

UNIVERSITY OF LONDON



REGULATIONS AND SYLLABUSES  
FOR THE  
GENERAL CERTIFICATE OF  
EDUCATION EXAMINATIONS

Summer      January  
                  and  
1966      1967

**Internationales Schulbuchinstitut**

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Regulations and Syllabuses for the General Certificate of Education  
Examinations / University of London. - Summer 1966 and January 1967. -  
[London] : Univ. of London, 1964. - 114 S.

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Panels, on which the Council, the Boards of Studies, the Moderators and Examiners and school teachers are represented, to advise it on the more specialised aspects of examining in different subjects.

The examinations are approved by the Secretary of State for Education and Science on whose behalf the certificates are attested.

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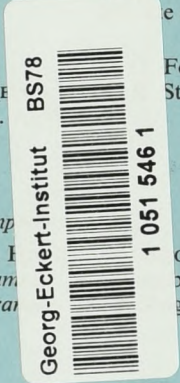
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## SPECIAL NOTICE IS DRAWN TO THE FOLLOWING CHANGES

### *Ordinary Level*

Astronomy, Navigation and Seamanship, in which syllabuses have been provided.

Music, in which the number of the Haydn symphony has been corrected.

### *Advanced Level*

Spanish, in which there is a new syllabus for Paper III.

The syllabuses appear in alphabetical order. Each subject is referred to by name and by a reference number which will be used in the preparation of entries and of results.

### **General**

All communications should be addressed to:

*The Secretary,*

*School Examinations Department,*

*University of London,*

*Senate House,*

*London, W.C.1*

Telephone: MUSEum 8000

### **Regulations and Syllabuses**

Copies of these Regulations are available, price 2s. 0d. post free in the United Kingdom, from the University of London Publications Department, 1 Malet Street (First Floor), London, W.C.1. (Telephone: MUSEum 8000). Regulations for the examinations at Overseas Centres are published separately, and may be obtained as above.

Heads of Schools and of other educational establishments may be supplied with free copies on application to the Secretary.

### **Past Examination Papers**

Papers set at recent examinations may be bought from the University of London Publications Department.

SPECIAL NOTICE IS DRAWN TO THE FOLLOWING CHAPTERS

Chapter 10  
Chapter 11  
Chapter 12  
Chapter 13  
Chapter 14  
Chapter 15  
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Chapter 19  
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London, 1966

London Publishing Department

# REGULATIONS FOR THE GENERAL CERTIFICATE OF EDUCATION EXAMINATION

## I. DATES OF EXAMINATIONS

1. The examination will be held in the Summer of 1966 and in January 1967 at the Ordinary and the Advanced levels. Special papers will be set in the Summer Examination only (see Regulation III).
2. Oral and practical tests are usually held in May and June, and in December and January.
3. Timetables for the Summer and Winter examinations are shown in Appendices A and B to these regulations. No special arrangements can be made to suit the convenience of candidates who are taking other examinations but where two subjects coincide on the University's timetable certain adjustments may be made in accordance with the instructions to Superintendents, which will be published with the list of candidates before each examination.

## II. ADMISSION TO THE EXAMINATION

1. The following may be admitted as candidates for the examination:

(a) Pupils presented by a school, college or similar institution approved for this purpose by the University. Entry to the January examination is limited to pupils presented by schools whose main body of candidates was entered for the previous Summer examination of the University.

(b) Persons not in attendance at a school, college or similar institution eligible for approval under (a), who may enter individually as private candidates.

2. The examination for private candidates is conducted at the University centre in London and at local centres. The list of local centres to which application should be made may be obtained from the University after 17 January for the Summer examination and after 15 August for the Winter examination.

3. Candidates may not change their place of examination once their entries have been accepted, although sympathetic consideration will be given to special cases supported by adequate evidence.

Candidates arriving from or going overseas after entering for the examination must inform the University as soon as possible. The University reserves the right not to transfer such entries. A candidate whose transfer from overseas is approved must complete the entry form and pay the fees appropriate to the Home examination.

4. Candidates will normally be admitted to the examination only if their sixteenth birthday is before September 1966, but the Head of a school may enter younger pupils if he is prepared to certify that it is educationally desirable that they should take the examination in the particular subjects at the time proposed, and that they have pursued a course of study with such a degree of competence as to make it very probable that they will pass in the subjects offered.

### III. SPECIAL PAPERS

1. To give abler candidates an opportunity to earn a supplementary ranking, a Special paper, forming part of the Advanced level examination and based on the same syllabus, will be set at the Summer examination in particular subjects. It will consist of questions of a more searching type, designed specially to test the candidate's intellectual grasp and capacity to think about his subject.

2. One Special paper will be set in each subject and candidates may offer only one such paper at each examination. The Special paper may only be taken in conjunction with the Advanced level papers in the same subject. Special papers will normally be of three hours duration except in Latin and Greek, in which they will be of two hours and a half. They will be taken on Wednesday, 25 May.

3. An outstanding performance on a Special paper will be awarded the grade of 'Distinction' and a good performance will be designated 'Merit'. These grades will be indicated on the certificate. In order to qualify for either of these two supplementary grades a candidate must at the same examination attain one of the three highest grades of pass available on the basic Advanced level papers in the same subject.

4. Universities and other authorities concerned with the selection of candidates may be notified of cases where candidates have offered Special papers without qualifying for a supplementary grading.

### IV. SUBJECTS OF EXAMINATION

1. The lists of subjects for the examination and their reference numbers and the levels at which they may be offered are as follows:

(O = Ordinary level, A = Advanced level, S = Special paper)

† May not be offered at the January examination.

