfullnis ðá: se hátte ‘Lucifer,’ ðæt is ‘Leóhtberend,’ for ðære miclan beorhtnisse his mæran hives. Ðá þúhte him tó huxlic ðæt hé híran sceolde ænigum hláforde, ðá hé swá ænlic wæs, and nolde wurðian ðone ðe hine geworhte, and him þancian áfre ðæs ðe hé him forgeaf, and beón him underþeódd ðæs ðe swíðor geornlice for ðære miclan mæððe ðe hé hine gemáðegode. Hé nolde ðá habban his Scippend him tó hláforde, ne he nolde þurhwunian on ðære sóðfæstnisse ðæs sóðfæstan Godes Suna, ðe hine gesceóp fægernisse, ac wolde mid riccetera him rice gewinnan, and þurh móðignisse hine macian tó Gode, and nam him gegadan ongeán Godes willan tó his unráðe on eornost gefestnod. Ðá næfde hé nán setl, hwær hé sittan mihte, for ðan ðe nán heofon nolde hine áberan, ne nán rice næs ðe his mihte beón ongeán Godes willan, ðe geworhte ealle þing. Ðá áfunde se móðiga hwilce his mihta wáron, ðá ðá his fét ne mihton furðon áhwar standan, ac hé feóll ðá adún tó deófle áwend and ealle his gegadan of ðám Godes hiréde into helle wíte be heora gewyrhtum.

## B. CYNEWULF.

*ELENE, II.*

HEHT þá onlice æðelinga hléo,  
 beorna béaggifa, swá hé þæt béacen geseah,  
 herja hildfruma, þæt him on heofonum ár  
 geíewed wearð, ófstum myclum,  
 Constantínus, Crístes róde,  
 tíréadig cyning, tácen, gewyrcean.  
 heht þá on úhtan mid árdæge  
 wígend wreccan ond wápenþræce,  
 hebban heorucumbul ond þæt hálige tréo

him beforan ferjan, on féonda gemang  
 beran béacen godes. býman sungon  
 hlúde for hergum. hrefu weorces gefeah,  
 úrigfeðra earn sið behéold,  
 wælhreowra wíg, wulf sang áhóf,  
 holtes gehléða. hildegesa stód.  
 þær wæs borda gebrec ond beorna gefrec,  
 heard handgeswing ond herga gring,  
 syððan héo earhære ærest méttan.  
 on þæt fátge folc flána scúras,  
 gáras ofer geolorand on gramra gemang  
 hetend heora/grimme, hildenædran  
 þurh fingra geweald forð onsendan.  
 stópon stóðhídige, stundum wræcon,  
 bræcon bordhréðan, bil in dufan,  
 þrungon þræchearde. þá wæs þúf hafan,  
 segn, for sweotum, sigeléoð galen.  
 gylden gríma, gáras líxtan  
 on heræfelda. hæðene grungon,  
 féollon friðelése. flugon instæpes  
 Húna léode, swá þæt hálige tréo  
 áræran heht Rómwara cyning  
 heaðofremmende. wurdon hearingas  
 wíde tówrecene. sume wíg fornam,  
 sume unsófte aldor generedon  
 on þám heresiðe, sume healfswice  
 flugon on fæsten ond feore burgon  
 æfter stánclifum, stede weardedon  
 ymb Danúbie, sume drenc fornam  
 on lagostréame lífes æt ende.  
 ðá wæs móðigra mægen on luste,  
 éhton elþéoda óð þæt æfen forð  
 fram dæges orde : daroðas flugon,  
 hildenædran. héap wæs gescyrded,  
 láðra lindwered. lythwón becwom  
 Húna herges hám eft þanon.  
 þá wæs gesýne, þæt sige forgeaf  
 Constantíno cyning ælmiltig  
 æt þám dægweorce, dómweorðunga,  
 rice under roderum, þurh his róde tréo.

2. Write the Infinitives of *gescah*, *getæwed*, *fornam*, *áhóf*, *stópon* and *forgeaf*.



3. Give the normal Anglo-Saxon spelling of *onlice*, *ond*, *becwom*, and *ferjan*.

4. Write a short history of the *Codex Vercellensis*.

5. Narrate the action of CYNEWULF's *ELENE*.

EDWARD ARBER.

## EARLY ENGLISH.

Friday, July 1st, 1887.—Morning, 10 to 1.

1. Translate literally into modern English, the following passages :—

A.

ANCREN RIWLE. 1200 A.D.

A lefdi was þet was mid hire voan biset al abuten, and hire lond al destrued, & heo al povre, wiþinnen one eorþene castel. On mihti kinges lufe was þauh biturnd upon hire, so unimete swuþe þet he vor wouhleccunge sende hire his sonden, on efter oþer, and oft somed monie; & sende hire beaubelez boþe veole & feire, and sukurs of livenesþ, & help of his heie hird to holden hire castel. Heo underveng al ase on unrecheleas þing, þet was so herd-ihearted þet hire lufe ne muhte he never beon þe neorre. Hwat wult-tu more? He com him sulf a-last, and scheawede hire his feire neb, ase þe þet was of alle men veirest for to biholden, and spec swuþe sweteliche, & so murie wordes þet heo muhten þe deade arearen vrom deaþe to live. And vrouhte veole wundes, and dude veole meistries bivoren hire eihsihþe; & scheawede hire his mihten; tolde hire of his kinedome; and bead for to makien hire cwene of al þet he ouhte. Al þis ne help nout. Nes þis wunderlich hoker? Vor heo nes never wurþe vor te beon his schelchine. Auh so, þuruh his debonerte, lufe hefde overkumen hine þet he seide on ende: 'Dame, þu ert iweorred, & þine von beoþ so stronge þet tu ne meiht nones-weis wiþuten sukurs of me ettleon hore honden, þet heo ne don þe to scheomefule deaþe. Ichchulle vor þe lufe of þe nimen þis fiht upon me, and aredden þe of ham þet secheþ þine deaþ. Ich wot þauh for soþe þet ich schal bitweonen ham undervongen deaþes wunde; and ich hit wulle hearteliche vor to ofgon þine hearte. Nu, þeonne, biseche ich þe, vor þe lufe þet ich kuþe þe, þet tu luvie me, hure & hure, efter þen ilke deaþe dead, hwon þu noldes lives.' Þes king dude al þus: aredde hire of alle hire von,

and was himself to wundre ituked, and isleien on ende.  
 þuruh miracle, þauh, he aros from deaþe to live. Nere þeos  
 ilke lefdi of uuele kunnes kunde, gif heo over alle þing ne  
 luve him her-efter?

## B

## ORMULUM. 1200 A.D.

I a33 wass sallt wiþþ iwhille lac,  
 forr þatt itt sholde tacnen  
 þatt all þatt tu willt offrenn Godd,  
 3iff þatt itt shall himm cwemenn,  
 all birrþ itt offredd ben wiþþ skill,  
 I all wiþþ luffsumm heorte,  
 swa þatt itt be clennlike don,  
 off rihhtbi3etenn ahhte,  
 swa þatt te Laferrd Jesu Crist  
 swetlike itt unnderfanne.  
 þiss wass bitacnedd þurh þe sallt  
 þatt ure mete sweteþ,  
 3iff þatt iss þatt mann wile itt don  
 wiþþ witt I skill þærinne.  
 Forr witt I skill iss wel inoh  
 þurh salltess smacc bitacnedd,  
 I tatt forr-þi-þatt witt I skill  
 iss god inn alle þinge,  
 all swa summ sallt iss swiþe god  
 þær þær itt to-bilimpeþþ;  
 I all forr-þi wass æfre sallt  
 wiþþ alle lakess offredd,  
 forr-þi-þatt nohht ne ma33 ben don  
 Allmahhti3 Godd to cweme,  
 but iff itt be wiþþ witt I skill  
 I luffsummlike forþedd.  
 All þuss þu mahht nu lakenn Godd  
 gastlike i þine þæwess,  
 wiþþ all þatt lac þatt offredd wass  
 biforenn Cristess come.

2. Discuss the dialects of the above passages, with reference  
 (1) to Anglo-Saxon, (2) to each other.

3. Explain the system of spelling adapted by the writer of the  
*Ormulum*, with the probable reasons for it.

## 4. Write in Anglo-Saxon—

Nere þeos ilke lefdi of uvele kunnes kinde.  
 I a33 wass salt wiþþ iwhille lac.

EDWARD ARBER.

**ENGLISH COMPOSITION.**

Thursday, June 30th, 1887.—Afternoon, 2 to 5.

1. Describe fully all the conditions that go to make a good Paragraph. Why are the paragraphs so important in modern English style?

2. Discuss the advantages and disadvantages of using (1) short or long Words; (2) short or long Sentences.

3. Describe the points to be observed in letter writing. Illustrate the same, by brief examples of (1) a letter of condolence upon a bereavement, (2) another of felicitation upon a happy event, (3) another of advice that must be unwelcome. Who are the great Letter Writers in English Literature?

4. What are the principal matters to be observed in good fiction, as regards (1) the plot, (2) the local colouring, (3) the characters, and (4) their talk?

5. Discriminate between Blank Verse and Heroic Couplets. Tell all you know of the Terza Rima, Ottava Rima, and the Chaucerian Stanza.

6. What is the use and purpose of Rhetoric? Discriminate between a Metaphor and a Simile. Describe, with examples, some of the forms of Metonymy. Define Antanacsis, Climax, and Onomatopœia.

7. Write in prose on *one* of the following subjects:

(a) A brief survey of the fifty years' reign of Queen VICTORIA.

(b) A description of the Queen's Jubilee visit to the town of Birmingham.

(c) A description of the prettiest place you have ever seen.

EDWARD ARBER.

**ENGLISH LITERATURE AND HISTORY.**

Thursday, June 30th, 1887.—Morning, 10 to 1.

INTERMEDIATE PASS COURSE.

Period, 1558-1603 A.D.; with Special Works.

1. Describe the five chief Works in prose produced in the reign of Queen ELIZABETH.

2. Give an account of the various poetical Translations from the Classics during this Period ; both in rhymed verse, and in " Artful verse."

3. Name, with dates, the Poetical Miscellanies of the reign.

4. Describe the occasion, plan, ground works, and gradual development of the *Mirror for Magistrates*. Name two Poems in it that became celebrated.

5. Write an account of our first Actors, our first Dramas, and our first Theatres.

6. Trace the rise of the Puritans in the Church, in the literature, and in politics.

7. Tell all you know of SIDNEY'S *ASTROPHEL* and *STELLA*, and his *Arcadia*.

8. Describe the Adventures in the Fourth Book of the *Faerie Queene*.

9. Give a brief account of *EUPHUES* and his *England*, and of its Author. Whence is the special literary importance of this Work ? Illustrate its peculiarities of style.

10. Describe the plot of SHAKESPEARE'S *Twelfth Night* ; and in particular the characters of VIOLA, the Clown, and Sir ANDREW AGUECHEEK.

11. Give information respecting the following Works and their Authors :—*The Casket Letters*, *A brief Discourse of the Troubles begun at Frankfort*, *The Gaping Gulf*, *The Execution of Justice*, *The Annals of England*, *The principal navigations voyages and discoveries of the English Nation*, *MENAPHON*, *Every man out of his humour*.

EDWARD ARBER.

Thursday, June 30th, 1887.—Afternoon, 2 to 5.

B.A. PASS COURSE.

Period, 1360—1400 A.D. ; with Special Works.

1. Write a sketch of the Literary History of this Period.

2. Narrate the changes as to the national language which took place in this time.

3. State the chief ascertained facts of CHAUCER'S life.

4. What innovations did CHAUCER make in the English versification ? Compare his versification with that in *PIERS PLOWMAN*.

5. Compare the poetical diction of CHAUCER'S *Knight's Tale* with that of its modernization by DRYDEN in his *PALAMON and ARCITE*.

6. What does the Prologue to the *Legend of Good Women* tell us of CHAUCER ? Quote the lines that contain the list of his Works

up to the time of his writing that Prologue. Describe its two versions, and quote the lines which fix the anterior date of the revised one.

7. When did Archdeacon JOHN BARBOUR write his *Bruce*? Describe the nature and duration of its action; and also the versification of the poem.

8. Write an account of JOHN GOWER. Describe fully his *Vox Clamantis*, and briefly his *Confessio Amantis*.

9. Give WILLIAM of Thorpe's account of the chief Lollard doctrines. Name the translators of the two Lollard versions of the Scriptures into English. Discuss the following words in the Wycliffite version of the *Proverbs*: *leize*, *preciousere*, *relatide*, *beliȝt*, *zalde*, *undirnyne*.

10. Describe Dr. JOHNSON'S opinions of DRYDEN, as a dramatist, a satirist, a versifier, a critic, and a man.

11. Write short notices of Sir JOHN MANDEVILLE, JEAN FROISSART, "the philosophical STRODE," and JOHN of Trevisa.

EDWARD ARBER.

## FRENCH.

### LADIES' CLASS AND JUNIOR CLASS.

Wednesday, June 29th, 1887.—Afternoon, 2-30 to 5-30.

#### I. LA RICHESSE DE LA LANGUE FRANÇAISE.

Il est bien curieux et bien délicat le travail lu, ces jours derniers, par M. Michel Bréal, à la séance publique annuelle des cinq académies, sur le classement de mots dans notre esprit.

Voici, par exemple, ce qu'il dit du caractère fortuit des causes qui influent sur le sens des mots et en multiplient les applications :

"Une société aussi variée, aussi compliquée que la nôtre, se divise nécessairement en divers groupes qui n'ont ni les mêmes besoins ni les mêmes occupations. Il arrive constamment qu'un terme général, en passant dans la langue des différents états et métiers, a pris une signification particulière qui n'est pas du tout la même d'une profession à l'autre. Veuillez songer un instant aux sens donnés à des termes tels que *travail*, *ouvrage*, *opération*, *acte*, *effet*, *élément*, *exercice*. Il semble que la langue ait pris la mesure trop large pour le mot, lequel se rétrécit ensuite aux dimensions de la chose. Dans l'île de Guernesey, le mot *œuvre* désigne un tricot. Chez nos paysans, le travail par excellence, le travail de la terre, a limité et fixé le sens du mot *labour*. Pour le soldat, *exercice* représente le maniement des armes; pour le pianiste, des morceaux qui exigent la rapidité et la justesse du doigté; pour l'administrateur, la perception et l'emploi du revenu public. C'est la multiplicité des professions qui amène à sa suite la multiplicité des sens. La langue française, comme une sorte de matière première, est dis-

tribuée à tous les états, à toutes les vocations, à toutes les sciences, à tous les arts, lesquels la rendent ensuite façonnée et diversifiée. Les choses ne sont pas désignées par des mots à signification toute matérielle, comme *clef, ton, racine, article* ! Cette variété n'est point, ainsi que l'ont cru des observateurs superficiels, un symptôme de pauvreté, mais au contraire une preuve de vitalité et de richesse."

## II. PRÉFACE DU ROMAN DE LÉLIA.

Après *Indiana* et *Valentine* j'écrivis *Lélia*, sans suite, sans plan, et avec l'intention, dans le principe, de l'écrire pour moi seule. Je n'avais aucun système, je n'appartenais à aucune école, je ne songeais presque pas au public ; je ne me faisais pas encore une idée nette de ce qu'est la publicité. Je ne croyais nullement qu'il pût m'appartenir d'impressionner ou d'influencer l'esprit des autres.

Était-ce modestie ? Je puis affirmer que oui, bien qu'il ne paraisse guère modeste de s'attribuer une vertu si rare. Mais comme, chez moi, ce n'était pas vertu, je dis la chose comme elle est. Ce n'était pas un effort de ma raison, un triomphe remporté sur la vanité naturelle à notre espèce, mais bien une insouciance du fait, un imprévoyance innée, une tendance à m'absorber dans une occupation de l'esprit, sans me souvenir qu'au delà du monde de mes rêves, il existait un monde de réalités sur lequel ma pensée, sereine ou sombre, pouvait avoir une action quelconque. . . .

Le livre a été écrit de bonne foi, sous le poids d'une souffrance intérieure quasi mortelle, souffrance toute morale, toute philosophique et religieuse, et qui me créait des angoisses inexplicables pour les gens qui vivent sans chercher la cause et le but de la vie. . . .

Ceux qui liront plus tard l'histoire de ma vie intellectuelle ne s'étonneront plus que le doute ait été pour moi une chose si sérieuse.—*Georges Sand.*

## III. Grammar.

1. Parse the words—"se sont élançés" ; "j'en vois qui se latent."

2. Give the second person singular and plural, present indicative, and third person singular and plural, present subjunctive, of the following verbs :—*Employer, étendre, mettre, faire, croire, s'entr'ouvrir, voir, disparaître, secourir* ; give also the future, first person singular, of *faire* and *voir*, *secourir*, and explain their formation.

3. "*Thackeray naquit en 1811.*" Write this date in full.

Translate and write in full :—"The Temple of Jerusalem was commenced in 1011, B.C." "The Turks took Jerusalem in the year 1076 of the Christian era."