*Subject number*

		<i>Page</i>
1. Accounts, Principles of . . . . .	O† - -	12
2. Art . . . . .	O, A -	13
3. Biology . . . . .	O, A, S	23
4. Biology (Rural) . . . . .	O† - -	25
5. Botany . . . . .	O, A, S	26
6. British Constitution . . . . .	O, A -	29
7. Chemistry . . . . .	O, A, S	30
8. Commerce . . . . .	O† - -	36
9. Domestic Subjects (Cookery) . . . . .	O, A† -	} 38
10. Domestic Subjects (Dressmaking) . . . . .	- A† -	
11. Domestic Subjects (Needlework) . . . . .	O - -	
12. Economics . . . . .	O, A, S	42
13. Elementary Surveying . . . . .	O† - -	44
14. English Language ( <i>see also subject 57</i> ) . . . . .	O - -	45
15. English Literature . . . . .	O, A, S	45
16. English Literature (Syllabus B) . . . . .	O - -	46
17. French . . . . .	O, A, S	49
18. General Science . . . . .	O - -	51
19. General Science (Additional) . . . . .	O - -	51
20. Geography . . . . .	O, A, S	56

<i>Subject Number</i>		<i>Page</i>
21. Geology . . . . .	O, A, S	58
23. German . . . . .	O, A, S	61
24. Greek (Classical) . . . . .	O, A, S	62
25. Greek Literature in Translation . . . . .	O† - -	63
26. Handicraft (Embroidery) . . . . .	O† - -	} 64
27. Handicraft (Metalwork) . . . . .	O, A† -	
28. Handicraft (Woodwork) . . . . .	O, A† -	} 68
29. History . . . . .	O, A, S	
30. History (Ancient) . . . . .	O, A -	70
32. History (British Economic) . . . . .	O, A, S	71
35. Human Anatomy, Physiology and Hygiene . . . . .	O - -	71
36. Italian . . . . .	O, A† -	49
37. Latin . . . . .	O, A, S	73
38. Latin (Syllabus B) . . . . .	O - -	74
39. Logic . . . . .	O†, A† -	76
40. Mathematics, Pure . . . . .	O, A, S	} 77
41. Mathematics, Pure (Syllabus B) . . . . .	O - -	
42. Mathematics, Additional (O level)/Further (A level) . . . . .	O, A -	
43. Mathematics, Applied . . . . .	- A, S	
44. Mathematics (Pure and Applied) . . . . .	- A, S	} 88
45. Music . . . . .	O, A -	
46. Physics . . . . .	O, A, S	92
47. Physics with Chemistry . . . . .	O - -	98
48. Religious Knowledge . . . . .	O, A, S	100
49. Russian . . . . .	O, A† S	102
50. Spanish . . . . .	O, A, S	105
51. Technical Drawing . . . . .	O, A -	106
52. Zoology . . . . .	- A, S	107
57. English Language with Spoken English . . . . .	O - -	45
58. Navigation . . . . .	O - -	91
59. Seamanship . . . . .	O - -	103
60. Astronomy . . . . .	O - -	20

When a language has been specially approved at the Advanced level, it may be offered at the Summer examination only, except Hausa which will be examined only in the January examination and Classical Arabic which will be examined at Advanced level in both Summer and January examinations. No Special papers will be set in specially approved languages except in Classical Hebrew, in which one will be set if requested by a school before October 1965.

The syllabuses for the specially approved European, Oriental and African languages are given on pages 110-114.

<i>Subject number</i>	<i>Specially Approved Languages</i>
101. Afrikaans . . . . .	O, A
102. Albanian . . . . .	O, A
103. Amharic . . . . .	O -
104. Arabic (Classical) . . . . .	O, A
105. Armenian . . . . .	O -
106. Armenian (Classical) . . . . .	- A
107. Bahasa Indonesia . . . . .	O -
108. Bengali . . . . .	O -
109. Bulgarian . . . . .	- A
110. Burmese . . . . .	O -
111. Chinese . . . . .	O -
112. Chinese (Classical) . . . . .	- A

*Subject number*

113. Czech . . . . .	O, A
114. Danish . . . . .	O, A
115. Dutch . . . . .	O, A
116. Estonian . . . . .	O -
117. Ewe . . . . .	O -
118. Fante . . . . .	O -
119. Finnish . . . . .	O -
120. Ga . . . . .	O -
121. Greek (Modern) . . . . .	O, A
122. Gujarati . . . . .	O -
123. Hausa . . . . .	O, A
124. Hebrew (Classical) . . . . .	O, A
125. Hebrew (Modern) . . . . .	O -
126. Hindi . . . . .	O -
127. Hungarian . . . . .	O, A
128. Icelandic . . . . .	O -
129. Igbo . . . . .	O -
130. Irish . . . . .	O, A
131. Japanese . . . . .	O -
132. Japanese (Classical) . . . . .	- A
133. Latvian . . . . .	O -
134. Lithuanian . . . . .	O -
135. Malay . . . . .	O -
164. Maldivian . . . . .	O -
136. Maltese . . . . .	O -
137. Marathi . . . . .	O -
138. Norwegian . . . . .	O, A
165. Nyanja . . . . .	O -
139. Pali . . . . .	O, A
140. Persian . . . . .	O -
141. Persian (Classical) . . . . .	- A
142. Polish . . . . .	O, A
143. Portuguese . . . . .	O, A
144. Rumanian . . . . .	O, A
146. Sanskrit . . . . .	O, A
147. Scottish Gaelic . . . . .	O, A
148. Serbo-Croat . . . . .	O, A
149. Siamese . . . . .	O -
150. Slovak . . . . .	O, A
151. Slovene . . . . .	O, A
152. Swahili . . . . .	O, A
153. Swedish . . . . .	O, A
154. Turkish . . . . .	O, A
155. Twi . . . . .	O -
156. Ukrainian . . . . .	O -
157. Urdu . . . . .	O -
158. Vietnamese . . . . .	O -
159. Welsh . . . . .	O, A
160. White Russian . . . . .	O -
161. Yoruba . . . . .	O -

In the January examination at the Ordinary level, only one option, Metalwork or Woodwork, may be offered in Handicraft and only one option, Cookery or Needlework, in Domestic Subjects, unless candidates who

wish to take both options within a subject are free to take them on the same day. Schools wishing to enter candidates for both options must note the fact on their proposal form.

At the January examination candidates may only offer combinations of subjects permitted by the timetable, but the University will give sympathetic consideration to difficulties caused by this restriction provided that a school gives not less than three months' notice of them.

2. Not more than four subjects at the Advanced level or ten subjects in all may be offered at the same examination. A candidate may not offer a subject at both the Ordinary and the Advanced levels at the same examination, except in Handicraft (Metalwork and Woodwork) and in Domestic Subjects, where one section may be taken at the Ordinary and the other at the Advanced level. Where there are alternative syllabuses within a subject, only one may be offered.

3. Candidates who fail in a subject at the Advanced level may at the discretion of the examiners be awarded a pass in the subject at the Ordinary level.

4. The following combinations of subjects are forbidden in any one examination:

(a) Classical Hebrew and Modern Hebrew

(b) Classical Greek and Modern Greek

(c) Greek Literature in Translation and Classical Greek

(d) Mathematics (Pure and Applied) and either Pure Mathematics or Applied Mathematics

(e) Additional Mathematics and either Further Mathematics or Pure Mathematics at Advanced level

(f) Statistics at Ordinary level in Pure Mathematics and in Additional Mathematics.

(g) Physics with Chemistry and either Physics or Chemistry or General Science

(h) Biology or Rural Biology and either Botany or Zoology

(j) Biology and Rural Biology

(k) General Science or Additional General Science and either Physics, Chemistry, Physics with Chemistry, Botany, Biology or Rural Biology

(l) Additional General Science and Human Anatomy, Physiology and Hygiene

Only one of the subjects History, Ancient History and British Economic History, and only one of the specially approved languages, may be offered at any one examination at the Ordinary level.

5. Oral examinations are compulsory at both levels in French, German, Spanish, Italian and Russian but will not normally be set in other languages. The Head of a school or college may apply at the time of entry to the examination for oral examinations in other Modern Languages which are taught in the school or college.

6. The examinations in Science will aim at ascertaining whether candidates possess a knowledge of fundamental principles and methods of science, acquired by observation of nature or by a simple course of experiment in physical measurement, or by the investigation of simple problems and commonly-occurring phenomena illustrating natural laws.

Candidates offering an experimental science subject at Advanced level must satisfy the examiners in the practical as well as in the written part of the examination. Private candidates may not offer an experimental science subject at the Advanced level unless they satisfy the University that they have adequate laboratory facilities for the study of the subject.

Schools will be given the option, which must be exercised for each examination, of applying to hold practical examinations in the Biological subjects in their own laboratories.

The practical examinations in the Biological subjects will be designed to be appropriate to candidates taking the examinations in school laboratories, and schools opting to use their own laboratories will be required to supply at their own expense any living material needed for the practical tests.

7. Papers may be set more closely in accordance with the school curriculum, provided that any special syllabus proposed is submitted to the University for approval at least two years before the examination for which it is intended, and is approved as being equivalent to that for which it is substituted.

8. Candidates will not be credited with a subject unless they satisfy the examiners that they are able to write good English and to present their material in an orderly manner.

#### V. ENTRY FORMS: SCHOOLS AND COLLEGES

1. Towards the end of September 1965, Heads of schools and colleges will receive proposal forms on which they are asked to estimate the number of candidates who will be entered and the number who will be taking each subject in the Summer examination in 1966. This information must be sent to the Secretary by 1 November 1965.

2. Early in January 1966 entry forms will be sent to schools and colleges for completion with the names of candidates, their dates of birth and the subjects they are offering. These forms will be required by 8 March, which is the closing date for entry to the Summer examination in 1966. It will be postponed for candidates whose plans need modification because of the results of the January examination, if these are not published before 8 March.

3. The proposal forms for the January examination 1967 will be sent out in September and should be returned by 1 October 1966. Entry forms will be issued on receipt of proposal forms and should be returned, giving the names and dates of birth of all candidates with the subjects to be taken, by 15 October. This is the closing date for entry to the January examination in 1967.

#### VI. ENTRY FORMS: PRIVATE CANDIDATES AT THE UNIVERSITY CENTRE IN LONDON

1. Private candidates at this centre must apply **by postcard** to the Secretary for an entry form as follows:

For the Summer examination 1966 not later than 22 February

For the January examination 1967 not later than 1 October 1966.

2. Completed entry forms, accompanied by the fees due, must be returned to the Secretary not later than 8 March for the Summer examination and 15 October for the January examination. The closing date for entry to the Summer examination will be postponed for candidates whose plans require modification because of the results of the January examination, if these are not published before 8 March.

#### VII. ENTRY FORMS: PRIVATE CANDIDATES SITTING AT LOCAL CENTRES OR SCHOOLS

1. Private candidates who live outside the London area and who wish to sit locally must seek accommodation at a local centre. Entry must always be made, and fees paid, to the centre which has agreed to accommodate a candidate. A candidate may enter for the examination through one centre only.

2. Because entries and fees must be forwarded to the University by the dates given in Regulation VI above, the centre may fix an earlier local closing date, and candidates are strongly advised to make their preliminary approaches to the centre at which they hope to sit at least one month before the University closing dates.

3. These arrangements also apply to a private candidate who arranges to take the examination at a school; this is only possible when the school is entering candidates for the University's examination and offers the candidate a place.

4. Schools and colleges are under no obligation to provide examination facilities for private candidates, and the University is not prepared to approach them on behalf of individual candidates.

#### VIII. FEES

1. The initial entry fee to the examination is one pound. Only one such fee is payable for each examination whether subjects are offered at more than one level or not.

2. In addition, the entry fee for a subject at Ordinary level is ten shillings, for a subject at Advanced level thirty shillings, and for a subject in which a Special paper is taken one pound in addition to the Advanced level fee.

3. A fee of ten shillings will be payable by a candidate taking the optional test in spoken English, in addition to the normal subject entry fee for English Language.

4. A fee of ten shillings per subject will be payable by a candidate taking the practical examination in a science subject in a University laboratory, in addition to the normal subject entry fee.

5. The University reserves the right to alter these entry fees at any time, although it will not normally do so without giving twelve months' notice of its intention.

6. If the University has approved a special syllabus in any subject of the examination, the school or group of schools submitting the special syllabus will be required to pay a fee of ten guineas for each special paper or test set at either the Ordinary or the Advanced level.

7. Candidates offering two sections in Domestic Subjects at the Ordinary level or in Handicraft at either the Ordinary or the Advanced level, and those taking both the optional papers II and III in Domestic Subjects at the Advanced level, will be required to pay fees for each section or paper as a separate subject.

8. If a Special Superintendent is provided by the University to supervise the examination, the additional fees and expenses will be payable by the school or centre.

9. Private candidates examined at a University centre in London are required to pay a local fee of fifteen shillings. A local fee is also payable to the local authorities at most provincial centres.

10. In very special circumstances, a late entry may be accepted if made within one week of the closing date for entry to the Summer or January examination, but only on the payment of an additional late entry fee of two pounds.

#### IX. REFUND OF FEES

1. Examination fees cannot be transferred from one examination to another and the full examination fees will be payable by a candidate at any subsequent entry, which must be made by the date given in the Regulations.

2. Candidates who withdraw from the examination not later than the last normal date for entry may receive a full refund of the fee(s) paid for the subject(s) from which they withdraw.