4. *Les beaux ciels.* State the rule about the two plural forms of *ciel*. Give also the two plurals of *vil*, and the singular, if any, of *aient*, *mœurs*, *voix*, *gens*, *nez*, *baux*.

5. Distinguish between *avant*, *devant*, *auparavant*, with respect to their meaning and place, and translate :—*I saw him before. She*

*stood before me. Come before night. Knock at the door before coming in.*

6. Give the *gendre* of the words—*lueur, éclair, voiles, anniversaire, soupçon, gens*. State the general rule or rules concerning the gender of nouns derived from Latin.

7. Translate—Come for her. Send for your book. Give me some. Do not give me any. You are no more than twenty years of age. There are only ten books on the table.

8. Put in the plural the following sentences:—“à laquelle un peintre qui aurait bien employé son temps n'eût donné.” “L'école où il avait été.

#### IV. A HAPPY EXPRESSION.—UNEXPECTED POLITENESS.

In 1793, when Buonaparte was besieging Toulon, which was then in possession of the English, and from which he drove them, he was one day directing the construction of a battery, and the enemy perceiving it, commenced a warm fire upon it. Buonaparte, wanting to send off a despatch, asked for a sergeant who could write. A sergeant immediately came out of the ranks and wrote a letter under his dictation. It was scarcely finished when a cannon-ball fell between Buonaparte and him, and covered them with dust: the latter, looking towards the English lines, said, “Gentlemen, I thank you, I did not think you were so polite. I wanted a little sand for my letter.”

The expression, and the calmness of the sergeant, struck Napoleon; he did not forget it; the sergeant was soon promoted, and finally became a general—it was the brave Junot, whose name is so often found in the annals of French glory, and who, by his courage and perseverance, became Duke of Abrantes, a name rendered doubly illustrious by the literary productions of his widow, the Duchess of Abrantes.

E. LORVILLE.

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#### MIDDLE CLASS.

Wednesday, June 29th, 1887.—Afternoon, 2.30 to 5.30.

1. Translate into English:—

#### L'ALLIANCE DE LA POLITIQUE ET DES LETTRES.

Il n'y a de vraie et de sérieuse littérature que dans l'alliance des affaires et des lettres. Bossuet n'aurait pas été un aussi grand orateur s'il n'avait pas été un grand évêque. Voltaire n'aurait été qu'un auteur de tragédies du second ordre s'il n'avait pas remué son siècle par l'ascendant de ses idées et mêlé la politique à la poésie. Quand il n'y aura plus en France que des littérateurs proprement dits, nous pourrons dire adieu à la littérature. Il est vrai qu'il nous restera les chemins de fer et la Bourse.

Eh bien! Je l'avoue, à ma confusion si l'on veut, je préfère un beau livre à une belle machine; je donnerais tous les vaisseaux à

hélice du monde pour une *Iliade* ou pour une *Enéide*. Je ne suis pas si amoureux de la tranquillité que je n'achetasse volontiers par un peu d'agitation ces grandes œuvres de l'esprit qui ne naissent guère qu'aux époques de lutte morale et politique. Je ne plains pas la petite démocratie athénienne d'avoir enfanté dans les douleurs de ses discordes intestines, de ses guerres et de ses révolutions un Périclès, un Thucydide, un Démosthène. Rome ne me paraît pas avoir payé trop cher la gloire que l'éloquence d'un Cicéron répandra à jamais sur le génie romain. Je ne dis pas : Heureux les peuples qui n'ont pas d'histoire ! Heureux, au contraire, les peuples qui en ont une, quelque prix qu'elle leur ait coûté ! Heureux les peuples qui ont vécu et immortalisé leur nom ! Heureux les peuples qui ont eu de grands capitaines, de grands orateurs ! Tout cela s'achète cher, j'en conviens. La liberté a ses orages, la gloire ses retours cruels ! Oui, mais avoir une histoire, c'est avoir vécu. Cette tranquillité morne que quelques personnes regardent comme l'apogée du bonheur pour un peuple, c'est le néant. Autant vaudrait n'avoir pas été. Quel est le barbare qui voudrait retrancher le XVI. siècles de nos annales, malgré tant de discordes civiles et de guerres de religion ? Y a-t-il un véritable Anglais qui rougisse de la révolution de 1648 et de Cromwell lui-même ?—*Sylvestre de Lacy*.

### Grammar.

1. Give the future, first person singular and plural, of—*savoir*, *assavoir*, *cueillir*, *tenir*, *voir*, *valoir*, and explain the formation of that tense in those verbs.

2. Give the feminine forms of the adjectives—*favori*, *turc*, *franc*, *absous*, *matin*, *bas*, *exprès*, and explain the so-called irregularities.

3. Explain the presence of the negative *ne* in Lafontaine's "On se voit d'un autre œil qu'on *ne* voit son prochain ;" and in Boileau's "Gardez qu'une voyelle à courir trop hâtée, *ne* soit d'une voyelle en son chemin heurtée." Explain also why the conjunction "à moins que" generally governs *ne*.

4. Of what gender are *chêne*, *corne*, *douleur*, *fleur*, *incendie*, *génie*, *pomme*, *espace*, *art*, *dent*, *gent*, respectively. State rules and explain exceptions. State also the reason why *délice*, *orgue*, *œuvre*, *voile*, are of both genders. When are they masculine ? When feminine ?

5. Give the complete rule of agreement of the past participle in the reflective verb. Instances.

6. Through what intermediate forms have *stant*, *amant*, passed to reach their present form ?

7. "Chacun aime à parler de soi." "Il ne parle que de lui-même." Why this difference in the translation of English *himself* ?

### Idiom.

Translate or explain (give the French idiomatic expressions when such exist) :—



Send this bottle round. I shall bring them round. He died a pauper ; his widow is entirely unprovided for. We have provided against all accidents. Is your new book out ? No, it is not. Bring it here. Bring him here. He was not well brought up. When did you break up ? I shall attend to your business.

Show by examples the different ways in which the verbs *to get* and *to do* may be rendered into French.

Translate :—Par bonheur ; de bonne heure ; à la bonne heure ; savez-vous l'heure ? Prenez une voiture à l'heure. Parlez sur l'heure. Je les ai vus tout-à-l'heure ; j'irai tout-à-l'heure. Tout n'est qu'heur et malheur.—“Tant d'heur et tant de gloire ne peuvent pas si tôt sortir de ta mémoire” (*Cinna*). Vous parlez à propos, à tout propos, à propos de rien, mal à propos. Je fus frappé de l'à-propos. Parlez à n'importe qui. Faites n'importe quoi. Faites-le n'importe comment. Allez n'importe où.

Show by instances the different ways in which the word *monsieur* may be translated into English.

Translate into French :—

#### THE FEUDAL SYSTEM.

It is the previous state of society, under the grand-children of Charlemagne, which we must always keep in mind, if we would appreciate the effects of the feudal system upon the welfare of mankind. The institutions of the eleventh century must be compared with those of the ninth, not with the advanced civilization of modern times. The state of anarchy which we usually term feudal, was the natural result of a vast and barbarous empire feebly administered, and the cause, rather than the effect, of the general establishment of feudal tenures. These, by preserving the mutual relations of the whole, kept alive the feeling of a common country and common duties ; and settled, after the lapse of ages, into the free constitution of England, the firm monarchy of France, and the federal union of Germany. . . .

If we look at the feudal polity as a scheme of civil freedom, it bears a noble countenance. To the feudal law it is owing that the very names of right and privilege were not swept away, as in Asia, by the desolating hand of power. The tyranny which, on every favourable moment, was breaking through all barriers, would have rioted without control, if, when the people were poor and disunited, the nobility had not been brave and free. So far as the sphere of feudality extended, it diffused the spirit of liberty and the notions of private right. Every one will acknowledge this who considers the limitations of the services of vassalage, so cautiously marked in those law-books which are the records of customs ; the reciprocity of obligation between the lord and his tenant ; the consent required in every measure of a legislative or general nature ; the security, above all, which every vassal found in the administration of justice by his peers, and even—we may in this sense say—in the trial by combat. The bulk of the people, it is true, were degraded by servitude.—*Hallam*.

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E. LOREILLE.

## SENIOR CLASS.

Wednesday, June 29th, 1887.—Afternoon, 2.30 to 5.30.

## I.

## LE CIMETIÈRE DE CAMPAGNE.

Où suis-je ? A mes regards un humble cimetière  
 Offre de l'homme éteint la demeure dernière.  
 Un cimetière aux champs ! quel tableau ! quel trésor ;  
 Là ne se montrent point l'airain, le marbre, l'or ;  
 Là ne s'élèvent point ces tombes jastueuses  
 Où dorment à grands frais les ombres orgueilleuses  
 De ces usurpateurs par la mort dévorés,  
 Et, jusque dans la mort, du peuple séparés.  
 On y trouve, fermés par des remparts agrestes,  
 Quelques pierres sans nom, quelques tombes modestes,  
 Le reste dans la poudre au hasard confondu.  
 Salut, cendre du pauvre ! Ah ! ce respect t'est dû.  
 Souvent ceux dont le marbre immense et solitaire  
 D'un vain poids après eux fatigue encor la terre,  
 Ne firent que changer de mort dans le tombeau ;  
 Toi, chacun de tes jours fut un bienfait nouveau.  
 Courbé sur les sillons, de leurs trésors serviles  
 Ta sueur enrichit l'oisiveté des villes ;  
 Et, quand Mars des combats fit retentir le cri,  
 Tu défendis l'État après l'avoir nourri.  
 Enfin, chaque tombeau de cet enclos tranquille  
 Renferme un citoyen qui fut toujours utile  
 Salut, cendre du pauvre ! accepte tous mes pleurs.

—*Lcgouré.*

## II.

## DE LA SYNTAXE.

Il convient d'indiquer pour compléter l'ouvrage,  
 Comment les mots entr'eux sont joints d'après l'usage.  
 La Syntaxe consiste à graver dans l'esprit  
 L'accord qui doit régner dans tout ce qu'on écrit.  
 Ainsi, lorsqu'on veut transmettre sa pensée,  
 Il faut que la raison ne soit jamais blessée :  
 Que le concours des mots fixe l'attention,  
 Chaque fois que l'on émet sa proposition.  
 Mais, pour que la clarté dans le discours préside,  
 Il faut que la syntaxe avec grâce le guide :  
 Que les règles de l'art, cimentant les écrits,  
 Leur donnent, en tout temps, et leur lustre et leur prix.  
 La proposition est ce qu'on appelle,

D'un jugement émis la peinture fidèle.  
 Quand je dis : *l'Eternel est juste et révérent,*  
 J'exprime, avec raison, qu'à cet être adoré  
 Convient la qualité de *révérent*, de *juste* :  
 Qui sait le mériter par sa puissance auguste.

—*E. Loreille.*

### III.

### Idioms.

Traduisez en Français :—

1. I am at a loss to understand what he means.
2. I shall find them out.
3. You must put up with it.
4. They have seen better days.
5. This book is out of print.
6. What a good fellow he is !
7. I have a fellow-feeling for him.
8. We shall set out this day week.
9. I won't part with it.
10. The whole is greater than a part.

### IV.

### Idiomatic Sentences.

Traduisez en Anglais :—

1. Le mieux est l'ennemi du bien.
2. À beau jeu, beau retour.
3. Mettez la main à l'œuvre.
4. Je remuerai ciel et terre.
5. Il n'est pas de votre force.
6. Ne me faites pas une querelle d'allemand.
7. Décampez au plus vite.
8. Nous nous sommes donné du bon temps.
9. C'est du charlatanisme rien de plus.
10. C'est la fiche de consolation.

### V.

### Composition.

Traduisez en Français :—

Cortes, at this time, was thirty-three, or, perhaps, thirty-four years of age. In stature he was rather above the middle size. His complexion was pale, and his large dark eyes gave an expression of gravity to his countenance not to have been expected in one of his cheerful temperament. His figure was slender, at least until later life, but his chest was deep, his shoulders broad, his frame muscular and well-proportioned. It presented the union of agility and vigour, which qualified him to excell in fencing, horsemanship, and the other generous exercises of chivalry. In his diet he was temperate, careless of what he ate, and drinking little ; while to

toil and privation he seemed perfectly indifferent. His dress, for he did not disdain the impression produced by such adventitious aids, was such as to set off his handsome person to advantage ; neither gaudy nor striking, but rich. He wore few ornaments, and usually the same ; but those were of great price. His manners, frank and soldier-like, concealed a most cool and calculating spirit ; but with his gayest humour there mingled a settled air of resolution which made those who approached him feel they must obey.

VI. Écrivez un essai soit sur "l'Amitié," "L'Éxil," ou sur  
"Le spectacle d'une nuit d'été."

E. LOREILLE.

### Composition.

(*Open to all classes.*)

Wednesday, June 29th, 1887.

#### REAPPEARANCE IN PUBLIC.

In the February of next year the Queen opened Parliament in person ; but she sat with eyes fixed on the ground, probably thinking of the last occasion, when he was by her side. Two visits were also paid this year to Aldershot, and two marriages in the Royal family took place—that of the Princess Mary of Cambridge to Prince Teck, and of the Princess Helena to Prince Christian. In October the Queen opened the new Waterworks at Aberdeen, and there for the first time since her widowhood spoke in public. She said : "I have felt that at a time when the attention of the country has been so anxiously directed to the state of public health, it was right that I should make an exertion to testify my sense of the importance of a work so well calculated as this to promote the health and comfort of your ancient city." Several interesting episodes belong to the year 1867. In February the Queen again opened Parliament in person. During the year she made her first essay in authorship with "The Early Years of H.R.H. the Prince Consort," which was compiled under her Majesty's direction by General Grey. On May 20 she laid the foundation stone of the Albert Hall, a task to which she had nerved herself with great difficulty, but with the hope that this building "might yet look down on such a centre of institutions for the promotion of art and science as it was his fond hope to establish there." The Queen of Prussia, the Sultan, and the Empress of the French were among the illustrious visitors this year, and in August the Queen once more escaped from State ceremonials and illustrious visitors to the quietude of Scotland. A detailed account of this visit is given in "More Leaves from the Journal," but quite the most interesting incident of it is the excursion to Abbotsford, with the recognition by a great Queen of a greatness to which even sovereigns must bow. "In the study," says the Queen, "we saw his (Sir W. Scott's)

Journal, in which Mr. Hope Scott asked me to write my name—which I felt it to be a presumption in me to do.” The Queen gives a picturesque description this year of the keeping of Halloween. “We had been driving out,” she writes, “but we hurried back to be in time for the celebration. Close to Donald Stewart’s house we were met by two gillies bearing torches. Louise got out and took one, walking by the side of the carriage, and looking like one of the witches in ‘Macbeth.’ As we approached Balmoral, the keepers and their wives and children, the gillies, and other people met us, all with torches, Brown also carrying one. We got out at the house, where Leopold joined us, and a torch was given to him. We walked round the whole house, preceded by Ross playing the pipes, going down the steps of the terrace. Louise and Leopold went first, then came Janie Ely and I, followed by everyone carrying torches, which had a very pretty effect. After this a bonfire was made of all the torches close to the house, and they danced reels whilst Ross played the pipes.”

Nothing in the year 1868 calls for detailed notice. Early in the year an address, signed by nearly 23,000 Irish residents in London, expressing loyalty and devotion, was presented; this being one outcome of the Fenian conspiracy and the Clerkenwell explosion. Then came news of the attempt to assassinate the Duke of Edinburgh in Australia—an event to which her Majesty alluded, with gratitude for his preservation, when in May she laid the foundation-stone of the new buildings for St. Thomas’s Hospital. Before the summer holiday, which this year was spent in Switzerland, at Lucerne, the Queen held a review of 27,000 volunteers, in Windsor Park. After a month in Switzerland, pausing only for three days at Windsor, the Queen proceeded once more to Balmoral. There, witnessing “the juicing of the sheep,” contemplating Highland christenings, drinking to the health of the babes and mothers “in whisky,” visiting poor old dying cottars, making presents of shawls and socks, the time wore away. It was this year that her Majesty’s “Leaves from the Journal of our Life in the Highlands” appeared, a copy of which was sent to Charles Dickens, as a gift from “one of the humblest of writers to one of the greatest.”

E. LOREILLE.

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## GERMAN.

### JUNIOR CLASS.

Tuesday, July 5th, 1887.—Afternoon, 2-30 to 5.