3. No part of the initial entry fee of one pound or of the local fee of fifteen shillings payable to the University by a private candidate examined at a London centre will be returned unless the candidate withdraws, not later than the last normal date for entry to the examination, from all subjects for which he has entered.

4. Fees for late entry are not returnable.

5. If candidates withdraw between the last normal date for entry and the first day of June for the Summer examination (first day of May for Special papers) and the first day of January for the January examination from all the subjects for which they entered, half the fees paid other than the initial fee of one pound and the local fee of fifteen shillings payable to the University by a private candidate examined at a London centre will be returned.

6. No fee that has been paid by or on behalf of a candidate will be refunded except as provided above, although the Principal of the University may at his discretion and on receipt of satisfactory evidence authorise the refund of the fees paid other than the initial fee of one pound (and the local fee of fifteen shillings payable to the University by a private candidate examined at a London centre) for a candidate who is absent from examination in all the subjects for which he entered by reason of illness (a medical certificate certifying illness at the time of the examination must be sent with any application), contact with a person suffering from a contagious or infectious illness, death of parent or of candidate, or through the exigency of service in the Forces of the Crown. Applications for return of fees with supporting evidence should be addressed to the Secretary, and should be made not later than the last day of July for the Summer examination or the last day of February for the January examination.

## X. SUPERINTENDENCE AT THE EXAMINATION

1. The Head of a school, college or similar institution is responsible to the University for the proper conduct of the examination for the General Certificate of Education. He must ensure that the detailed instructions sent to him with reference to the arrangements for all examinations held in the school, the distribution of the examination papers to the candidates, the collection of scripts at the end of each period and their despatch to the appropriate examiner, and the maintenance of a constant and effective supervision over the candidates are all carried out. He may call on members of his teaching staff to assist in invigilation, but the number should be as small as possible, and no other persons may be employed without the prior consent of the Secretary.

It is the duty of Superintendents to report to the University all cases of irregularity or misconduct in the examination. A candidate involved in such irregularity or misconduct in connection with the examination may be disqualified and barred from entry to future examinations during the pleasure of the Senate.

2. If the Head of a school, college or similar institution wishes to delegate the responsibility of superintendence to another person he should communicate with the Secretary not later than 1 May for the Summer examination, or 1 December for the January examination, stating the circumstances and submitting proposals for the consideration of the University.

3. The Head of a school, college or similar institution may make a special report on the work of candidates whose examination performance may have been prejudiced through no fault of their own. These reports will be made available to the examiners in their final assessment of candidates' work. They must be submitted on the forms provided, being based on the work done

during the previous year and including both an estimate of the candidates' proficiency at the time of the examination and a note of the circumstances occasioning the report.

4. The University may at any time send a Special Superintendent to a school or centre to take control of the examination, or may send an officer or Superintendent to a school or centre during the examination to inspect the arrangements and to see that the examination is being conducted in strict accordance with the Regulations.

## XI. ISSUE OF RESULTS

1. Results will be issued in the form of grades. At the Advanced level there will be seven grades arranged in order of merit. The first five will be grades of pass, the next will denote the award of an Ordinary level pass, and the last will represent a failure. For the Special papers there will be three grades denoting 'Distinction', 'Merit' or failure to qualify. At the Ordinary level there will be nine grades of which the first six will be grades of pass.

2. As soon as possible after each examination a list will be sent to the Head of each school, college or similar institution showing the names of the candidates and the grades obtained in all subjects offered. The Head should limit the communication of results to his teaching staff, the individual candidates and their parents: the grades should otherwise be treated as confidential.

3. Private candidates who make their entries direct to the University will receive their results from the Senate House: those who enter through a school or college will receive them from the school or college.

4. The University may communicate candidates' results to Universities, Local Education and other authorities.

5. The marking of papers by the University or its examiners and the results of such marking shall be final and binding on all candidates and the University will not, except in its absolute discretion, enter into correspondence about results with candidates or their parents or guardians or other persons claiming to act *in loco parentis*.

6. In certain subjects from time to time selected by the University in its absolute discretion, work taking a form other than that of a written reply to a paper will be returned to the candidate submitting the same, but all written replies to papers and the copyright therein are or will become the property of the University and will not be returned and every application to enter (whether from a school, college or similar institution or from a private candidate) will be deemed to constitute an agreement by the candidate with the University to assign such copyright to the University if called upon in writing so to do.

## XII. CERTIFICATES

1. General Certificates awarded by the University will record the name of the candidate, the school or centre at which the examination was taken, and the subjects in which a pass at the Ordinary level was obtained. Certificates at the Advanced level will also record the grade of pass attained, and candidates who qualify for a supplementary grading by means of Special papers will have this shewn on their certificates.

2. Certificates will be issued to schools, colleges and similar institutions for distribution to successful candidates as soon as possible after each examination. Private candidates will receive their certificates direct from the University if they entered directly through the University.

3. A duplicate certificate will not be issued without satisfactory evidence of the destruction of the original.

# SYLLABUSES OF SUBJECTS

*These syllabuses are intended solely to indicate the scope of the examinations and are not to be regarded as indicating the way in which the subjects are to be taught.*

## 1. PRINCIPLES OF ACCOUNTS

### ORDINARY LEVEL ONLY

This subject may be taken at the Summer examination only.

There will be one paper of 3 hours.

Candidates will be examined in the elementary principles of accounting and the ability to record transactions by double entry book-keeping; they will be expected to understand the significance of the accounts they prepare.

The importance of accounts as records of transactions and as aids to the efficient management of a business or a non-trading organisation.

Recording of transactions; books of original entry, sources of information, use of documents or copies as books of original entry; analysis columns; the cash book, petty cash book, records of bank transactions, reconciliation of bank balance; the ledger, classes of ledger account, posting to the ledger, balancing and closing accounts, modern forms of ledger accounts, divisions of the ledger, control accounts, interpretation of ledger accounts, the trial balance, its uses and limitations.

Distinction between capital and revenue, income and expenditure accounts, trading and profit and loss accounts, ascertainment of profit or loss from the records, the understanding of profit or loss as increase or decrease in the net value of assets.

Gross profit; net profit; valuation of stock on hand; relation of turnover to gross and net profit; fixed and variable expenses and their relation to turnover; relation of net profit to capital invested; interest on capital; proprietors' salaries. Computation of profit or loss from incomplete records.

The trading period; treatment of charges paid in advance or in arrear; provisions for bad debts, depreciation and other losses; treatment of income accrued but unpaid.