#### I. Translate into English—

(1.) Die Berge wurden hier noch steiler, die Tannenwälder wogten unten wie ein grünes Meer, und am blauen Himmel oben schifften die weissen Wolken. Die Wildheit der Gegend war durch ihre Einheit und Einfachheit gleichsam gezähmt. Wie ein guter Dichter liebt die Natur keine schroffen Übergänge. Die Wolken,

so bizarr gestaltet sie auch zuweilen erscheinen, tragen ein weiszes oder doch ein mildes, mit dem blauen Himmel und der grünen Erde harmonisch korrespondierendes Kolorit, so dasz alle Farben einer Gegend wie leise Musik in einander schmelzen, und jeder Naturanblick krampfstillend und gemüthberuhigend wirkt. Eben wie ein groszer Dichter weisz die Natur auch mit den wenigsten Mitteln die gröszten Effekte hervor zu bringen. Da sind nur *eine* Sonne, Bäume, Blumen, Wasser und Liebe. Freilich, fehlt letztere im Herzen des Beschauers, so mag das ganze wohl einen schlechten Anblick gewähren, und die Sonne hat dann bloss so und so viel Meilen im Durchmesser, und die Bäume sind gut zum Einheizen, und die Blumen werden nach Staubfäden klassifiziert, und das Wasser ist nasz.—*Heine, Harzreise.*

- (2.)           Steiget auf, ihr alten Träume!  
                  Öffne dich, du Herzensthor!  
                  Liederwonne, Wehmuthstränen  
                  Strömen wunderbar hervor.  
                  Durch die Tannen will ich schweifen,  
                  Wo die muntre Quelle springt,  
                  Wo die stolzen Hirsche wandeln,  
                  Wo die liebe Drossel singt.  
                  Auf die Berge will ich steigen,  
                  Auf die schroffen Felsenhöhn,  
                  Wo die grauen Schloszruinen  
                  In dem Morgenlichte stehn.  
                  Dorten setz' ich still mich nieder  
                  Und gedenke alter Zeit,  
                  Alter blühender Geschlechter  
                  Und versunkner Herrlichkeit.  
                  Gras bedeckt jetzt den Turnierplatz,  
                  Wo gekämpft der stolze Mann,  
                  Der die Besten überwunden  
                  Und des Kampfes Preis gewann.  
                  Epheu rankt an dem Balkone,  
                  Wo die schöne Dame stand,  
                  Die den stolzen Überwinder  
                  Mit den Augen überwand.  
                  Ach! den Sieger und die Siegrin  
                  Hat besiegt des Todes Hand—  
                  Jener dürre Sensenritter  
                  Streckt uns alle in den Sand.—*Heine, ibid.*

(3.) So stillstehend ruhig auch das Leben dieser Leute erscheint, so ist es dennoch ein wahrhaftes, lebendiges Leben. Die steinalte, zitternde Frau, die, dem groszen Schranke gegenüber, hinterm Ofen sass, mag dort schon ein Vierteljahrhundert lang gesessen haben, und ihr Denken und Fühlen ist gewisz innig verwachsen mit allen Ecken dieses Ofens und allen Schnitzereien dieses Schrankes. Und Schrank und Ofen leben, denn ein Mensch hat ihnen einen Teil seiner Seele eingeblözt. Nur durch solch tiefes Anschauungsleben,

durch die „Unmittelbarkeit“ entstand die deutsche Märchenfabel, deren Eigentümlichkeit darin besteht, dass nicht nur die Tiere und Pflanzen, sondern auch ganz leblos scheinende Gegenstände sprechen und handeln. Sinnigem, harmlosem Volke in der stillen, umfriedeten Heimlichkeit seiner niedern Berg- und Waldhütten offenbarte sich das innere Leben solcher Gegenstände; diese gewannen einen notwendigen, konsequenten Charakter, eine süsse Mischung von phantastischer Laune und rein menschlicher Gesinnung.—*Heine, ibid.*

## II. Translate into German—

He has succeeded in his difficult undertaking. I am not easily frightened, but if he were to speak to me I should not know what to say. My eldest brother would also have come, if he had not suffered from headache. If Henry had kept his promise, I would have written to our friends in Dresden last night. Of all the singing birds the nightingale sings most charmingly. Why did you call that man your friend? He pretended not to know you. After visiting some friends in Paris, we went by train to Brest where we remained two days, and then we started for America by steamer. The meeting did not take place, but we found an opportunity of thanking all our old friends for their great kindness. Except us two there was no person present. According to my opinion it does not matter whether we travel on foot, on horseback, in a carriage, by land or by sea. The wind has fallen; not a leaf moves now. My uneasiness cannot be described; but the matter has at last been decided, and we are making arrangements for the journey.

## III. Grammar questions.

(1.) Give the nominative and genitive singular, and the nominative and dative plural, with the definite article, of—*Palast, Ort, Tag, Nacht, Schnur, Pfand, Mensch, Hospital*, adding the meaning in English.

(2.) Decline fully all the personal pronouns as well as—*ein tiefes Thal, welcher Mann, feine Seide*, and state the rule for the declension of adjectives.

(3.) Conjugate the present indicative and subjunctive of—*nehmen, fallen, gehen, laufen*, and give the infinitive, imperfect, and past participle of the German verbs—to *succeed, to recover from illness, to enjoy, to stand, to see, to be frightened, to frighten*.

(4.) State the gender of nouns ending in—*ig, ling, heit, chen, tum, keit, nis*.

(5.) What cases are connected with the prepositions—*an, aus, auf, wegen, mit, statt, durch, für, um?*

KARL DAMMANN.

## SENIOR CLASS.

Tuesday, July 5th, 1887.—Afternoon, 2.30 to 5.

## I. Translate into English—

(1.) *Marinelli*. — Hier, gnädiger Herr, aus diesem Fenster können Sie ihn sehen. Er geht die Arkade auf und nieder. Eben biegt er ein; er kömmt—Nein, er kehrt wieder um. Ganz einig ist er mit sich noch nicht. Aber um ein Groszes ruhiger ist er—oder scheint er. Für uns gleichviel!—Natürlich! Was ihm auch beide Weiber in den Kopf gesetzt haben, wird er es wagen zu äuszern?—Wie Battista gehört, soll ihm seine Frau den Wagen sogleich herausenden. Denn er kam zu Pferde. Geben Sie Acht, wenn er nun vor Ihnen erscheint, wird er ganz unterthänigst Eurer Durchlaucht für den gnädigen Schutz danken, den seine Familie bei diesem so traurigen Zufalle hier gefunden; wird sich mit sammt seiner Tochter zu fernerer Gnade empfehlen; wird sie ruhig nach der Stadt bringen, und es in tiefster Unterwerfung erwarten, welchen weitem Antheil Euer Durchlaucht an seinem unglücklichen, lieben Mädchen zu nehmen geruhen wollen.

*Prinz*.—Wenn er nun aber so zahm nicht ist? Und schwerlich wird er es sein. Ich kenne ihn zu gut. Wenn er höchstens seinen Argwohn erstickt, seine Wuth verbeißt, aber Emilien, anstatt sie nach der Stadt zu führen, mit sich nimmt? bei sich behält? oder wohl gar in ein Kloster auszer meinem Gebiete verschlieszt? Wie dann?

*Marinelli*.—Die fürchtende Liebe sieht weit. Wahrlich! Aber er wird ja nicht.—

*Prinz*.—Wenn er nun aber! Wie dann? Was wird es uns dann helfen, dass der unglückliche Graf sein Leben darüber verloren?  
—*Lessing, Emilia Galotti.*

## (2.)

Die Gesinnung ist löblich, und wahr ist auch die Geschichte. Mütterchen, die du erzählst; denn so ist Alles begegnet. Aber besser ist besser. Nicht einen Jeden betrifft es, Anzufangen von vorn sein ganzes Leben und Wesen; Nicht soll Jeder sich quälen, wie wir und Andere thaten. O, wie glücklich ist der, dem Vater und Mutter das Haus schon Wohlbestellt übergeben, und der mit Gedeihen es ausziert! Aller Anfang ist schwer, am schwersten der Anfang der Wirthschaft. Mancherlei Dinge bedarf der Mensch, und Alles wird täglich Theurer; da seht' er sich vor, des Geldes mehr zu erwerben. Und so hoff' ich von dir, mein Hermann, dasz du mir nächstens In das Haus die Braut mit schöner Mitgift hereinführt; Denn ein wackerer Mann verdient ein begütertes Mädchen, Und es behaget so wohl, wenn mit dem gewünschten Weibchen Auch in Körben und Kasten die nützliche Gabe hereinkommt. Nicht umsonst bereitet durch manche Jahre die Mutter Viele Leinwand der Tochter von feinem und starkem Gewebe;



Nicht umsonst verehren die Pathen ihr Silbergeräthe,  
 Und der Vater sondert im Pulte das seltene Goldstück ;  
 Denn sie soll dereinst mit ihren Gütern und Gaben  
 Jenen Jüngling erfreun, der sie vor Allen erwählt hat.  
 Ja, ich weisz, wie behaglich ein Weibchen im Hause sich findet,  
 Das ihr eignes Geräth in Küch' und Zimmern erkennt,  
 Und das Bette sich selbst und den Tisch sich selber gedeckt hat.  
 —Goethe, *Hermann und Dorothea*.

## II. Translate into German—

(1.) Spain was indeed the land of chivalry. The respect for the sex which had descended from the Visigoths was mingled with the religious enthusiasm which had been kindled in the long wars with the Infidel. The apotheosis of chivalry in the person of their apostle and patron, St. James, contributed still further to this exaltation of sentiment, which was maintained by the various military orders, who devoted themselves, in the bold language of the age, to the service "of God and the ladies." So that the Spaniard may be said to have put in action what, in other countries, passed for the extravagances of the minstrel. An example of this occurs in the fifteenth century, when a passage of arms was defended at Orbigo, not far from the shrine of Compostella, by a Castilian Knight, named Suero de Queñones, and his nine companions, against all comers, in the presence of John the Second and his court. The object was to release the Knight from the obligation, imposed on him by his mistress, of publicly wearing an iron collar round his neck every Thursday. The whole affair is narrated with becoming gravity by an eye-witness, and the reader may fancy himself perusing the adventures of a Launcelot or an Amadis.—*Prescott, History of the Reign of Ferdinand and Isabella*.

(2.) Give the idiomatic German for—No sooner said than done. The country is alive to the imminent danger. How came this change about? He lives thoughtlessly. Unity is great strength. I will give you this in the bargain. His opponent took to his heels. That is no business of yours. He was caught in the very act. I can make nothing of it. She ought to have done it. What day of the month is it? How dare you do such a thing? There was much talking and laughing. I cannot help it. This is a nice chair to sit on. I could not help laughing.

## III.

### Literature.

(1.) Give an outline of the plot of "*Emilia Galotti*," and a short description of the principal characters in "*Hermann und Dorothea*."

(2.) Show the connexion of each of the two given extracts with the rest of the piece from which it is taken.

(3.) Mention some of the chief prose works of Lessing and Goethe, and discuss their contents.

KARL DAMMANN.

## PURE MATHEMATICS.

## JUNIOR CLASS.

Tuesday, June 28th, 1887.—Morning, 10 to 1.

1. Explain how to place the decimal point in the quotient and in the remainder after dividing one decimal by another.

Divide 576·319624175874 by 8197·563 to five places of decimals in the quotient and give the complete remainder.

2. Gold is sold to the Mint at £3 17s. 10½d. per oz., and is mixed with alloy, worth 5s. 2d. per oz., in the proportion of 11 to 1. If sovereigns be coined of this mixture, each weighing 5 dwts. 3·247 grains, find what is the Mint profit on 100 sovereigns.

3. A tradesman sells goods at a profit of 30 per cent., but takes 5 per cent. off his customer's bill for cash payment. Find his percentage of profit.

4. Incomes less than £150 are exempt from tax, and incomes between £150 and £400 can claim an abatement of £120. A man has to pay an income tax of £17 17s. 5d., the tax being 8d. in the £. If it were allowable for him to reckon his own and his wife's incomes separately, he could claim abatement for himself and exemption for his wife, and then the amount of the tax would be halved. Find their respective incomes.

5. Find the G.C.M. of

$$4x^4 + 26x^3 + 41x^2 - 2x - 24$$

$$\text{and } 3x^4 + 20x^3 + 32x^2 - 8x - 32.$$

6. Reduce to its simplest form the expression

$$\frac{1}{(x+1)^2(x+2)^2} - \frac{1}{(x+2)^2} + \frac{2}{x+1} - \frac{2}{x+2}.$$

7. Solve the equation

$$\frac{7x+23}{21} - \frac{x+1}{3} = \frac{1}{2} \left( \frac{x+9}{2x+7} + \frac{23}{35} \right).$$

8. Enumerate the cases in which it can be proved that two triangles are equal in all respects.

If two triangles have two sides of the one equal to two sides of the other, each to each, and have the angles opposite to one of the equal sides in each equal to each other, prove that in certain cases the triangles are equal in all respects. What happens in the excepted case?

9. Show that if a straight line meet two parallel straight lines, it makes the alternate angles equal to each other.

Show how to divide a given finite straight line into any required number of equal parts, giving the full proof.

10. The square on the sum of two lines exceeds the sum of the squares on the lines by twice the rectangle contained by them.

Divide a given line into two parts, such that the sum of the squares in the parts may be equal to a given square.

Where will be the point of division when the given square exceeds the square on half the given line?

R. S. HEATH.

Tuesday, June 28th, 1887.—Afternoon, 2 to 5.

1. Reduce the decimal  $3.8\dot{7}\dot{2}$  to a vulgar fraction in its lowest terms.

2. A bill of £86 15s. 6½d. is only worth £86 6s. 5d. to-day, the rate of interest being 3½ per cent. How long has the bill to run?

3. A tea merchant buys teas at 4s. 3½d. per lb. and 2s. 7d. per lb. and mixes them. Find the proportion in which he must mix them in order to realise a profit of 35 per cent. by selling the mixture at 4s. per lb.

4. Divide £153 6s. 9d. among three persons, A, B, C, so that A may have 5 per cent. more than B, and B may have 4 per cent. more than C.

5. Solve the equations

$$\left. \begin{aligned} \frac{y - \frac{1}{2}}{6} &= \frac{3}{8}(3 - x) + \frac{1}{24} \\ x - y &= \frac{5}{12}(y - 3) - 1 \end{aligned} \right\}.$$

What is the peculiarity of the equations

$$\left. \begin{aligned} 7x - 18y &= 13 \\ \frac{1}{4}(x - 3y) &= \frac{1}{2} - \frac{1}{24}x \end{aligned} \right\}?$$

6. Insert 42 arithmetic means between 3 and 175. Show that the sum of all these means is 3738.

7. The third term of a Geometrical Progression is  $3\frac{2}{3}$ , and the sixth is  $-\frac{1}{12}\frac{2}{3}\frac{4}{9}$ . Find the first term and the common ratio, and show that the sum of the series to infinity is equal to 7.

8. Construct all the common tangents to two given circles, distinguishing between the cases in which the circles (1) lie entirely outside each other, (2) touch each other externally, (3) cut each other, (4) lie one inside the other.

9. If the circumference of a circle be divided into any number of equal parts, the points of division are the angular points of a polygon which is equilateral and equiangular.

If the alternate angles of a regular heptagon be joined, show that the resulting star-shaped figure is equilateral and equiangular.

10. A point moves so that the sum of the squares of its distances from the angular points of a parallelogram is constant, prove that the point must always remain at the same distance from the centre of the parallelogram.

R. S. HEATH.

### MIDDLE CLASS.

Tuesday, June 28th, 1887.—Morning, 10 to 1.

1. Simplify the expression

$$\left( \frac{a^{-\frac{2}{3}} x^{\frac{1}{2}}}{x^{-1} a} \right)^2 \div \sqrt[3]{\frac{a-1}{x-3}},$$

and extract the square root of

$$81 \left( \frac{\sqrt[3]{x^4}}{y^2} + 1 \right) + 36 \frac{x^{\frac{1}{3}}}{\sqrt[3]{y}} (x^{\frac{2}{3}} y^{-1} - 1) - 158 \frac{\sqrt[3]{x^2}}{y}.$$

2. Solve the equations

$$(1) \ x^2 + (b - c)x = a^2 + bc + ca + ab,$$

$$(2) \ \frac{3x-2}{2} + \sqrt{2x^2 - 5x + 3} = \frac{(x+1)^2}{3}.$$

3. How many numbers can be formed by using all the digits 2, 5, 9, 0, supposing that the figure 0 may not stand first? Show that the sum of all these numbers is 103104.

4. If a solid angle be contained by three plane angles, show that any two of them are together greater than the third.

Give a geometrical construction for drawing through a given point a straight line which shall be equally inclined to three given lines meeting in the point.

5. Find the value of the sine of an angle in terms of the tangent.

Prove the identity

$$\sin \theta \tan^2 \theta + \operatorname{cosec} \theta \sec^2 \theta - 2 \tan \theta \sec \theta \\ = \operatorname{cosec} \theta - \sin \theta.$$

6. Prove the formulæ

$$(1) \ \sin(A - B) = \sin A \cos B - \cos A \sin B,$$

$$(2) \ \cos Q - \cos P = 2 \sin \frac{P+Q}{2} \sin \frac{P-Q}{2}.$$

Solve the equation

$$3 \sin 2\theta + 2 \cos 2\theta = 2 (1 + \cos^2 \theta).$$

7. In any triangle prove the formulæ

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$= \frac{2}{abc} \sqrt{s(s-a)(s-b)(s-c)}$$

8. In a triangle, given  $a = 104$ ,  $b = 63$ ,  $A = 56^\circ 13' 45''$ , find the remaining elements. Is the triangle possible or ambiguous?

9. If the circular measure of an angle be denoted by  $\theta$ , show that

$$\sin \theta < \theta \text{ and } > \theta - \frac{\theta^3}{4}.$$

10. Investigate a formula for the distance between two points whose co-ordinates are  $(p, q)$ ,  $(p', q')$ .

A point moves so that it remains equidistant from the two fixed points  $(-1, 3)$   $(5, -2)$ ; show that its locus is the line

$$12x - 10y = 19.$$

R. S. HEATH.

Tuesday, June 28th, 1887.—Afternoon, 2 to 5.

(*Logarithmic Tables may be used.*)

1. Prove the formula

$$\log_a \left( \frac{p}{q} \right) = \log_a p - \log_a q.$$

Find the values of  $\log_3 8$ , and extract the 11th root of .003641279 correct to seven places of decimals.

2. A man whose life is worth 10 years' purchase wishes to invest his capital of £1000 in the purchase of a life annuity. If compound interest be reckoned at  $4\frac{1}{2}$  per cent. show that the value of the annuity will be £126 7s. 6 $\frac{3}{4}$ d.

3. If a quadrilateral be inscribed in a circle, show that the sum of the rectangles contained by pairs of opposite sides is equal to the rectangle contained by the diagonals of the quadrilateral.

If A B C be a triangle and P any point of the circumscribing circle, show that with a proper convention of sign

$$a. AP + b. BP + c. CP = 0.$$

4. A rectangular tub whose length is 3 feet and breadth 2 feet contains water, and a cylinder whose diameter is 1 foot with its axis vertical is partly immersed. If the cylinder be pushed down so that one inch more of its length is wetted, show that the rise of the water in the tub is about .1319 inches.

5. Prove that the volume of a triangular pyramid is equal to one-third of the product of the altitude into the area of the base.

A bucket has its top and bottom diameter 10 inches and 7 inches, respectively. Find its depth if it will just hold two gallons. (1 gallon = 277.274 c. in.)

6. Investigate the equation to a straight line in the form

$$y = mx + c.$$

Find the equation of the line joining the points  $(-2, 1)$ ,  $(3, 0)$ , and show that the part of the line lying between these points is bisected by the line  $2x - 8y + 3 = 0$ .

7. Find the equations to the lines through the point  $(-3, 2)$  (1) parallel to, (2) perpendicular to, (3) inclined at angles of  $45^\circ$  to, the line  $4x + 3y = 7$ .

8. Find the centre and radius and the equation of the circle circumscribing the triangle formed by the three points  $(-2, 5)$ ,  $(1, 6)$   $(4, -3)$ .

9. Show that the line  $x \cos \theta + y \sin \theta = a$  touches the circle  $x^2 + y^2 = a^2$ , for all values of  $\theta$ .

Hence show that the locus of the intersection of two perpendicular lines, one of which touches the circle  $x^2 + y^2 = a^2$ , and the other the circle  $x^2 + y^2 = b^2$ , is a concentric circle of radius  $\sqrt{a^2 + b^2}$ .

10. Show how to transform an equation from Cartesian to Polar co-ordinates, and *vice versa*.

What is the nature of the loci represented by the equations

(1)  $r = a \cos \theta$ ,

(2)  $\theta = \alpha$ ,

(3)  $24x^2 - 34xy - 45y^2 = 0$ ?

R. S. HEATH.

#### SENIOR CLASS.

Tuesday, June 28th, 1887.—Morning, 10 to 1.

1. Enunciate and prove the binomial theorem when the index is a positive integer.

$$\begin{aligned} \text{If } (1+x)^n &= a_0 + a_1x + a_2x^2 + \dots + a_nx^n \\ \text{show that } a_0 + 2a_1 + 3a_2 + \dots + (n+1)a_n &= 2^{n-1}(n+2). \end{aligned}$$

3. Investigate the expansion

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

Prove that  $2 \log_e n - \log_e (n+1) - \log_e (n-1)$

$$= \frac{1}{n^2} + \frac{1}{2n^4} + \frac{1}{3n^6} + \dots$$

3. Prove that in a determinant any row or column may be increased or diminished by any equimultiples of the corresponding constituents by one or more of the other rows or columns.

Show that

$$\begin{vmatrix} 1+a & 1 & 1 & 1 \\ 1 & 1+b & 1 & 1 \\ 1 & 1 & 1+c & 1 \\ 1 & 1 & 1 & 1+d \end{vmatrix} = abcd \left(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}\right).$$

4. Prove the formula  $\cos \theta + i \sin \theta = e^{i\theta}$ .

Show that

$$\left(\frac{-1 + i\sqrt{3}}{2}\right)^n + \left(\frac{-1 - i\sqrt{3}}{2}\right)^n = -1$$

if  $n$  be any integer which is not a multiple of 3.

What is the value if  $n$  be a multiple of 3?

5. Sum the series

$$\sin^2 \theta - \sin^2 2\theta + \sin^2 3\theta - \dots \text{ to } 2n \text{ terms,}$$

and show that

$$1 + x \cos a \sec a + \frac{x^2}{2!} \cos 2a \sec^2 a + \frac{x^3}{3!} \cos 3a \sec^3 a + \dots = e^x \cos(x \tan a).$$

6. Assuming the formula

$$\sin \theta = \theta \left(1 - \frac{\theta^2}{\pi^2}\right) \left(1 - \frac{\theta^2}{2^2 \pi^2}\right) \left(1 - \frac{\theta^2}{3^2 \pi^2}\right) \dots$$

$$\text{show that } \cos \theta = \left(1 - \frac{4\theta^2}{\pi^2}\right) \left(1 - \frac{4\theta^2}{3^2 \pi^2}\right) \dots$$

$$\text{and prove that } \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}.$$

7. In the hyperbola prove geometrically that  $CT \cdot CN = CA^2$ .

If  $SY$  be drawn from a focus perpendicular to any tangent and  $CD$  be the conjugate diameter show that  $SY : SP = BC : CD$ .

8. In an ellipse show that the locus of the middle points of a series of parallel chords is a straight line.

The tangent at  $P$  meets one of the equiconjugate diameters in  $Q$ , show that the other tangent from  $Q$  to the ellipse is parallel to the line joining the feet of the perpendiculars from  $P$  to the axes.

9. Find the equation to the axis, the latus rectum, and the co-ordinates of the vertex of the parabola

$$(4x - 3y)^2 - 68x - 74y + 41 = 0.$$

10. Differentiate  $\tan x$ ,  $\tan^{-1}x$ , from first principles. Find also the differential coefficients of

$$\log \tan \frac{x}{2}, \quad e^{ax} \cos(b \tan^{-1}x).$$

— R. S. HEATH.

Tuesday, June 28th, 1887.—Afternoon, 2 to 5.

1. Prove that the sides and angles of a spherical triangle are, respectively, the supplements of the angles and sides of the polar triangle.

Prove the relation

$$\tan \frac{1}{2} (A - B) = \frac{\sin \frac{1}{2} (a - b)}{\sin \frac{1}{2} (a + b)} \cot \frac{C}{2},$$

and deduce a corresponding formula by means of the polar triangle.

2. In a right-angled triangle,  $C$  being the right angle, show that

$$\tan A = \frac{\tan a}{\sin b}.$$

If  $p, q, r$  be the lengths of the three perpendiculars from the angular points on the sides of a spherical triangle, show that

$$\sin p \sin a = \sin q \sin b = \sin r \sin c.$$

3. Show that the equation to a parabola when referred to a diameter and the tangent at its extremity as axes of co-ordinates is

$$y^2 = 4a'x,$$

where  $a'$  denotes the local distance of the origin.

If lines be drawn through the focus to make a constant angle with all the tangents to a parabola, show that the locus of the points where they meet the tangents is a fixed tangent to the parabola.

4. Give a proof of Taylor's theorem, without entering into the question of convergence.

Prove the expansion

$$\log \frac{\sin x}{x} = -\frac{x^2}{6} - \frac{x^4}{180} \dots$$

5. A cistern is to be constructed with a square base and vertical sides to hold a given quantity of water. Show that the expense of lining it with lead will be least when the depth is equal to half the side of the square base.

6. Investigate a method of finding rectilinear asymptotes to a curve, distinguishing the case in which the asymptote is parallel to one of the axes of co-ordinates.

Find all the asymptotes of the curve

$$y(x - y)^3 = y(x - y) + 2.$$

7. Trace the curve

$$x(x + y)^2 = a(x - y)^2.$$

8. Integrate the functions

$$\frac{1}{\sqrt{a^2 + x^2}}, \quad \frac{1}{\sin x}, \quad \text{and } \tan^{-1}x.$$



9. Decompose the fraction  $\frac{x+3}{x^4-1}$  into partial fractions and integrate it.

10. Show that the whole area of the curve

$$\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} = 1$$

is equal to  $\frac{3\pi}{8}ab$ .

R. S. HEATH.

# HIGHER SENIOR CLASS.

Tuesday, June 28th, 1887.—Morning, 10 to 1.

1. If  $\frac{p_n}{q_n}$  be the  $n^{\text{th}}$  convergent to a continued fraction, then

$$p_n q_{n-1} - p_{n-1} q_n = (-1)^n.$$

$$\text{If } a_1 + \frac{1}{a_2 + \frac{1}{a_3 + \dots + \frac{1}{a_n}}} = \frac{P}{Q},$$

and if  $\frac{p}{q}$  be the convergent immediately preceding  $\frac{P}{Q}$ , show that

$$a_n + \frac{1}{a_{n-1} + \frac{1}{a_{n-2} + \dots + \frac{1}{a_1}}} = \frac{P}{p}.$$

2. Prove Fermat's Theorem in the form

$$x^{p-1} - 1 = 0, \pmod{p}$$

where  $p$  is any prime number and  $x$  prime to  $p$ .

If  $p$  be a prime number greater than 7, show that  $p^6 - 1$  is divisible by 504.

3. Define an envelope. Show how to find the envelope of a family of curves whose equation contains an arbitrary parameter.

Show that the envelope of the family of curves

$$P \cos^n \theta + Q \sin^n \theta = R,$$

where  $\theta$  is an arbitrary parameter, and  $P, Q, R$  functions of  $x$  and  $y$ , is

$$P^{\frac{2}{2-n}} + Q^{\frac{2}{2-n}} = R^{\frac{2}{2-n}}.$$

4. Investigate in any manner the radius of curvature at any point of an ellipse in the form  $\rho = \frac{b^3}{ab}$ .

Show that the circle of curvature at the origin for the curve  $x + y = ax^2 + by^2 + cx^3$  is  $(a+b)(x^2 + y^2) = 2x + 2y$ .

5. Investigate a formula of reduction for the integral

$$\int_0^{\frac{\pi}{2}} \sin^m \theta \cos^n \theta \, d\theta$$

by which the integral is made to depend on another of the same form containing  $\sin^{m-2} \theta$ .

Prove that if  $y = \frac{x^3 - a^3}{3x^2}$

$$\int_y^\infty \frac{dy}{\sqrt{4y^3 + a^3}} = \sqrt[3]{3} \int_x^\infty \frac{dx}{\sqrt{4x^3 - a^3}}.$$

6. If  $(u + v) = f(x + y)$ ,

$$\text{show that } \frac{du}{dx} = \frac{dv}{dy}, \quad \frac{dv}{dx} = -\frac{du}{dy},$$

and that consequently  $\frac{d^2u}{dx^2} + \frac{d^2u}{dy^2} = 0$  with a similar equation in  $v$ .

Prove that the curves  $u = a$ ,  $v = b$  cut at right angles.

7. Define the intrinsic equation of the curve.

Show that if  $s = f(\phi)$  be the intrinsic equation to a curve, that of the evolute is  $s = f'(\phi) + c$ , where  $c$  is a constant.

Show that the epicycloid has an intrinsic equation of the form  $s = k \sin m\phi$  where  $k$  and  $m$  are constants, and hence prove that the evolute is an epicycloid.

8. If  $(l, m, n)$   $(l', m', n')$  be the direction cosines of two lines, show that the angle between them is given by the equation

$$\cos \theta = ll' + mm' + nn'.$$

Show that the two lines defined by the equations

$$\left. \begin{aligned} l + m + n &= 0, \\ \frac{mn}{b-c} + \frac{nl}{c-a} + \frac{lm}{a-b} &= 0 \end{aligned} \right\}$$

are inclined to each other at an angle of  $\frac{\pi}{3}$ .

9. Trace the surface  $\frac{x^2}{a} - \frac{y^2}{b} = 2z$ , showing that it has two asymptotic planes.

Find the locus of the middle points of all straight lines passing through the origin and terminated by two fixed planes.

10. Show that the hyperboloid of one sheet  $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$  contains two sets of generating lines crossing each other, one of each set passing through every point of the surface.

If a plane contain two parallel generators, show that it passes through the centre and touches the asymptotic cone.

R. S. HEATH.

Tuesday, June 28th, 1887.—Afternoon, 2 to 5.

*PROBLEM PAPER.*

1. Find the generating function and the general term of the recurring series

$$2 - x + 5x^2 - 7x^3 + \dots$$

2. An ellipse cuts the side BC of a triangle in P, P', the side CA in Q, Q', and the side AB in R, R'. Show that

$$BR \cdot BR' \cdot CP \cdot CP' \cdot AQ \cdot AQ' = CR \cdot CR' \cdot AP \cdot AP' \cdot BQ \cdot BQ'.$$

Extend this theorem to any polygon whose sides are met by any curve; that is, if (B)' denote the continued product of the  $n$  segments made on the side BC between B and the curve; (B) the product of the segments made on the side BA, then

$$(A)' \cdot (B)' \cdot (C)' \dots = (A) \cdot (B) \cdot (C) \dots$$

3. If ABC be any three points on a great circle and P any point on the sphere, show that

$$\sin BC \cos AP + \sin CA \cos BP + \sin AB \cos CP = 0.$$

4. Normals are drawn at the extremities of a pair of conjugate diameters forming a parallelogram. Show that the area of the parallelogram is

$$\frac{8(a^2 - b^2)^2}{ab} \sin^3 \phi \cos^3 \phi$$

where  $\phi$  denotes the eccentric angle of the extremity of one of the diameters.

5. Prove the theorem

$$\frac{\pi}{2} = \frac{\sin \theta}{\cos \theta} + \frac{1}{2} \cdot \frac{\sin 2\theta}{\cos^2 \theta} + \frac{1}{3} \cdot \frac{\sin 3\theta}{\cos^3 \theta} + \dots$$

6. Show that the curve  $r^2 \theta = a^2$  has a point of inflexion whose co-ordinates are  $r = a\sqrt{2}$ ,  $\theta = \frac{1}{2}$ .

7. In Peaucellier's link-work PQRS is a rhombus of jointed bars, two of whose angles, Q, R, are connected with a fixed point O by two equal rods. P is joined to a fixed point C by a rod equal in length to OC. Prove that the point S will describe a straight line.

8. If any point P on a hyperbola be denoted by the co-ordinates  $x = a \cosh u$ ,  $y = b \sinh u$ , show that the area of any sector CAP is equal to  $\frac{1}{2} abu$ , and that its centroid has co-ordinates

$$\bar{x} = \frac{2a}{3} \frac{\sinh u}{u}$$

$$\bar{y} = \frac{2b}{3} \frac{\cosh u - 1}{u}.$$

9. Prove that the moment of inertia of a right cylinder of radius  $\alpha$ , and height  $h$ , about a line through its centroid perpendicular to the axis is equal to

$$\frac{M}{4} \cdot \left( \frac{h^2}{3} + \alpha^2 \right)$$

10. A triangle moves with the extremities of its base sliding along two fixed rectangular axes. Show that the locus of the vertex is, in general, an ellipse. If  $h$  be the altitude of the triangle, and  $a, b$  the segments into which it divides the base, show that the equation to the locus is

$$(bx - hy)^2 + (ay - hx)^2 = (ab - h^2)^2,$$

and that the area of the ellipse is  $\pi(ab - h^2)$ .

What is the locus when the triangle is right angled, so that

$$ab = h^2?$$

R. S. HEATH.

## APPLIED MATHEMATICS.

### JUNIOR CLASS.

Wednesday, June 29th, 1887.—Morning, 10 to 1.

1. Define density, and prove the formula  $M = \rho V$ .

If the density of water be denoted by unity, the acceleration of gravity by  $\frac{1}{2}$ , and the measure of a horse-power by  $3\frac{1}{2}$ , find the units of length, time, and mass.

2. Prove the parallelogram of velocities.

A man tricycling westwards at the rate of 8 miles an hour, feels the wind to be due south of him; on increasing his speed to 16 miles an hour the wind appears to be south-west; find the velocity of the wind.

3. Prove that the time taken by a particle to slide from rest down a chord of a vertical circle, from the highest point to the circumference, is independent of the inclination of the chord to the vertical.

A train of 120 tons experiences a passive resistance of 15 lb. per ton. It has brakes which press on the wheels with  $\frac{2}{3}$  of the weight of the train, and have a co-efficient of friction equal to  $\cdot 18$ . An engine pulls the train down an incline of 1 in 300 from one station so as to stop at another distant 3 miles, in 5 minutes. Show that the pull of the engine is about 1.84 tons.