Special forms of final accounts; manufacturing accounts, departmental accounts.

Partnerships; simple problems on the disposal of profits or losses and entries necessary on admission of a new partner.

The balance sheet; its nature and purpose, valuation of assets, fixed, current, wasting assets; arrangement of items to show value of fixed assets and net value of floating assets; interpretation of balance sheet, capital owned, capital employed, short and long term liabilities.

Joint stock companies. Simple treatment to include capital, nominal, called up, paid up, share capital, preference, ordinary, deferred; loan capital, debentures, simple, mortgage, fixed and floating charges, appropriation of profit; interpretation of a simple balance sheet. (Preparation of a trading or of a profit and loss account will not be expected, nor will the entries necessary to record the issue of capital.)

## 2. ART

### ORDINARY LEVEL

The examination will be set on two alternative syllabuses, Syllabus A and Syllabus B. Syllabus B will only be examined in the Summer and may not be offered by private candidates.

#### SYLLABUS A

The examination will consist of the following sections :

- (1) Drawing from plants or other natural objects
- (2) Drawing from life
- (3) Composition from objects
- (4) Composition from imagination or memory
- (5) Design
- (6) History of the Visual Arts.

Candidates must offer three sections, one of which must be either section (1) or section (2).

#### *Materials*

Work may be in any suitable medium provided that the drawings and paintings may be packed and examined without their smudging or sticking. The University will provide quarter Imperial cartridge paper, which will be white or near white, but schools or candidates may provide alternative types of paper provided that it is not larger than half Imperial. Such paper must be white or near white for work in sections (1) or (2), but for work in other sections it may be of any other colour. All work must be packed flat whenever possible.

#### *Section (1) Drawing from plants or other natural objects (2½ hours)*

Candidates will be required to make a drawing from a plant, spray of foliage, or flowers or fruit and leaves, or other natural objects. One of the chief aims of the drawing should be to show clearly the shape and structure of the subject. Colour may be used.

#### *Section (2) Drawing from life (2½ hours)*

Candidates will be required to make two drawings from the clothed model. One of the chief aims of these drawings should be to show clearly the shape and structure of the model.

Colour may be used. The total time for the two drawings will be 2½ hours of which fifteen minutes will be allowed for the drawing of a short pose and fifteen to twenty minutes allowed to the model for resting.

#### *Section (3) Composition from objects (2½ hours)*

Candidates will be required to make a drawing or painting from a group of specified objects arranged by the Art teacher. There will be alternative lists of objects from which groups may be arranged. A wide range of treatment will be allowed but special attention should in all cases be paid to the relation of the objects to each other, to their background and to the composition as a whole.

#### *Section (4) Composition from imagination or memory (3 hours)*

A paper containing a list of alternative subjects will be sent to schools at least seven and not more than fourteen days before the date of the examination for distribution to the candidates. The actual composition will be carried out in

the examination room; sketches or notes must not be taken into the examination room. No guidance should be given to candidates other than that printed on the question paper.

There will be a wide choice of subjects including descriptions of scenes from everyday life and passages from poems and other literary works. Colour should be used.

Private candidates will be set an alternative paper, and will not receive a list of subjects in advance.

*Section (5) Design (3 hours)*

There will be a choice of questions in each of the alternatives given below. Candidates may take only *one* of the sub-sections.

(i) *Lino-cutting or wood engraving*

An original design will be required for a book illustration, title page, end paper, book cover, advertisement or decorative motif.

(ii) *Lettering and calligraphy*

Candidates will be expected to have a knowledge of at least two types of printed lettering and to have had practical experience in carrying out manuscript lettering. The candidate should be able to select lettering suitable for the subject and to design an appropriate layout.

(iii) *Design for book production*

Including the planning and decoration of paper book covers, layout of text with illustrations, end papers, book jackets, etc.

(iv) *Design for printed patterns*

An original design will be required, suitable for printing on material (i.e., fabric or paper) showing ability to plan a unit of pattern and indicate how it could be repeated over a larger area.

*Section (6) History of the Visual Arts (2 hours)*

The questions will be framed to test general knowledge of the history and historical development of the subject rather than technical detail. Opportunities will be given for the expression of the candidate's personal appreciation of works. There will be opportunities, where appropriate, for candidates to use their knowledge of local examples: they will be expected to illustrate their answers with sketches wherever appropriate.

A list of books referring to the subjects in the syllabus may be obtained from the Secretary. These books will be useful to candidates in preparing for the examination but the questions in the papers will not require the study of particular books.

There will be a choice of questions on each of the following periods or fields of the visual arts and candidates must answer questions from one section only.

- (i) Greek and Roman Art and Architecture
- (ii) Gothic Art and Architecture in England
- (iii) The Art of the Italian Renaissance, c. 1300-c. 1550
- (iv) English painting from Hogarth to Turner (1735-1850)
- (v) French Eighteenth and Nineteenth Century Painting
- (vi) Painting in the Netherlands in the Fifteenth and Sixteenth Centuries
- (vii) Painting in the Netherlands in the Seventeenth Century
- (viii) Crafts and costume in Georgian England
- (ix) The English House including its furnishings and surroundings.

*SYLLABUS B (No papers will be set on Syllabus B in the January examination)*

The examination will consist of two parts and candidates must satisfy the examiners in both.

Part I will consist of one paper, chosen from sections (1), (2), (3) or (6) from Syllabus A; Part II will consist of a test in the design and practice of a craft. Candidates must choose *one* of the following crafts:

- (7) Pottery (6 hours)
- (8) Weaving (6 hours)
- (9) Fabric printing (5 hours)
- (10) Design for book production (5 hours)
- (11) Lino-cutting or wood engraving (5 hours)
- (12) Modelling or carving (6 hours).

Heads of schools must inform the Secretary in writing of the crafts which will be offered by their candidates in Syllabus B, before 1 October of the year before the examination. Any school wishing to enter candidates for a test in a craft other than those listed may submit, not less than two years before the last date for entry to the examination, a special syllabus for the consideration of the University.

No assistance is to be given to candidates during the working periods and all work must be done under examination conditions in the period notified with the timetable. The supervisor should keep a time sheet of the working of each candidate and must ensure that no candidate exceeds the total time allowed.

All the necessary materials for Part II must be provided by the school, which is responsible for seeing that the candidate's examination number and the school number are firmly attached to the finished work and that this is packed in such a way as to avoid damage in transit, unless a University Examiner visits the school to assess it. No course work need be submitted in connection with this examination, and the work submitted for the practical examination will not be returned.

## ADVANCED LEVEL

The examination will be set on two alternative syllabuses, Syllabus A and Syllabus B. Syllabus B will only be examined in the Summer and may not be offered by private candidates.

### *SYLLABUS A*

The examination will consist of the following sections:

- (1) Drawing from plants or other natural objects
- (2) Drawing from life
- (3) Composition from objects
- (4) Composition from imagination or memory
- (5) Design for a craft
- (6) History of architecture
- (7) History of painting
- (8) History of a craft.

Candidates must offer three sections, one of which must be either section (1) or section (2) and of which only one may be chosen from sections (6), (7) and (8). Colour must be used in at least one of the sections.

#### *Materials*

Work may be in any suitable medium provided that the drawings and

paintings may be packed and examined without their smudging or sticking. The University will provide half Imperial cartridge paper, which will be white or near white, but schools or candidates may provide alternative types of paper provided that it is not larger than half Imperial. Such paper must be white or near white for work in sections (1) or (2), but for work in other sections it may be of any other colour. All work must be packed flat whenever possible.

*Section (1) Drawing from plants or other natural objects (3 hours)*

Candidates will be required to make a drawing from a plant, spray of foliage, or flowers or fruit and leaves, or other natural objects. One of the chief aims of the drawing should be to show clearly the shape and structure of the subject. Colour may be used.

*Section (2) Drawing from life (3 hours)*

Candidates will be required to make two drawings from a model clothed or nude. One of the chief aims of these drawings should be to show clearly the shape and structure of the model. Colour may be used. The total time for the two drawings will be three hours, of which about fifteen minutes will be allowed for drawing the short pose and about twenty minutes to half an hour allowed for the model to rest.

*Section (3) Composition from objects (3½ hours)*

Candidates will be required to make a composition by drawing or painting from a group of objects arranged by themselves. There will be alternative lists of objects from which groups may be arranged. Colour may be used.

A wide range of treatment will be allowed but special attention should in all cases be paid to the relation of the objects to each other, to their background and to the composition as a whole.

*Section (4) Composition from imagination or memory (3 hours)*

Candidates will be required to make a picture based on a given subject. A paper containing a list of alternative subjects will be sent to schools at least seven and not more than fourteen days before the date of the examination for distribution to the candidates. Sketches or notes must not be taken into the examination room.

There will be a wide choice of subjects including descriptions of scenes from everyday life and passages from poems and other literary work. Colour should be used.

Private candidates will be set an alternative paper, and will not receive a list of subjects in advance.

*Section (5) Design for a craft (3 hours)*

There will be a choice of questions in each of the crafts listed in the sections below and candidates will be required to make a design for a piece of work in one craft. They will be asked to describe the materials and methods in which the work would be carried out.

Candidates taking this paper must also submit to the University an example of work in the same craft as that for which they design in the examination. Such work must have been done by the candidate within two years of the examination and should be either a completed work or a completed part of a project, when notes indicating the whole scheme should be given. Notes, working drawings or rough drafts may be sent with each example of work.

Specimens submitted must be accompanied by a statement from the school to indicate how far they are the unaided work of the candidate. All specimens of work must be packed flat whenever possible.

(i) *Lino cutting and wood engraving*

An original design will be required for a book illustration, title page, end paper, book cover, advertisements, or decorative motif.

(ii) *Lettering and Calligraphy*

Candidates will be expected to have a knowledge of at least three types of printed lettering and to have had practical experience in carrying out manuscript lettering. They should be able to select lettering suitable for the subject set and to design an appropriate layout.

(iii) *Book design*

The planning and decoration of paper book covers, text with illustrations, end papers or title pages, etc.

(iv) *Screen printing*

Design for a small poster, decorative print or repeated pattern.

(v) *Hand-printed textiles*

The planning of a design suitable for printing on material according to the method selected. Ability to manage a repeat should be shown.

(vi) *Weaving*

The planning of a design for a hand-woven piece of cloth.

(vii) *Embroidery*

Candidates will be expected to have a knowledge of different types of stitches including examples in the following groups: Canvas, Chained, Flat, Knotted, Looped and Composite. They should be able to select a suitable and varied range of stitches when planning a design.

(viii) *Theatrical design*

Design for a set; back cloth and drop curtain or design for four costumes.

**GENERAL NOTE ON SECTIONS (6) and (7), (History of Architecture and History of Painting).**

Questions on the History of Architecture and the History of Painting will be framed to test general knowledge of the history and historical development of the subject rather than technical detail.

Opportunities will be given for the expression of the candidates' personal appreciation of works: they will be expected to illustrate their answers with sketches wherever appropriate. A list of books referring to the subjects in each syllabus may be obtained from the Secretary. These books will be useful to candidates in preparing for the examination, but the questions will not make the study of particular books essential.

There will be a choice of questions on each of the periods or fields of Art or Architecture, and candidates must answer questions from one section only.

**Section (6) History of Architecture (3 hours)**

- (i) Greek and Roman Architecture
- (ii) Gothic Architecture in England and France
- (iii) Renaissance Architecture in Italy, c. 1400-1600
- (iv) 17th and 18th Century Architecture in England
- (v) Problems of 20th Century Architecture
- (vi) A syllabus on a period or type of architecture with special reference to local architecture, such syllabus to be submitted in accordance with Regulation IV, 7 (p. 8).

*Section (7) History of Painting (3 hours)*

- (i) Italian Renaissance Painting, c.1300-1600
- (ii) The Painting of the Netherlands in the 15th and 16th Centuries
- (iii) Spanish Painting, 1550-1830
- (iv) The Painting of the Netherlands in the 17th Century
- (v) French Painting in the 17th and 18th Centuries
- (vi) French Painting in the 19th Century
- (vii) English Painting, 1530-1750
- (viii) English Painting, 1725-1900
- (ix) European Painting, 1880 to the present day.

*Section (8) History of a craft (3 hours)*

Schools may submit to the University for approval a special syllabus dealing with the history of a specific craft or branch of applied Art, in accordance with Regulation IV, 7. This section may not be offered by private candidates.