4. Prove that after an impact between two inelastic bodies, there has been a loss of kinetic energy.

If it takes 5 blows of a sledge hammer weighing 7 lbs., descending with a velocity of 8 feet per second, to drive a bolt  $\frac{3}{4}$  inch in diameter and weighing  $\frac{1}{2}$  lb., one inch vertically into the earth, show

that a cannon-shot 9 inches in diameter weighing 80 lbs. striking a bank with a velocity 1600 feet per second will penetrate to a distance of about 56·68 feet, supposing the resistance uniform and proportional to the area of the section of the hole.

5. Prove that any system of forces acting on a rigid body in one plane is equivalent to two forces acting at any two points A, B of the body, one of the forces being at right angles to A B.

Deduce one form of the conditions of equilibrium of a rigid body under any forces in one plane.

6. A girder bridge consists of a straight girder, which is divided into three equal parts ; underneath the middle part are three equal rods forming a square with it, and the corners of this square are connected by rods to the ends of the straight girder. A large weight is placed in the centre, show that the stress in each of the vertical struts is equal to half this weight, the weights of the girders being neglected.

7. Investigate the inclination of the beam of a balance to the horizon when it is loaded with unequal weights.

A chemical balance has two scale-pans, each weighing  $\frac{1}{2}$  lb. ; the beam is 18 inches long and weighs 1 lb. The centre of the beam and the centre of gravity of the beam are, respectively, ·1543 and ·07 inches below the knife edge. The balance has a pointer 1 foot long, which moves before a scale whose divisions are  $\frac{1}{10}$  inch. Prove that when one scale contains a particle of dust weighing 1 grain, the pointer will stand at the first division.

8. Assuming that the centre of gravity of a cone is  $\frac{1}{4}$  of its height from the base, find that of a frustum of a cone, the radii of whose ends are  $a$ ,  $b$ , and whose height is  $h$ .

9. What is meant by the principle of virtual work ?

Two screws, one with 15 threads to the foot, and the other with 20 threads to the foot, are arranged as a differential screw. The outer bears a cog-wheel of 36 teeth, which is turned by a smaller wheel of 9 teeth fixed to a handle 9 inches long. Show that the mechanical advantage is 1130·976.

10. Prove the formula for the pressure of a fluid at any depth, namely,  $p = p_0 + g\rho z$ .

A hemispherical bowl of radius 6 inches is turned upside down on a smooth plane, and water poured in through a small hole at its vertex. Find the weight of the bowl, if it will bear being filled with water without being lifted off the plane by the internal pressures.

R. S. HEATH.

## SENIOR CLASS.

Wednesday, June 29th, 1887.—Morning, 10 to 1.

1. Investigate the range of a particle projected in a vertical plane from the foot of an inclined plane; show that the range on the plane is the greatest for a given initial velocity, when the direction of projection bisects the angle between the plane and the vertical.

A heavy particle is projected from a point in a horizontal plane in such a manner that at its highest point it impinges directly on a vertical plane from which it rebounds, and after another rebound from the horizontal plane returns to the point of projection; prove that the coefficient of restitution is  $\frac{1}{2}$ .

2. A particle is describing a curve, and the velocity at any point is  $v$ ; show that the normal acceleration is equal to  $\frac{v^2}{\rho}$ .

A particle slides down the arc of a vertical cycloid, starting from rest at the cusp. Show that the pressure on the curve at any point is proportional to the radius of curvature.

3. Show how Newton's second law of motion may be applied to the case of a body of varying mass.

A heavy uniform chain lies near the edge of a table, and the end slips over the edge and the chain slides off. Show that the end of the chain will descend with uniform acceleration  $\frac{g}{3}$ .

4. The equation  $\ddot{x} + \mu x = 0$  defines a harmonic motion. Prove that it is the projection of a uniform circular motion, and that the periodic time is independent of the amplitude of vibration.

A particle moves under a constant repulsive force from a fixed point, and is projected with a velocity which is to that in a circle at the same distance under an equal attractive force as  $\sqrt{2} : 1$ ; prove that the orbit is the curve

$$r^{\frac{3}{2}} = a^{\frac{3}{2}} \sec \frac{3}{2} \theta.$$

5. Find the equation of motion of a body which moves about a horizontal axis under the action of gravity.

A cube oscillates about the diagonal of one of its faces, which is fixed in a horizontal position; show that the length of the simple equivalent pendulum is  $\frac{3}{8}$  of the edge of the cube.

6. Prove that any system of forces can be reduced to a wrench about a certain screw.

Show that the system may be reduced in an infinite number of ways to two forces, and that the shortest distance between the forces intersects the central axis perpendicularly.

7. Investigate the equation  $y = a \log \sec \frac{x}{a}$  of the catenary of

uniform strength; that is, the curve in which a string whose thickness is proportional to the tension at any point will hang under gravity.

Prove that in this curve

$$\rho = \frac{\alpha}{2} \left( e^{\frac{s}{\alpha}} + e^{-\frac{s}{\alpha}} \right)$$

where  $s$  is measured from the lowest point.

8. Prove that when a string is coiled round a rough post, the tension decreases in geometrical progression as the angle through which the string turns increases in arithmetical progression.

Prove that the work done in stretching a string is half the work which would be done by the final force of extension in moving its point of application through a space equal to the final extension.

9. Prove that one rough body rolling on another will be in stable equilibrium provided that

$$h < \frac{\rho\rho'}{\rho + \rho'}$$

where  $h$  is the height of the centroid of the rolling body above its point of contact and  $\rho, \rho'$  the radii of curvature of the surfaces in contact, being reckoned positive when both are convex.

A solid hemisphere rolls with its plane side in contact with a fixed sphere; find the smallest radius of the sphere that the equilibrium may be stable.

Show that when the radius of the fixed sphere is equal to  $\frac{5}{8}$  of that of the hemisphere, the equilibrium is unstable.

10. Show that in any displacement of a rigid body there is always one system of planes in the body which remain parallel to themselves after displacement, and hence prove that any displacement may be effected by a twist about a certain screw.

R. S. HEATH.

Friday, July 1st, 1887.—Afternoon, 2 to 5.

1. State Kepler's Laws relating to the motion of the planets, and point out the arguments by which Newton inferred from them the principle of universal gravitation.

2. What is meant by the terms *right ascension* and *declination*? Give an account of Flamsteed's method of observing the position of the "first point of Aries."

It was New-moon on June 21st; sketch the position and appearance of the Moon to-night at midnight.

3. Show how to convert sidereal time into mean solar time. Calculate approximately the sidereal time at 12 o'clock this morning.

4. Show that the effect of atmospheric refraction is to elevate the position of a star towards the zenith by a quantity proportional to the tangent of the zenith distance.

5. Investigate the construction for a horizontal sun-dial, calculating the position of the hour-division on the dial corresponding to any given hour of the day.

6. Explain the method of stereographic projection, proving that any angle is unaltered by the projection.

Prove that the scale of the map at any point is  $1 : 1 + \cos \gamma$ , where  $\gamma$  is the distance of the point from the pole opposite to the eye-point.

7. Find the hour angle at which a star of declination  $\delta$  rises in latitude  $l$ .

Show that if  $r$  be the refraction of the atmosphere, the change in the time of rising due to refraction is

$$\delta h = \sqrt{\frac{r}{\cos(l + \delta) \cos(l - \delta)}}.$$

8. A particle is projected with a given velocity from a point in a given direction, and is acted on by a force tending to a point varying inversely as the square of the distance. Give equations for determining the axes of the orbit and their direction.

If at any point the velocity receive a small increment  $dv$ , show that the consequent change in the eccentricity will be

$$de = \frac{2b^2}{\mu ac} v dv.$$

9. A particle slides under gravity down the arc of a cycloid whose axis is vertical; show that the equation of the motion is

$$4a\ddot{s} + gs = 0,$$

and thence find the time of a vibration.

10. A weight P hanging vertically just supports a weight W in that system of pulleys in which there is only one string. If P, W be interchanged, prove that their centre of gravity will descend with an acceleration

$$g \frac{(W - P)^2}{W^2 - WP + P^2}.$$

R. S. HEATH.

## PHYSICS.

JUNIOR CLASS.

Thursday, June 30th.—Morning, 10 to 1.

1. Enunciate the Triangle of Forces.

A captive balloon is moored by a rope. Draw a figure, showing the forces acting on it when it is blown somewhat to one side by a



wind, and explain how the ratio of the force of the wind to the pull by the rope may be determined if the length of the rope is known, and the distance to which the balloon is blown to one side.

2. A uniform plate in the shape of an equilateral triangle is hung up by three vertical strings attached to the three angular points, the plate being horizontal. A mass of 12lbs. is placed half way between one of the angular points and the opposite side. The plate itself weighs 12lbs. Find the pull on each string.

3. Explain the meaning of the following terms :—*Pound-weight, Foot-pound, Horse-power.*

Sketch a system of pulleys with three moveable pulleys, and find the relation between the Power and the Weight. Show that the work done by the Power in any small displacement is equal to the work done on the Weight.

4. A body moves from rest with an acceleration. Show how to represent its velocity at any time on a velocity-time diagram. What represents the distance traversed on such a diagram?

A body starts from rest, and at the end of 1 minute its velocity is 600 cm. per second. What distance will it traverse in 10 minutes from rest if the acceleration is uniform?

5. "Force may be measured by change of momentum produced per second." Show that if we have some independent method of comparing forces this will enable us to compare masses.

A mass of 100 grammes is moved from rest, and at the end of 5 seconds its velocity is 100 centimetres per second. What is the force acting upon it in dynes, and what ratio does the force bear to the weight of 100 grammes.

6. Show that the weight of a floating body must be equal to the weight of the liquid which it displaces.

A cube floats with two of its sides horizontal. In water it is  $\frac{1}{4}$  immersed. A liquid is then poured on to the surface of the water till  $\frac{1}{2}$  of the cube is immersed, equal depths being in the water and in the liquid. Find the specific gravity of the liquid.

7. Describe the common air-pump, and explain how it acts. How much is the pressure decreased at each stroke neglecting leakage and alteration of temperature?

How would you determine experimentally the pressure of the air (1) in a common air-pump, (2) in a condensing air-pump?

8. Explain how the velocity of light has been determined by means of observations on Jupiter's satellites.

I set my watch by the Council House clock at the College, and then walk  $2\frac{1}{2}$  miles up the Hagley Road. The next striking of the hour on the Council House clock appears to be 12 seconds late. If my watch goes correctly what is the velocity of sound?

9. A luminous point is placed 5 feet from a concave mirror of  $2\frac{1}{2}$  feet radius. Where is the image?

Give a drawing showing (1) the region in the plane of the figure within which the image will be visible; (2) the pencil of rays by which an eye placed somewhere near the axis sees the image.

10. A small object is placed 2 feet from a concave lens 1 foot focal length. Find the distance of the image from the lens. Give a drawing showing how the nature, position, and magnitude of the image may be determined, given the centre and focus of the lens.

J. H. POYNTING.

Thursday, June 30th, 1887.—Afternoon, 2 to 5.

1. Describe experiments to show that a liquid surface behaves as a stretched film.

A cube of wood of exactly half the density of water floats in water but more than half of it is immersed. Explain this and show that the smaller the cube the greater is the excess of it immersed.

2. Describe some simple method of showing that the intensity of illumination of a surface varies inversely as the square of the distance of the surface from the source.

Describe the shadow photometer and the mode of using it to compare the illuminating powers of two sources.

3. Describe Fizeau's toothed wheel method of determining the velocity of light.

4. A hole is made in the shutter of a dark room. If a screen is held quite close up to the hole a patch of light the shape and size of the hole is formed on the screen. If the screen is moved to a distance an image of the outside view is formed on it. Explain these facts.

5. Two mirrors are placed so as to meet at an angle of  $60^\circ$  and a candle is placed between them. Show how many images will be formed and draw the pencil of rays by which an eye will see a point in the image in the compartment formed by producing both mirrors through their intersection.

6. A concave mirror has a radius of 12 inches. Find the position of the image of a point distant from the surface (1) 24 inches, (2) 12 inches, (3) 4 inches, and draw the pencil by which an eye near the axis will see the image in the last case.

7. State the laws of refraction of light and describe a rough mode of experimentally verifying them. A ray is incident on a medium whose refractive index is  $\sqrt{2}$ , the angle of incidence being  $45^\circ$ . Find the angle of refraction.

8. Explain clearly what is meant by the critical angle in refraction.

A series of smooth waves are passing over a deep lake. Describe the appearance to a fish looking upwards.

9. A convex lens has a focal length of 2 inches. An arrow 1 inch long is placed 6 inches from it. Draw a figure showing the nature, position, and magnitude of the image (as nearly as you can to scale).

10. Show by figures the change in position of the image of an object as the object moves from a great distance up to the surface of a concave lens.

Explain the use of a concave lens to a short sighted person.

J. H. POYNTING.

#### MIDDLE CLASS.

Thursday, June 30th.—Morning, 10 to 1.

1. State the law of universal gravitation and give the experiments and observations upon which is based our belief in its truth.

2. You are given a volatile liquid. Describe how you would determine (1) its maximum vapour pressure, at say  $20^{\circ}$ ; (2) the density of its vapour, as compared with that of air at the same temperature and pressure.

If 1 cc. of water at  $0^{\circ}$  expands to 1700 cc. of steam at  $100^{\circ}$  and 760 mm., find the density of steam as compared with that of air at the same temperature and pressure. [1 litre of air at  $0^{\circ}$  and 760 mm. weighs 1.29 grms.]

3. Describe experiments to show that good radiators are good absorbers, and that bodies radiate energy of the same quality as that which they absorb.

A spirit lamp is placed in front of a bunsen burner. In each is placed some sodium salt. The edges of the spirit flame appear smoky against the other. Explain this.

4. Explain what is meant by (1) the strength of pole (2) the moment of a given magnet. How could you compare by experiment (1) the strength of pole, (2) the moment of two given magnets.

5. Describe an attracted disc electrometer. How does the attraction on the disc vary (1) with the difference of potential, (2) with the distance.

If the air is replaced by a medium of greater Specific Inductive Capacity, is the attraction greater or less? Explain your answer.

6. A cell of EMF 1.9 volts has its terminals connected by three wires of 2, 3 and 6 ohms respectively. The internal resistance of the cell is .2 ohm. Find the current (1) when the wires are in series, (2) when the wires connect the terminals in multiple arc.

7. Explain the terms *Thermo-electric current*, *Peltier effect*.

An iron wire has two copper wires soldered to its ends, and these are connected to a galvanometer. Describe the indications

of the galvanometer as one of the copper iron junctions is gradually heated.

8. Explain fully the effect on the pitch of a note of motion of the source towards the observer.

The velocity of sound being 1,100 feet per second, find the rise in pitch of the whistle of a train approaching the observer at 60 miles an hour.

9. A convex lens has focal length of 10 inches. A luminous point is placed 30 inches from the lens in the axis. Where is the image of the point.

10. A slit acts as a source of light. An image of it is thrown on to a screen at some distance. A prism is then interposed. Describe the appearance on a screen held in the course of the rays at the same distance from the slit and show how the prism should be placed for good definition.

If in place of throwing the image on to a screen the lens be removed and the prism be held close to the eye, describe the appearance of the slit.

Illustrate each case by carefully drawn figures.

J. H. POYNTING.

Thursday, June 30th, 1887.—Afternoon, 2 to 5.

1. A circle of wire is placed in a vertical plane east and west. A magnet is moved up from the south with its axis perpendicular to the coil and its N S Pole to the north. Give figures showing the direction of the currents in the wire for different parts of the motion of the magnet as it is gradually moved from some distance south through the coil to some distance north.

2. Explain in full detail how the velocity of sound in air may be determined most accurately, giving the reasons for the various arrangements adopted.

Explain by the aid of figures how sound is heard better with the wind than against it.

3. Newton found, by calculation, that the velocity of sound in air should be equal to the square root of its elasticity divided by its density. Explain what is here meant by the elasticity, and show that if the volume of the air varies inversely as its pressure the elasticity is equal to the pressure.

Explain how the elasticity of air when disturbed by sound waves is greater than the pressure both in condensations and rarefactions.

4. How would you show experimentally that the frequency of transverse vibration of a string varies (1) inversely as the length, (2) directly as the square root of the stretching force?

A given stretched string has frequency 256. Another string has the same density, but double the length and one-fourth the

diameter. What must be the ratio of the stretching forces in order that the frequency of the second string may be 512.

5. Describe the mode of vibration of the air in a pipe open at one end when resounding to a fork held over the open end. Discuss the relation between the length of the pipe and the wave length of the fork in air, and show what are the possible harmonics.

6. Using an undulating curve to indicate displacements in a series of sound waves in air, show how from it we may determine the distribution of compressions and rarefactions and the directions of motion of the particles at different parts of the waves.

7. Explain clearly how it is that beats occur when two sources of slightly different pitch are sounding together, and show that the frequency of the beats is equal to the difference of frequencies of the two sources.

8. Investigate a formula for the relation between the focal length and the distances of image and object from the surface of a convex mirror.