*SYLLABUS B (No papers will be set on Syllabus B in the January examination)*

The examination will consist of two parts and candidates must satisfy the examiners in both. Part I will consist of one paper chosen from sections (1), (2), (3), (6), (7) or (8) from Syllabus A; Part II will consist of a test of the candidate's knowledge of a craft and his ability to design and carry out an example. The time allowed will be not more than 15 hours excluding the fixing of dye, drying, firing, casting, etc.

Candidates must choose one of the following crafts:

- (9) Pottery
- (10) Weaving
- (11) Lino cutting or wood engraving
- (12) Sculpture
- (13) Screen printing
- (14) Hand-printed textiles
- (15) Embroidery
- (16) Theatrical design.

Heads of schools must inform the Secretary in writing of the crafts which will be offered by their candidates in Syllabus B, before 1 October of the year before the examination. Any school wishing to enter for a test in a craft other than those listed may submit, not less than two years before the last date for entry to the examination, a special syllabus for the consideration of the University.

No assistance is to be given to candidates during the working periods and all work must be done under examination conditions during the period of the written papers. The supervisor should keep a time sheet of the working of each candidate and must ensure that no candidate exceeds the total time allowed.

All the necessary material for Part II must be provided by the school which is responsible for seeing that the candidate's examination number and the school number are firmly attached to the finished work and that this is packed in such a way as to avoid damage in transit, unless a University examiner visits the school to assess it. No course work need be submitted in connection with this examination and the work submitted for the practical examination will not be returned.

### *Section (9) Pottery*

Candidates will be required to design and make a piece of Pottery, during the examination period of 15 hours, excluding time taken for casting, drying and firing etc. They must have a working knowledge of the following methods and techniques:

- Throwing on the wheel
- Slab construction
- Coil construction
- Slip casting
- Decoration by means of slip
- Turning of feet
- Mould making
- Fitting of handles
- Tile making
- Incised decoration
- Underglaze painting
- Use of glazes.

Candidates must present a log, written during the examination, detailing their procedure and explaining any technical processes they use.

### *Section (10) Weaving*

Candidates should be familiar with all aspects of a four shaft loom. They should understand the use of point paper, simple drafts and weaves produced on a four shaft loom by these drafts. They should have experience in the use of wool, cotton and linen yarns, and have some knowledge of interior design as well as a knowledge of costume and textile design including contemporary examples.

### *Section (11) Lino cutting or wood engraving*

Candidates will be expected to have had practical experience in designing and carrying out a varied range of examples of the chosen craft and to have studied a wide selection of modern and historical examples where possible.

For lino cutting candidates should have had experience in working fairly large, i.e., with a smaller dimension of not less than twelve inches and they should have had experience of making prints with not less than three separate blocks.

For wood engraving candidates should have had experience in working with a smaller dimension of not less than six inches.

### *Section (12) Sculpture*

Candidates will be required to make a piece of Sculpture, during the examination period of 15 hours, excluding the time taken for casting, drying and firing etc. Candidates must have had experience in modelling from natural objects and in addition to be familiar with at least two of the following techniques:

- Casting in plaster
- Carving in wood
- Carving in stone
- Constructions in various materials, metal, wood plastic etc.
- Terracotta.

### *Section (13) Screen printing*

Candidates should be able to design and print a small poster, decorative print or repeat pattern. The design is of primary importance; the candidates should have some knowledge of lettering.

### *Section (14) Hand-printed textiles*

Candidates should have a knowledge of block, and screen printing, the more common types of dyes and an understanding of the types of repeats used in textile printing. They should have some knowledge of interior design as well as a knowledge of costume and textile design including contemporary examples.

### *Section (15) Embroidery*

The candidate will be expected to have a practical knowledge of different types of stitches including examples in the following groups:

Canvas  
Chained  
Flat  
Knotted  
Looped  
Composite.

The candidate will also be expected to have studied not less than two of the following:

Appliqué  
Black work and fillings  
Cut and drawn work  
Inlaid work  
Insertion  
Laid and couched work  
Quilting.

The candidate should be able to select suitable and, as far as possible, varied stitches when planning a design and to use them freely and effectively when carrying it out.

### *Section (16) Theatre design*

It will be of great advantage to candidates if they have had the opportunity to visit a theatre and see something of its working. They must have some knowledge of the factors in mounting a production. They should have some relevant knowledge of literature, architecture and costume and will be expected to have had some practical experience in making simple properties and costumes and in the elements of scene painting.

## **60. ASTRONOMY**

### **ORDINARY LEVEL ONLY**

There will be one paper of 2½ hours.

There will be one or two essay-type questions on a limited range of subjects, and a number of questions requiring fairly short answers on a reasonably wide range of subjects. Candidates must answer five questions out of ten. Evidence of some practical work (experiments and observations) will be required; candidates must submit their notebooks before the examination, and the examiner may question them on the work they have done.

This should be related to observations which can reasonably be expected of them. Practical projects should be encouraged; a list of from which three should be selected is appended to the syllabus and schools wishing to submit others should write to the Secretary by 1 October of the year before the examination.

#### *History of Astronomy:*

The important advances in Astronomy, for example, the work of Eratosthenes, Hipparchus, Ptolemy, Copernicus, Tycho Brahe, Kepler, Galileo, Newton, Herschel, Bessel, Goodricke.

#### *The Earth and Sky:*

Shape and size of earth. Evidence for rotation. Latitude, longitude, polar star, circumpolar stars. Annual motion of the Earth associated with variations of the appearance of the sky. Familiarity with some of the well known constellations, star groups and stars, including The Plough, Cassiopeia, Pegasus, Cygnus, Orion, Capella, Vega, Sirius, Algol, The Zodiac.

#### *Optics:*

Properties of light, reflection and refraction. Effect on observations of atmospheric refraction. Parallax. Dispersion of light. Line and continuous spectra. Properties of simple lens systems. Construction of a simple refracting telescope. Newtonian reflecting telescope. Magnifying power of telescope.

#### *The Solar System:*

##### *(a) The Sun.*

Nature, size, temperature and distance. The Sun as a typical star. The motion of Sunspots associated with rotation of Sun, also connection with magnetic storms on Earth. Description of appearance of chromosphere, corona and prominences at total eclipse.

##### *(b) The Moon.*

Nature of surface (visible and invisible from the earth), size and distance. Phases. Orbit and reasons for solar and lunar eclipses. Libration.

##### *(c) The Planets.*

The probable atmospheres and surface temperatures and the possibilities of life on Mercury, Venus, Mars, Jupiter, Saturn. The apparent motions. The phases of Venus, the satellites of Jupiter, the rings of Saturn. The discovery of Uranus, Neptune and Pluto. The sizes and approximate distances from the sun.