A convex mirror radius two feet is on the wall of a room facing a window 4 feet wide, the room being 20 feet long. Determine the position of the image and its width, and draw the pencil by which an eye in the room sees a point in the window frame.

9. Describe exactly how you would determine the focal length of a convex lens.

Two convex lenses, each of 1 inch focal length, are placed two inches apart. A small object is placed 4 inches from one of them on the common axis. Determine, either by calculation or by a carefully drawn figure, the position of the image from which the rays proceed after passing through both lenses.

J. H. POYNTING.

#### SENIOR CLASS.

Thursday, June 30th, 1887.—Morning, 10 to 1.

1. Shew by consideration of the work done in charging a system of conductors that if a given charge communicated to a body A raise the potential of another conductor B to P, the same charge communicated to B would raise the potential of A to P.

2. Describe Sir W. Thomson's method of comparing the static capacities of four condensers against each other, and find the relation of the capacities which makes the arrangement most sensitive.

3. Describe carefully Boltzmann's methods of determining the Specific Inductive Capacities of Solids.

4. Prove that the constant of the ordinary form of galvanometer is represented by  $2\pi n.a.^{-1}$ , where  $a$  is the mean radius.

The intensity of a current as measured by a galvanometer is independent of the magnetic moment of the galvanometer magnet: if, however, this moment be small the instrument will not give correct indications. Explain this.

5. What are the precautions necessary for the accurate comparison of electrical resistances?

Find the ratio of the resistances of a number of approximately equal coils in series and in parallel arc, and show that it is nearly independent of the errors of the individual coils.

6. What is the physical meaning of the "coefficient of mutual induction" between two coils. Explain with equations the principal methods of determining it in absolute measure.

7. Describe and discuss the duplex system of telegraphy.

8. Give a brief summary of our knowledge of Terrestrial Magnetism.

E. F. J. LOVE.

Thursday, June 30th, 1887.—Afternoon, 2 to 5.

1. A number of equal balls are laid in a straight groove, and a similar ball impelled along the groove to strike the end of the row. Find whether any, and if so how much, Kinetic Energy is lost during impact if the balls be (a) Inelastic, (b) Perfectly elastic.

2. Find the Moment of Inertia of an equilateral triangular lamina of uniform thickness about an axis through its centre of gravity perpendicular to its plane.

3. An achromatic object glass is to be constructed of two lenses, one of flint the other of crown glass, cemented together: the dispersive powers being respectively .045 and .021, the mean refractive indices 1.5 and 1.6, and the radius of the common surface 12.5 cm.: determine the radii of the other faces.

4. Find the rise of temperature produced in a mass of water at 30°C. on suddenly raising the pressure from 0 to 1 megadyne per square cm., given the coefficient of expansion of water = .0003 and  $J = 42 \times 10^6$ .

5. Shew that the "absorption-coefficient" of a gas increases in geometrical progression as the density increases in arithmetical; and deduce thence a connection between the density of a radiating gas-layer and the relative intensities of the lines in its spectrum.

6. Assuming the formula  $2n \cdot \pi a^2 \left\{ a^2 + b^2 \right\}^{-\frac{3}{2}}$  for the constant of a double coil galvanometer,  $a$  being the mean radius, and  $2b$  the distance of mean planes; find for what value of  $a/b$  errors of measuring these quantities will have least influence on the result, assuming the *absolute* errors to be small, constant, and equal.

7. Write an essay on *one only* of the following :—

Dissipation of Energy.  
 Nature of an Electric Current.  
 Methods of measuring the wave-length of light.  
 Kinetic Theory of Gases.  
 Consonance and Dissonance.

E. F. J. LOVE.

## CHEMISTRY.

ELEMENTARY COURSE.

Christmas, 1886.

(*Equations to be given where possible.*)

1. How was Oxygen first prepared by Priestley? What is the usual method?
2. State fully the changes produced in Sulphur by heat.
3. Give two methods for the preparation of Chlorine and describe its properties.
4. State Avogadro's Law, and explain how it is possible to connect together the weight and volume of gaseous compounds.
5. How may the composition of Water be proved synthetically and analytically.
6. Complete the following equations—
 
$$\begin{array}{rcl} 5\text{Br}_2 + 2\text{P} + 8\text{H}_2\text{O} & = & \\ \text{BaCl}_2 + \text{Na}_2\text{SO}_4 & = & \\ 2\text{Cl}_2 + 2\text{HgO} & = & \\ \text{CaF}_2 + \text{H}_2\text{SO}_4 & = & \end{array}$$

7. 250 cubic centimetres of Oxygen at 10°C and 756 mm. Find the volume at 0°C and 760 mm.

W. W. J. NICOL.

Wednesday, March 30th, 1887.—Morning, 10 to 1.

(*Equations to be given when possible.*)

1. Describe the sources, preparation, and properties of Ammonia.
2. Give your reasons for regarding Chlorine, Bromine, and Iodine as a natural group of elements.
3. Describe the action of heat on  $\text{Na}_3\text{HPO}_4$  and  $\text{NaNH}_4\text{HPO}_4$ . Give graphic formulæ for the three phosphoric acids and explain their relationship to one another.
4. Describe fully the properties of Carbon and the preparation of Carbon Monoxide.

5. Calculate the formula of a compound with the following percentage composition :—

|               |       |         |
|---------------|-------|---------|
| Carbon.....   | 20·00 | C = 12. |
| Oxygen .....  | 26·67 | O = 16. |
| Sulphur ..... | 53·33 | S = 32. |

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100·00

6. Describe the extraction of Lead from Galena, and the separation of the Silver from the Lead.

7. How would you prepare the following Chlorides:  $\text{P Cl}_3$ ,  $\text{Si Cl}_4$ ,  $\text{Ca Cl}_2$ ,  $\text{Mg Cl}_2$ ?

8. Give a short account of the various physical properties of the metals as a class.

9. Describe the manufacture of Washing Soda by the Leblanc process.

W. W. J. NICOL.

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#### ELEMENTARY COURSE.

Wednesday, June 29th, 1887.—Morning, 10 to 1.

(*Equations to be given where possible.*)

1. Describe the preparation and properties of Chlorine.

2. How would you prepare and collect the following gases :—Nitrogen, Nitrous Oxide, Sulphur Dioxide, and Hydrogen.

3. How is the composition of water determined analytically and synthetically.

4. What volume of air (Oxygen = 20%) is required for the complete combustion of 100 c.c. of Ethylene ( $\text{C}_2\text{H}_4$ )?

5. Calculate the percentage composition of Calcium Carbonate  $\text{CaCO}_3$ .

Ca = 40.    C = 12.    O = 16.

6. Describe the properties of Vitreous and of Amorphous Phosphorus, and show how they may be proved to consist of the same Element.

7. What is meant by a “Hard Water?” What is the cause of “Hardness.”

8. Describe the preparation of Phosphorus from Bone Ash. Write graphic formulæ for the various Phosphoric Acids, pointing out their relations to one another.

W. W. J. NICOL.

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#### GENERAL COURSE. PART I.

##### FIRST EXAMINATION.

Christmas, 1886.

1. Who discovered oxygen, and when?

Describe the chief properties of oxygen gas. What proportion of



oxygen is there in atmospheric air, and under what circumstances does it vary?

2. Describe the successive effects produced by heating sulphur from  $0^{\circ}$  to  $1000^{\circ}$  and letting it cool again.

3. What are the principal ingredients dissolved in rain water, spring water, and sea water respectively? and how may pure water be obtained?

4. Explain by equations the action of strong sulphuric acid on—

- (a) Common salt.
- (b) Crystallised copper sulphate.
- (c) Oxalic acid.
- (d) Metallic copper.

5. Find the mass in grams of—

- (a) 1 cubic decimetre of sulphuric acid of density 1.84.
- (b) 1 cubic metre of hydrogen gas at normal temp. and pressure.
- (c) 2,500 cubic centimetres of sulphur dioxide measured at  $20^{\circ}$  and 760 mm.

6. Write the formulæ for normal sulphate, sulphite, thiosulphate, and hyposulphite of sodium, and describe tests by which they may be distinguished and identified.

7. How is hydriodic acid gas best made? How can you explain the fact that hydrogen and iodine will not combine together as freely as hydrogen and chlorine do?

8. The formula for phosphoric acid being  $H_3PO_4$ , and for phosphorous acid  $H_3PO_3$ , how do you account for the fact that there are three phosphates of sodium, but only two phosphites?

9. State the facts and arguments by which we arrive at the conclusion that the molecules of hydrogen and of oxygen are diatomic, and must be expressed by the formulæ  $H_2$  and  $O_2$  respectively.

WILLIAM A. TILDEN.

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#### GENERAL COURSE. PART I.

#### EASTER EXAMINATION.

March, 1887.

1. Write down the formulæ for all the known oxides and chlorides of hydrogen, phosphorus, silicon, aluminium, magnesium, iron.

2. How is phosphorous chloride made? What is its action upon water and upon common alcohol?

3. How is bleaching powder made? Describe and explain the action of sulphuric and of hydrochloric acid upon it. What is the effect of boiling bleaching powder with water?

4. Give an outline of the process by which sodium carbonate crystals are manufactured.

5. How is potassium dichromate made? What reactions occur when a solution of it acidified with sulphuric acid is boiled with sulphurous acid and with alcohol?

6. Give a brief account of the properties and composition (not manufacture) of cast iron, wrought iron, and steel.

7. Describe and explain by formulæ the Prussian Blue test for hydrocyanic acid.

8. Give examples showing that the physical properties (*e.g.*, fusibility, volatility, or solubility, &c.) of substances often determine the manner in which they react on one another chemically.

9. Suppose 10 litres of ethylene,  $C_2H_4$ , measured off at  $15^\circ$  and 740 m.m. What weight of oxygen, in grams, will be required to burn it to  $CO_2$  and water.

10. The specific heat of a metal being  $\cdot092$ , calculate its atomic weight. To what other elements would such a metal be nearly allied?

WILLIAM A. TILDEN.

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## ORGANIC CHEMISTRY.

Wednesday, June 29th, 1887.

1. How is pure ethylene made?

Show by what means ethylene may be converted into—

(a) Common alcohol,

(b) Succinic acid.

2. Describe the manufacture of ferrocyanide of potassium, and the properties and uses of this salt.

3. Explain the formation of primary monamines by the processes of Wurtz and Hofmann.

How would you obtain tetrethyl ammonium hydroxide? Describe its chief properties.

4. Write formulæ for the amides corresponding to acetic acid, glycolic acid, and malic acid, adding the appropriate names.

5. Describe reactions by which oleic, salicylic, cinnamic, tartaric acids may be identified.

6. Give an account of the several monochloro-derivatives of toluene, and the series of related substances.

7. What is supposed to be the general constitution of the natural alkaloids? Classify these substances.

WILLIAM A. TILDEN.

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## CHEMISTRY.

EXAMINATION FOR SESSIONAL PRIZE.

Tuesday, July 5th, 1887.

1. State approximately the solubility in cold water of common salt and potassium nitrate, and by a graphic construction show the effect of a gradual increase of temperature from, say,  $10^{\circ}$  to  $100^{\circ}\text{C}$  on the solubility.

Mention some salts which are apparently more soluble in cold than in hot water.

2. By what experiments has it been shown that ozone consists of the same matter as common oxygen, but that its density is 24, if that of oxygen is 16, times the density of hydrogen.

3. From white arsenic show how to obtain (a) orpiment, (b) common sodium arseniate, (c) cacodyl.

4. Explain by equations the following reactions used in volumetric analysis :—

(a) oxalic acid and permanganate acidified with sulphuric acid ;

(b) bleaching powder mixed with excess of potassium iodide and acidified with hydrochloric acid ;

(c) sulphurous acid and iodine.

In the last case describe the effect of altering the amount of water present.

5. Describe the flame spectra of the alkali metals and thallium. What relation has thallium to the alkali group ?

6. How are cyanic and cyanuric acids obtained ? Describe their properties.

7. What are glucosides ? Mention some of the more important of these compounds.

WILLIAM A. TILDEN.

## PRACTICAL CHEMISTRY.

## I.

QUALITATIVE ANALYSIS.

Wednesday, July 6th, 1887.—Hours, 10 to 5.

(Books allowed.)

You are required to analyse A and B, and write out in proper form a full account of your experiments and the conclusions drawn from them.

No marks will be given for bare results unsupported by evidence.

A contains three metallic and three negative radicles.

B is a mixture of salts.

## II.

## QUANTITATIVE ANALYSIS.

Thursday and Friday, July 7th and 8th, 1887.

(Books allowed.)

A is a sample of cast iron turnings. Determine the percentage of silicon (Si) they contain.

B is a sample of bleaching powder. Determine the percentage of "available" chlorine in it.

WILLIAM A. TILDEN.

## ZOOLOGY.

Monday, June 27th, 1887.—Morning 10 to 1.

(*As far as possible illustrate your answers by diagrammatic figures.*)

1. Describe, with figures, the various kinds of cells met with in the ectoderm and endoderm of the Hydra, and state what you know about their several functions.

2. Trace the various modifications which a nephridium undergoes in the Leech, Earthworm, Snail, and Frog respectively.

3. Give a brief account of the anatomy and life-history of Distoma.

4. What do you mean by "respiration"? Describe the respiratory organs and the mechanism of respiration in a Cray-fish, a Snail, a Frog, and a Rabbit.

5. Wherein do the Frog, Pigeon, and Rabbit differ from one another as regards the structure of—

- (i.) The heart, and the arrangement of the main arteries and veins ;
- (ii.) The shoulder-girdle and fore-limbs ;
- (iii.) The pelvic-girdle and hind-limbs ;
- (iv.) The skull.

6. Describe the structure of a typical ovum. How may the presence of food-yolk modify the structure and influence the mode of segmentation of an ovum? Illustrate your answer by a comparison of the early stages in the development of the Frog, Chick, and Rabbit.

7. Give an account of the mode of formation and function of the amnion, allantois, and placenta. Describe the course of the circulation in the embryo rabbit, and the changes which take place at birth.

T. W. BRIDGE.

## ELEMENTARY ZOOLOGY.

## PRACTICAL.

Friday, July 1st, 1887.—Afternoon, 2 to 5.

1. Dissect out, draw, and name the component parts of the following appendages of a Crayfish :—

- (i.) Antennules ;
- (ii.) 1st and 2nd pairs of maxillæ ;
- (iii.) 2nd pair of maxillipedes ;
- (iv.) 1st and 2nd pairs of abdominal appendages.

2. Dissect out the nervous system, or the heart and main arteries of the same animal.

3. Dissect out the reproductive system of a Snail.

T. W. BRIDGE.

## SESSIONAL EXAMINATION.

Monday, July 4th, 1887.—Afternoon, 2 to 5.

1. Dissect out in a Frog the 1st, 2nd, 5th, 7th, 9th, and 10th cranial nerves. Make a drawing of your dissection and describe the peripheral distribution of the nerves.

2. In the same animal dissect out the arterial system.

3. In the same animal dissect out, —

- (i.) The pancreas and its duct ;
- (ii.) The anterior and posterior roots of a spinal nerve.

4. *Vivâ-voce*.

5. Identify and describe the specimen marked "A."

T. W. BRIDGE.

## ADVANCED ZOOLOGY.

Friday, July 8th, 1887.—Afternoon, 2 to 4.30.

1. Enumerate and define the principal groups of Protozoa. Describe the various methods of reproduction which characterize the group.

2. Define the Coelentera. State what you know about the anatomical peculiarities of the following types :—Sertularia, Stylaster, Physophora, Rhizostoma, Actinia, and Alcyonium.

3. Give a brief account of the structure of the segmental organs in the Leech, Earthworm, Anodon, and Chiton.

4. Describe in detail the anatomy and development of Amphioxus.

5. Define the terms :—Polar cells, morula, blastosphere, gastrula (embolic and epibolic), proctodæum, and stromatodæum. Briefly

describe the changes which take place in an ovum prior to, and after, fertilization.

T. W. BRIDGE.

## BOTANY AND VEGETABLE PHYSIOLOGY.

### I.—ADVANCED PAPER.

Monday, June 27th, 1887.—Afternoon, 2 to 5.

1. Describe the various methods of apical growth met with (1) in roots, (2) in stems.
2. Compare the processes of fertilisation and conjugation.
3. Describe the structure of the male and female flower in *Pinus*.
4. Give an account of the life history of *Penicillium*.
5. Give an account of the origin and development of sieve-tubes.
6. Starting with the fern plant, describe the progressive degradation of the prothallus.

W. HILLHOUSE.

### LABORATORY.

Friday, July 1st, 1887.—Morning, 10 to 1.

1. By suitable sections determine the nature and structure of the materials D, E, and F.
2. Study, and illustrate by sections and diagrams, the nature and distribution of the latex system in G.

W. HILLHOUSE.

- D. Rhizome of *Convolvulus arvensis*.
- E. Tuber of Truffle.
- F. Stem of *Rhipsalis*.
- G. *Euphorbia Jacquinifolia*.

### II.—ELEMENTARY PAPER.

Monday, June 27th, 1875.—Afternoon, 2 to 5.

1. Describe the various methods of apical growth met with (1) in roots, (2) in stems.
2. Compare the processes of fertilisation and conjugation.
3. Describe the structure of the male and female flower in *Pinus*.
4. Give an account of the life history of *Penicillium*.
5. Describe the various methods by which the process known as pollination is effected.
6. Give a full account of the structure of a normal foliage leaf, illustrating your answer by drawings.

W. HILLHOUSE.

## LABORATORY.

Friday, July 1st, 1887.—Morning, 10 to 1.

1. By suitable sections determine the nature and structure of the materials A and B.
2. Describe fully and illustrate the structure of the sporogone (theca) of a moss; and mount longitudinal and cross sections of that provided.
3. Draw a floral diagram showing the structure of the flower (C) provided. Dissect out all the parts, and leave them arranged and named upon a sheet of paper.

W. HILLHOUSE.

- A. Young stem of Ivy.
  - B. Fruit of *Heracleum*.
  - C. Flower of *Viola*.
- 

## III.—SYSTEMATIC BOTANY.

Thursday, July 7th, 1887.—Afternoon, 2 to 5.

1. Give a very brief account of the different types of flower and fruit met with in

- (a) *Ranunculaceæ*.
- (b) *Rosaceæ*.

2. Describe in botanical language, and refer to their respective natural orders, giving your reasons, the plants A, B, C, and D provided.

W. HILLHOUSE.

- |                         |                       |
|-------------------------|-----------------------|
| A. <i>Potentilla</i> .  | C. <i>Thymus</i> .    |
| B. <i>Calceolaria</i> . | D. <i>Fagopyrum</i> . |
- 

## IV.—GENERAL AND MEDICAL BOTANY.

Friday, July 22nd, 1887.—Afternoon, 2 to 4.30.

1. Give an account of the phenomena of Respiration in plants, and compare with animals.
2. Describe briefly the life history of a Fern.
3. Describe, and illustrate by diagrams, the structure of an ordinary foliage leaf.
4. What are the most important economic plants in the natural order Solanaceæ? From what does the value of each arise?
5. Describe briefly, and ascribe to their respective natural orders, the plants A, B, C, and D.

W. HILLHOUSE.

- |                        |                                 |
|------------------------|---------------------------------|
| A. <i>Potentilla</i> . | C. <i>Atropa Belladonna</i> .   |
| B. <i>Origanum</i> .   | D. <i>Colutea arborescens</i> . |
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## SYSTEMATIC PHYSIOLOGY.

### ELEMENTARY CLASS.

Thursday, December 16th, 1886.—Afternoon, 2 to 4.

1. Describe the microscopical appearance of Hyaline Cartilage. Mention the various kinds of Cartilage.
2. In what parts of the body is involuntary (non-striated) muscle found? What is the microscopical appearance of involuntary (non-striated) muscle?
3. What is the function of the spinal cord: describe the structure of a cerebro-spinal nerve?

JOHN B. HAYCRAFT.

### ADVANCED CLASS.

Thursday, December 16th, 1886.—Afternoon, 2 to 4.

1. What change—both chemical and microscopical—does meat undergo when it putrifies?
2. Construct a drawing shewing the intrinsic and extrinsic nervous mechanism of the heart. How may this mechanism be influenced by the exhibition of Atropia and muscarine?
3. Construct drawings illustrative of the minute anatomy of the small intestine.
4. What parts of the adult brain are developed from the posterior and middle cerebral vesicle of the embryo?

JOHN B. HAYCRAFT.

### ELEMENTARY CLASS.

Friday, March 25th, 1887.

1. Describe the curves produced by a muscle attached to a writing lever—
  - (i.) When it is stimulated once a second.
  - (ii.) When stimulated six times a second.
  - (iii.) When stimulated thirty times a second.
2. Describe the muscular and osseous mechanisms concerned in ordinary respiration.
3. Construct a drawing of the central nervous system, and describe shortly the functions of the spinal cord.

JOHN B. HAYCRAFT.

### ADVANCED CLASS.

Friday, March 25th, 1887.

1. Describe the development of a long bone, such as the femur. Illustrate the description with drawings.



2. What do you know as to the matabolic processes which Proteids and Carbohydrates undergo when absorbed into the body?

3. Draw an urinary tubule; and describe the experiments of Heidenhain and Nussbaum.

4. What do you understand by the terms Myopia, Astigmatism, and Horopter?

JOHN B. HAYCRAFT.

## PRACTICAL PHYSIOLOGY.

July 15th, 1887.

### ADVANCED.

1. (a) Examine the urine A for three abnormal constituents.

(b) Examine the fluid B for ferments.

In each case write down the tests which you apply, and their results.

(A. Ammonia, Alkali Albuminate, Grape-sugar. B. Pancreatic Juice.)

2. The solution C contains between 3 and 5 per cent. of Grape-sugar. Ascertain the proportion of sugar as exactly as you can by Fehling's method.

3. (a) Mount the stained specimen A in Farrant's fluid.

(b) Stain and mount in Balsam one of each of the sections C and D.

Examine them microscopically, and mention from what organs you consider them to have been prepared, stating your reasons.

Leave your specimens for inspection.

(Lung, Small Intestine, Mucous Salivary Gland.)

4. Determine from which region of the spinal cord the mounted section A was taken, making diagrams of what you see with the low and high objective respectively.

5. Examine the five mounted specimens B to F. Explain with the aid of diagrams the structures they exhibit, and from these derive conclusions as to the organs from which they were prepared.

No marks will be allowed for merely identifying the specimens. (Preparations of the more complex tissues.)

F. J. ALLEN.

### ELEMENTARY.

1. Examine each of the solids A and B for one substance of physiological importance, and the fluid D for two such substances.

Write down the tests which you apply, and their results.

(A. Uric Acid. B. Urea. D. Alkali Albuminate and Grape-sugar.)

2. Stain and mount in Balsam one of each of the sections B and C.

Examine them microscopically, and mention from what organs you consider them to have been prepared, stating your reasons.

Leave your specimens for inspection.

(Spleen, Small Intestine.)

3. Examine the mounted specimens G, H, I, J ; make diagrams of each, explaining the structures seen, and from these derive your conclusions as to the nature of the tissues.

No marks will be allowed for merely identifying the tissues.

(Preparations from the simpler tissues.)

F. J. ALLEN.

## JUNIOR GEOLOGY.

### 1ST TERM.

Monday, December 20th, 1886.—Time : Three Hours.

(*Ten questions only to be answered, including questions Nos. 15 and 16, which must be attempted by all.*)

1. Give a brief account of the "Nebular Hypothesis" of Laplace, and name those phenomena of which it appears to afford a fairly satisfactory explanation.

2. Name the chemical elements of chief importance in the composition of the earth crust, and notice the chief minerals into which each of these elements enters most largely.

3. Write out what you know of the Tides, their origin, rate, direction of movement, &c.

4. What is known of the size, form, and physical constitution of the Sun ? What physical phenomena upon our globe are due to the Sun's heat ?

5. What are Volcanoes ? Give an account of their distribution, mode of action, and more important products.

6. Show how rain and rivers act in lowering the surface of a country. Explain why their apparent effects are so different in Britain and Western America (Colorado, &c.).

7. Describe the action of ice as a geological agent.

8. Explain and illustrate the meaning of the following terms :—  
(1) Delta, (2) River Terrace, (3) Geyser, (4) Cyclone, (5) Monsoon, (6) Isobaric Lines, (7) Dewpoint, (8) Ecliptic, (9) Orbit, (10) Season.

9. Write out a classification of the chief rock-forming minerals, giving, where you can, their chemical composition and crystallographic form.

10. Name the several kinds of Aqueous Rocks, and give their constitution, mode of origin, or alteration in each case.

11. Describe each of the following minerals, and note the rocks in which they severally occur :—(1) Orthoclase, (2) Labradorite, (3) Sanidine, (4) Olivine, (5) Serpentine, (6) Augite, (7) Chalcedony, (8) Hornblende, (9) Calc spar, (10) Diamond.

12. Describe the following rocks as fully as you can :—(1) Chalk, (2) Marble, (3) Slate, (4) Greywacke, (5) Breccia, (6) Syenite, (7) Gabbro, (8) Basalt, (9) Obsidian.

13. Name the various crystallographic systems. Show how the forms belonging to each system are distinguished, and give the terms employed in describing a crystal.

14. What deposits are now being laid down upon the sea floor? Classify these deposits, note their mode of origin, and name the rock which appears to be the nearest geological representative of each.

15. Name and describe, as fully as you can, the minerals laid before you.

16. Name and describe the rock specimens laid before you.

C. LAPWORTH.

## MIDDLE GEOLOGY.

1ST TERM.

### MINERALOGY.

Monday, December 20th, 1886.—Time: Three Hours.

(*Ten questions only to be answered; at least three from each Section.*)

#### SECTION I.

1. Explain and illustrate the distinction between (*a*) minerals, (*b*) crystals, (*c*) rocks, and name the primary divisions of each.

2. Explain and illustrate the following terms :—(1) octant, (2) diametral plane, (3) bevelment, (4) principal axis of symmetry, (5) solid angle, (6) acumination, (7) pinacoid, (8) intercept, (9) symbol, (10) parametral plane.

3. Enumerate and sketch in outline the various forms of crystalline “faces.” Name in each case a “form” in which the face occurs, and a “mineral” in which it is likely to be found.

4. Name the possible “forms” in the Hexagonal and Rhombic systems, and give their corresponding symbols.

5. In what crystalline systems do the following “forms” occur, give their ordinary symbols :—(1) Macrodome, (2) clinopinacoid, (3) hemiprism, (4) rhombohedron, (5) tetarto-octohedron?

#### SECTION II.

6. What is meant by a *twin crystal*? Enumerate and describe the several kinds of twin crystals, and give and explain the terms used in their description.

7. What special relationship is there between the chemical composition and the crystalline form of Minerals? Note the several exceptions to this rule of relationship.

8. Give the more important technical terms used in describing the "Physical Properties of Minerals," and illustrate each by a single example.

9. Write out what you know of:—(1) Opal, (2) Serpentine, (3) Amber, (4) Agate, (5) Aragonite, (6) Leucite, (7) Asbestos, (8) Gypsum, (9) Emery, (10) Garnet.

10. Classify the various rock-forming silicates, indicating at the same time the crystalline form and mode of occurrence of each.

#### SECTION III.

11. Define the terms:—Optic axis, biaxial, replacement-pseudomorph, homomorphism, oscillatory combination, trichites, dimorphous, dichroic, devitrified, and colloid.

12. Describe the chief species and varieties of Felspar, and show how they may be distinguished from each other under the microscope.

13. Give the essential microscopic characters of Hornblende, Augite, and Enstatite.

14. Write out what you know of the optical characters of Olivine, Diallage, and Mica.

15. Explain the structure and mode of use of the Polarizing Microscope.

C. LAPWORTH.

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#### PRACTICAL EXAMINATION.

Tuesday, December 21st, 1886.—Time: Three Hours.

(*All questions to be attempted.*)

1. Write out the proper names and symbols of the faces numbered upon the figures of crystals 1 to 8 in the accompanying sheet of illustrations.

2. Name all the forms indicated by the symbols ( $\alpha$ ) to ( $p$ ) upon the accompanying sheet.

3. Figures A to D represent basal planes of Hornblende, Diallage, Augite, and Enstatite respectively. Write upon them the proper interfacial angles, the names and symbols of the bounding planes, and draw in the lines of cleavage.

4. Give the symbols of all the faces upon the ten models placed before you.

5. Name all the minerals you can recognise in the microscopic slides handed to you.

C. LAPWORTH.

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2ND TERM.  
ECONOMIC GEOLOGY.

Tuesday, March 29th, 1887.—Time : Three Hours.

(*Ten questions only to be answered, including No. 14, which must be attempted by all.*)

1. What is meant by a Mineral Lode? How are its materials arranged, and what has probably been their mode of origin?

2. Under what special circumstance are mineral veins most abundant and productive? In prospecting for Copper, Gold, and Silver in a new and unexplored country to what indications would you attach the greatest weight?

3. Name the various ores of Iron. Note their geological horizons, mode of occurrence, and chief localities in Britain. Name, and describe in brief, the most important Iron regions in Spain and United States.

4. Define the following terms, and give the British or foreign localities where each is especially productive :—(1) *Stockwork*, (2) *Fahlband*, (3) *Gash-vein*, (4) *Bonanza*, (5) *Placer*, (6) *Stream-work*, (7) *Orebed*, (8) *Blackband*, (9) *Contact Deposit*, (10) *Impregnation*.

5. Give the names and chemical composition of the chief ores of Lead. Name the chief districts in Britain and North America where lead is being mined at the present day.

6. Write out a brief account of the geological structure, mines, and chief productions of one of the following districts :—(1) *West Shropshire*, (2) *Cornwall*, (3) *Alston Moor*, (4) *Comstock Lode*, (5) *Rio Tinto*.

7. How are (1) the geological age, (2) the relative dates of formation, and (3) the several stages of growth, of mineral veins ascertained? Is there any relation between the comparative productivity of a vein and (1) its compass bearing, (2) its age, and (3) its relation to aqueous or crystalline rocks?

8. Write out a connected account of the structure of the South Staffordshire Coalfield, noting especially the relative position and extent of its various coals and ironstones.

9. Compare the Carboniferous rocks of the following areas, and account for the differences between them :—(1) Bristol, (2) Coalbrookdale, (3) Atherstone, (4) Leeds, (5) Newcastle-on-Tyne.

10. Give the chemical composition of the following ores :—(1) *Erubescite*, (2) *Tetrahedrite*, (3) *Malachite*, (4) *Galena*, (5) *Zinc Blende*, (6) *Cassiterite*, (7) *Copper Glance*, (8) *Magnetite*, (9) *Hæmatite*, (10) *Chessylite*.

11. Classify the chief building stones of England in the order of their geological age; note the localities where they are obtained, and chief characteristics of each.

12. Where and upon what horizon do we obtain :—(1) Caen Stone, (2) Barnack Rag, (3) Craigleith Sandstone, (4) Pennant Grit, (5) Portland Stone, (6), Kentish Rag, (7) Stonesfield Slate, (8) Devonshire Marble, (9) Wallsend Coal, (10) Serpentine ?

13. What are the chief economic products of (*a*) the Old Red, (*b*) Trias, (*c*) British Oolite, and where are they obtained and employed.

14. Name the ten examples of ore laid before you.

C. LAPWORTH.

#### SPRING TERM.

#### PETROGRAPHY.

Tuesday, March 29th, 1887.—Time: Three Hours.

(*Seven questions only to be attempted.*)

1. Write out a classification of the Intermediate rocks, and explain and illustrate the principles upon which your classification is founded.

2. Describe the textural, mineralogical, and microscopical characteristics of the following :—(1) Dolerite, (2) Quartz-Trachyte, (3) Diorite, (4) Andesite, (5) Olivine-Basalt.

3. What are the essential minerals of the following :—(1) Pikrite, (2) Dacite, (3) Kersantite, (4) Nepheline Dolerite, (5) Gabbro ? Give a British locality for each where possible.

4. Describe and account for the following structures :—(1) Pegmatitic, (2) Felsitic, (3) Vitreous, (4) Ophitic, (5) Basaltic, (6) Amygdaloidal, (7) Sphærolitic, (8) Mylonitic, (9) Schistose, (10) Fluidal.

5. What do you understand by the (1) essential, (2) accessory, (3) original, and (4) secondary minerals of Igneous rocks ?

6. In what localities in Britain, and in what geological formations do we find relics of (1) contemporaneous Igneous rocks, (2) intrusive dykes of dolerite, (3) bosses of granite ?

7. What structural and mineralogical changes would you expect to find in Igneous rocks of vast geological antiquity which were originally, (*a*) Dunite, (*b*) Dolerite, (*c*) Obsidian, (*d*) Gabbro, (*e*) Sanidine-Trachyte.

8. In what volcanic rock species and under what conditions do we find the following minerals :—(1) Epidote, (2) Chlorite, (3) Diallage, (4) Free Quartz, (5) Zircon, (6) Leucite, (7) Pyrites, (8) Serpentine, (9) Sphene, (10) Apatite ?

9. Discuss the theories which have been promulgated respecting one of the following :—

(*a*) The order of crystallization of minerals in Igneous rocks ;

- (b) The natural sequence of volcanic rocks in any locality ;
- (c) The identity of volcanic rocks of Tertiary and Pre-tertiary ages.

## PRACTICAL EXAMINATION.

Time : Two Hours.

- 10. Name the 10 rock specimens placed before you.
- 11. Name the several rock species illustrated in the 20 microscopic slides.

C. LAPWORTH.

## 3RD TERM.

## FIELD GEOLOGY.

## PRACTICAL EXAMINATION.

- 1. Fill in carefully and colour the geological formations in the accompanying skeleton map from the notes and observations given.
- 2. Write down the names of the various formations, sub-formations, and zones occurring within the limits of the map, in the order of their age.
- 3. Draw and colour two geological sections from corner to corner across the map, making your contour to suit the outcrop of the formations.
- 4. Draw a vertical section, on the same scale as the map, with the different formations in their true order and thickness, with proper unconformities, &c. The Triassic Beds may be supposed to dip at  $15^{\circ}$ , while the Rhætic and the beds above are presumed to be horizontal.
- 5. There are two collieries in the map, one at Highfield and one at Weston. Draw the section of rocks traversed in the colliery shaft in both localities, and give the depth, from the surface, of the "Sixfoot" Coal in each case.
- 6. Give the geological ages of the two sets of faults in the map, and also the geological date of the period when the Silurian rocks of the district were folded and denuded.

C. LAPWORTH.

## JUNIOR PHYSIOGRAPHY.

## 1ST TERM.

Monday, December 20th, 1886.—Time : Two Hours.

*(Eight questions only to be answered, including No. 13, which must be attempted by all.)*

- 1. Write out a brief description of the sun and its appendages.

2. Define the following :—Meteorites, Nebula, Corona, Photosphere, Asteroid, Zodiacal Light, Fixed Star, Sun-spot, Satellite, and Comet.

3. How is it demonstrated that our earth is globular in form, and that it is revolving on its axis from West to East ?

4. Name the chief geographical lines found upon maps of the world, and explain their origin and use.

5. What do we know of the shape of the ocean floor ? How has this information been obtained ?

6. Of what gases is the atmosphere composed, and in what proportions are they mixed ? Name the various impurities in the air, and note their origin and effects.

7. What is meant by the “pressure” of the atmosphere ? How is it measured, and what are the causes and effects of its variation ?

8. Write out a connected account of the Gulf Stream, note its origin, course, speed, and effects.

9. Name those regions of the globe where the differences between the summer and winter temperature are excessive. What are the causes of these great differences ?

10. What are winds ? How are they caused and in what directions do they move ? Classify the various kinds of winds known to you.

11. Shew how the size and weight of the earth are measured.

12. A bottle thrown overboard at the Falkland Islands is picked up on the coast of Portugal. Shew in what special directions it must have travelled, and why.

13. On the accompanying sketch map fill in the isobaric lines, and mark the direction and force of the wind and the probable state of the weather at all the places named.

C. LAPWORTH.

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2ND TERM.

Time : Three Hours.

(*Ten questions only to be attempted : five from each Section.*)

SECTION I.

1. What is meant by the term “Earth Crust” ? Of what materials is the earth crust composed, and how are they arranged ?

2. Name and classify the various kinds of rocks and rock-formations, and indicate their mode of origin.

3. How do we prove that :—

(1) *Volcanoes once existed in Britain ;*

(2) *Britain has repeatedly been submerged below the sea level ;*



(3) *It has undergone remarkable changes in climate ;*

(4) *Its present living creatures are distinct from those of past times ?*

4. Write out what you know of (*a*) the distribution, (*b*) origin, (*c*) mode of action, and (*d*) chief products of volcanoes.

5. Define and illustrate the terms :—(1) *Barrier Reef*, (2) *Submerged Forest*, (3) *Geyser*, (4) *Atoll*, and (5) *Mineral Spring*.

6. Describe each of the following as fully as you can, and note its origin and physiographical effects :—(1) *River Terrace*, (2) *Loess*, (3) *Fiord*, (4) *Ice-foot*, (5) *Cavern*, (6) *Salt Lake*, (7) *Shingle Beach*, (8) *Desert*, (9) *Ground-Moraine*, (10) *Crevasse*.

7. Describe the course of a British river from its source to its mouth, and note and account for the changes in the course of the river, in the form of the valley, and in the aspect and composition of the river plain.

8. Write out a brief description of :—(1) *Falls of Niagara*, (2) *The Great Cañon of Colorado*, (3) *The Delta of the Nile*. Explain the mode of origin of each.

## SECTION II.

9. Prove that the present contour and relief of England and Wales are wholly due to natural agencies acting slowly in the course of time.

10. Write out a full description of a modern glacier ; shew that the Swiss glaciers were once of far vaster extent ; and give a brief description of the Glacial Period and its effects.

11. Define the various Biological Regions of the globe, and name the chief *animals* found in each.

12. To what Biological Regions do the following plants belong :—(1) *Wellingtonia*, (2) *Mimosa*, (3) *Baobab*, (4) *Bamboo*, (5) *Teak*, (6) *Mahogany*, (7) *Bread-Fruit*, (8) *Coffee*, (9) *Sugar-cane*, (10) *Passion-Flower*.

13. Say what you know of one the following :—(1) Laplace's Hypothesis of the Origin of the Solar System ; (2) Darwin's Evolutionary Theory ; (3) Point out in each case the chief facts for which the theory seems to afford an explanation.

14. What is a mountain range ? What is its structure and composition ? How did it originate, and why does it finally disappear ?

15. What are islands ? How are they formed, and whence do they derive the plants and animals which inhabit them ?

16. How are we able (1) to read the past history of the Physiography of the Globe, and (2) to prove that there has been no break in the continuity of life ?

C. LAPWORTH.

## COAL-MINING.

## FINAL EXAMINATION.

Tuesday, July 26th, 1887.—10.30 a.m. to 4.30 p.m.

*Six hours are allowed for this paper.*

*Not more than six questions may be attempted.*

*All figures in calculations must be shown.*

1. Enumerate the points requiring care in the construction of a water-draining siphon, and the circumstances which will affect its efficiency as regards height of suction.

2. Draw an idealistic plan, to a scale of 4 chains to an inch, of the dip workings, at a great depth, in the Thick Coal Seam of South Staffordshire.

State fully what objections have been urged against this method of working, and what remedial methods of working have been tried.

3. Briefly describe the arrangements you would adopt and the size of engines you would employ in underground haulage under the following conditions, namely:—

From two seams—A, 250 fathoms; B, 150 fathoms—

Seam A. Gradient—1 in 10;

Quantity—600 tons;

Distance—50 chains.

Seam B. Gradient—level;

Quantity—400 tons;

Distance—1000 yards.

Time, eight hours, and piston pressure, 40 lbs. on the square inch.

4. Name the various means by which the quantity of air passing through a mine may be doubled.

6. What is meant in mine ventilation by the expression “Co-efficient of friction?” How would you estimate it in a given mine, and in what ways may it be applied in calculations?

6. Give a sketch through a sectional plane parallel to the inlet of each of the four mine ventilating fans most largely used in this country.

7. What coal fields of this and other countries are remarkable for their freedom from fire-damp, or for their disposition to spontaneous ignition in mining, and how do you account for these peculiarities.

8. Give a sketch, about quarter full size, of each of those gauze lamps recommended by the last Royal Commission of Enquiry into the causes of Accidents in Mines.

9. Report the results of scientific investigation as to the relation of dust in mines, to explosions in mines, and state what conclusions of a practical character may be deduced therefrom.

WM. E. BENTON.

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## ENGINEERING.

### JUNIOR CLASS.

Saturday, December 18th, 1886.

1. In accurate chaining, with a 100 feet iron chain, what correction should be made for variation from standard temperature?
2. Describe exactly the vernier sliding callipers used in the class.
3. What is meant by B.W.G.? Give in mils and in millimetres the sizes Nos. 8, 10, 16, and 30 N.S.W.G.
4. Discuss the advantages of the millimetre and kilogram system of measurement over the inch and pound system.
5. What is a pyrometer? Describe one form and explain its defects.
6. Sketch one form of revolution counter and explain the construction.
7. Show how to test the adjustment of the line of collimation of the engineer's level.
8. Sketch the marking on a level staff from 7 feet to 8 feet.
9. Sketch the mechanism of Avery's platform weighing machine, and explain why the particular proportions that are given to the various levers are adopted.
10. Sketch any one form of dynamometer brake automatically compensating for variation of friction co-efficient.

ROBERT H. SMITH.

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### MIDDLE CLASS.

Saturday, December 18th, 1886.

1. Say what you know about the reduction of timber.
2. Mention the main facts about wet and dry seasoning and about wet and dry rot in timber.
3. Describe one method of preparing Portland Cement, and give its limits of specific weight and of tensile strength, and also the mode of specifying the required fineness of grain.
4. Mention the processes used in the reduction of stone from the quarry block, and describe one form of stone-saw.
5. State how many flasks would be used in moulding the pattern shewn, and explain how the moulding would be carried out.

6. Describe the means taken to prevent or minimize the production of gas in casting iron, and those taken to get rid of the gas when it is produced. In which kind of casting are the vents for the gas most important?

7. Sketch a 3-high rolling mill; explain its advantages over the 2-high mill. State how the flangs should be arranged in the former, and the reasons for this arrangement.

8. Sketch a rolling mill for the production of solid weldless tyres.

9. The bending moment on the box-girder section of a beam is 780,000 inch-lbs. and the surface stress is to be 8000 lbs. per square inch. The proportions of the section are given in the sketch shown on the blackboard. Find the necessary dimensions.

10. A hollow steel shaft of 20 inches outside and 8 inches inside diameter runs at 70 revolutions per minute. With a surface stress of 6000 lbs. per square inch, what twisting moment and what horse-power does it transmit? What is the angle of twist in minutes and seconds in a length of 8 feet?

ROBERT H. SMITH.

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#### SENIOR CLASS.

Saturday, December 18th, 1886.

1. Describe the necessary conditions under which economical combustion and efficient utilisation of the heat of combustion can be obtained in boiler furnaces.

2. Calculate the maximum theoretical elevation of furnace temperature with anthracite coal and air admitted to twice the amount needed for chemical union with the coal.

3. Give five examples of the heating surface required per boiler heat horse-power for average fuel with different heating efficiencies, and an amount of air admitted, giving  $cm = 6$ . Give the corresponding heating surfaces required per boiler mechanical horse-power.

4. Sketch the end of one of the tubes of a Root's, or a Babcock and Wilcox boiler.

5. Give the correct expression of the first thermodynamic law.

6. Explain the theoretic dynamical and thermal conditions of "reversibility," and state why these are necessarily only theoretic and incapable of actual realization.

7. Calculate either algebraically or arithmetically (with the help of the curves) the dimensions and the steam efficiency of a single-cylinder steam engine, with adiabatic expansion, the data being the IHP, the cut-off, the back pressure, the clearance volume, the point of compression, the piston speed, and the initial pressure. N.B.—If an arithmetical calculation be preferred, the data taken must be

in every item different from those that have been given for class exercises.

ROBERT H. SMITH.

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JUNIOR CLASS.

Friday, April 1st, 1887.—Morning, 10 to 1.

1. Explain by a freehand sketch how to construct velocity diagrams for all points of an ordinary horizontal steam engine.
2. Draw accurately the stress diagram for the bridge sketched and dimensioned on the blackboard. The scale of the diagram must be chosen by the examinee himself. The stresses should be read off and marked in figures along the bars of the bridge, tension being indicated by a + and compression by a -. The scales used must be written on the diagrams.

ROBERT H. SMITH.

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MIDDLE CLASS.

Friday, April 1st, 1887.—Morning, 10 to 1.

1. Mention the direct sources of energy for engineering work.
2. Enumerate the ways in which a portion of the energy of driving machines is dissipated.
3. Explain, with help of a freehand sketch, how to calculate the frictional efficiency of an ordinary horizontal steam engine.
4. Explain the theory of the friction of a screw, and draw out a curve on sectional paper showing how the frictional efficiency varies with the ratio of pitch to diameter.
5. A leather belt of double thickness and 4 inches wide runs at a speed of 1,600 feet per minute. The tension on tight side is twice that on slack side. What is the coefficient of friction, and what the proper horse-power transmitted? The two pulleys being 20 and 40 inches in diameter, estimate the work lost per minute in stretching and bending the belt.
6. If the greatest excess of work done by the steam in an engine over the work done on the resistance be 30,000 ft.-lbs., and the speed be limited within the range of 80 to 86 revolutions per minute, what would be a suitable size of fly-wheel?

ROBERT H. SMITH.

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SENIOR CLASS.

Friday, April 1st.—Morning, 10 to 1.

1. Explain the theory of balancing single cylinder and two cylinder engines.
2. Sketch and explain one form of Corliss' valve gear.

3. Explain in what way acceleration of momentum limits the speed and the ratio of expansion in steam engines.
4. Explain the limit of expansion that gives the least total annual cost per horse power.
5. What are the advantages and disadvantages of the pulsometer? Sketch it and explain its action.
6. Enumerate the resistances to be overcome by pumps, and give formulas for estimating their magnitudes in terms of the number of gallons to be pumped per hour.
7. Explain the proper limit of speed in pumps.
8. Explain the action of pump air vessels, and show how to find their proper size.

ROBERT H. SMITH.

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JUNIOR CLASS.

Monday, June 27th, 1887.—9-30 a.m. to 1 p.m.

1. Sketch two forms of saw teeth (one "inserted"), mention their special uses, and state what you know about cutting speed and rate of feed with timber saws.
2. Describe the main parts of the most approved stone dressing machine. State also the cutting speeds for this work, and also for granite turning.
3. What change wheels would you use in the Archdale College Lathe to cut a screw of 12 threads per inch? If the screw were of steel and  $\frac{3}{4}$  inch diameter, how many revolutions per minute might you run the lathe-spindle in roughing out before cutting the thread? Would you use lubricant in roughing this out?
4. Explain the quick return motion of an ordinary planing machine. Describe two devices for using both forward and backward strokes in planing machines for cutting.
5. Sketch so as to shew all details, "Tangye's" and "Smith & Coventry's" tool holders.
6. Name and explain the differences between the three main kinds of water-wheels and three main kinds of turbine. Explain in general terms the action of turbines.
7. Classify steam engines. Explain the special characteristics of fire engines.
8. What are double and triple expansion compound engines? What are their special advantages? What whole ratio of expansion is obtained in them?
9. What are the eight leading points in the steam distribution in a steam engine? How many of these can be settled independently with the simple D slide valve?

10. Explain the action of steam engine governors. Sketch one form of spring governor.

ROBERT H. SMITH.

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MIDDLE CLASS.

Monday, June 27th, 1887.—9-30 a.m. to 1 p.m.

1. A steel cylindrical boiler of 7 feet diameter is to be worked at 120 lbs. per square inch pressure. The longitudinal joints are to be double rivetted laps, and the ring joints single rivetted laps. Determine the proper thickness of plate, and the diameter and pitching of the rivets in each set of joints. The average stress on the plates between rivet holes not to exceed 6 tons per square inch.

2. Describe the principle of Clauzel's method of designing bridge rivetted joints.

3. A steam engine has its cylinder diameter 34", and pressure 95 lbs. per square inch. Its crank-pin overhangs the centre of the crank-shaft bearing by 15", and the stroke is 48". Determine the diameter of crank-shaft journal for a maximum stress of 3 tons per square inch.

4. Deduce the rules for crank-pins recommended in the class. State the principle on which is based another set of rules commonly followed.

5. How does the speed of an engine affect the safety of its connecting rod? Deduce a rule for the maximum stress in the rod.

6. Give skeleton sketches of six different forms of speed governor. Shew the graphic construction for finding the balancing speed of a Porter governor.

7. How should stone arch joints be proportioned? Give the ordinary graphic method of finding the curve of pressures along a stone arch.

8. A wrought-iron girder of 240 feet span has equal flanges. It is of uniform section, the depth being 25 feet. Its useful load is equivalent to an uniformly distributed load of 2 tons per foot. Calculate the flange sections and the weight of the girder.

ROBERT H. SMITH.

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SENIOR CLASS.

Monday, June 27th, 1887.—9.30 a.m. to 1 p.m.

1. Calculate a formula for the force spent in accelerating the water at the beginning of each stroke of a pump. Compare in this respect a pump driven by a uniformly rotating crank and one in which this force is the least possible.

2. What objects should one aim at in designing pump valves? Distinguish between foot-valves and delivery valves in this respect. What are the advantages of a number of small valves over a single large valve?
3. Compare the relative advantages of outside and inside locomotives.
4. Enumerate the resistances to the motion of a train and explain as fully as you can how each item varies. Give what you think the best of the formulas used for the whole resistance.
5. Explain the various causes of unsteadiness in the motion of a locomotive.
6. Why is the pull through the draw-pin variable in a very small degree compared to the variation of driving moment on the crank-shaft? Give a numerical illustration different from that given in the class.
7. Deduce the limit of brake-power that can be usefully applied, and formulas for the least time and distance in which a train can be stopped. Explain why the wheels should not be skidded on the rails.
8. State what you know about the action and effect of the exhaust blast.

ROBERT H. SMITH.





## FORM OF BEQUEST TO THE COLLEGE.

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I BEQUEATH the sum of £ , free of legacy duty, to the Mason Science College, established in Birmingham by the late Sir Josiah Mason. And I direct that the said legacy and the legacy duty thereon shall be paid exclusively out of such part of my personal estate as may by law be bequeathed for charitable purposes, and preferably to any other payment thereout. And I direct that the same legacy shall be paid to the Treasurer or Bailiff for the time being of the said College, whose receipt shall be an effectual discharge for the same, and that the same shall be applied \* [in the discretion of the Council of the said College to the general purposes thereof, or to such special purposes as the said Council shall determine.]

\* NOTE.—If any special directions or conditions are to be attached to the legacy, the part in brackets to be omitted and the special matter inserted.









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