##### *(d) Comets and meteors, including principal meteor showers.*

#### *The Celestial sphere:*

Celestial equator, meridian, ecliptic. The equinoxes, declination, right ascension and sidereal hour angle. Greenwich meridian and hour angle. Greenwich sidereal time. Observer's horizon, meridian and zenith. Altitude and azimuth. Altitude of pole star. Local hour angle. Local sidereal time. Motion of sun and planets relative to the stars. Rising and setting of heavenly bodies.

#### *Time:*

Sun dial gives time measured by apparent Sun. The Mean Sun, equation of time, Greenwich mean time, zone time. Calendar. The Seasons.

#### *Gravitation:*

Kepler's Laws. Newton's Law of Gravitation. The Earth's gravitational field. The meaning of velocity of escape from Earth or Moon; bearing on atmospheres. Simple explanation of tide-raising properties of Moon and Sun. An elementary account of the uses, construction and method of propulsion of artificial satellites. The velocity in a circular orbit, and the meaning of 'weightlessness' in an earth satellite.

### *The Stars:*

Their distances found from measurements of parallaxes. Measurement of distance in light-years and parsecs. Apparent differences in colours and brightness. The meaning of apparent and absolute magnitudes. Differences in stars revealed by spectra. Difficulty of measuring angular diameters. Variable stars. Eclipsing binaries and other types of variable stars. Binary stars; observations of binaries. Explanation of orbital motion under mutual gravitational attractions. Clusters and nebulae and the Milky Way (briefly).

### *Practical work*

These topics are intended as a guide: alternative and supplementary exercises will readily suggest themselves.

1. Identify features on the Moon from simple atlas. Sketch an atlas from formations observed.
2. Select a formation on the Moon. Prepare an outline on a white card, from a photograph suitably enlarged, and fill in the main details by observations with low and high powers.
3. Plot the positions of the Moon during the synodic month on Mercator's projection. The position may be estimated from angular distance from known stars, or from measurements of R.A. and Dec. by the circles of an equatorial mount.
4. Plot the positions of the planets on Mercator's projection.
5. Observe the great nebula in Orion with a small telescope. Describe its appearance and sketch the stars in the neighbourhood of the nebula.
6. Observe Mizar and Alcor (in Ursa Major) through small telescope. Describe the colours and relative magnitudes of the stars and estimate their angular separations. Other binary, or multiple systems of fairly wide separation should also be observed.
7. Describe the appearance of the Pleiades, and other open and close clusters.
8. Describe the appearance of Jupiter and its satellites. Consult the Ephemeris for times of eclipses, reappearances and transits of satellites. Record observations made. Also observe the phases of Venus and the rings of Saturn. (Note: Jupiter and Saturn may present considerable observational difficulties for some years due to declination, especially for urban observers.)
9. Examine Algol on successive nights and compare its brightness with that of nearby stars.
10. Construct a simple telescope from convex lenses and cardboard tubes. Estimate the magnifying power and angular field of view of a telescope with eyepieces of different focal lengths.
11. Construct a sundial. (For details see Schroeder.)
12. Use the shadow stick for finding the meridian and latitude and for the deduction of declination and equation of time. Observations of amplitudes and azimuths.
13. Observations of sun spots by projection of image on to a white card.
14. Projects using photography:
  - (i) Demonstrate apparent circular motion of stars by making long exposure with fixed pin-hole camera directed towards the Pole Star;
  - (ii) Use camera attached to equatorially driven telescope to take lunar photographs.
15. Projects using photography, spectroscopy (e.g. Fraunhofer Lines) and the use of an astro-compass, or radio telescope.

### 3. BIOLOGY

#### ORDINARY LEVEL

There will be one paper of 3 hours.

1. The main characteristics of living organisms and the difference between animals and plants, as illustrated by *Amoeba*\*, *Spirogyra*\*, a flowering plant and a mammal. Nutrition, elimination of waste, storage of reserve material, respiration, growth, irritability and movement, reproduction. Conditions under which life can exist.

2. (a) The form and structure of the parts of a flowering plant so far as they can be studied with a hand lens, and the functions of these parts so far as they can be ascertained by observation and simple experiment. An annual, a biennial and a perennial herb. Trees. Seasonal changes.

(b) Elementary plant physiology. Simple experiments on absorption, conduction, transpiration, photosynthesis, the value of salts, respiration, growth and tropic movements. Elementary facts of the circulation of carbon and nitrogen. An elementary study of soil in relation to plant growth. (An elementary knowledge of the chemical and physical properties of the atmosphere and of water will be assumed.)

(c) The life-history of a flowering plant (excluding the microscopic processes of maturation and development of the seed). The form and structure of a few simple flowers. Pollination (by insects and wind) and fertilisation. Fruit and seed dispersal. Germination, particularly as illustrated by seedlings easily grown in the garden or in pots or boxes. Vegetative reproduction.

3. A mammal to illustrate animal characteristics. The structure and functions of the skin; the skeleton; the alimentary tract and its glands; the respiratory system; the blood vascular system; the nervous system, and the eye and ear; the renal and reproductive systems. (Candidates should have seen dissections of a small mammal.)

4. Reproduction and development. An outline (external features only) of the development and metamorphosis of the frog and of a butterfly or moth. The mammalian foetus and the functions of the placenta (details of embryonic membranes are not required). Parental care.

5. The modes of life of saprophytes and parasites, as illustrated by a mould,\* dodder\* and a tape-worm.\*

6. The natural history, studied by personal observation and experiment of a few named animals and plants of any one habitat (habitat may be interpreted broadly and may, for example, include a balanced aquarium, or a garden or park). Stress should be on the adaptation to their environment of the animals and plants selected, rather than on a study of the community as a whole.

It is intended that, except in the types marked\*, the work should be carried out only so far as is possible with the naked eye or by the use of a hand lens. Simple accurate drawings are expected, but flora diagrams are not required. Field work and visits to zoological and botanical gardens, and to natural history museums, should be encouraged whenever possible.

#### ADVANCED LEVEL

There will be two papers, each of 3 hours, and a practical examination of 3 hours.

Candidates must satisfy the examiners in the practical as well as in the written examination.

This syllabus is intended as an introduction to the study of living organisms, their characteristics and their place in nature.

1. The general structure, physiology and life-history of the following organisms as illustrating various grades in animal and plant organisation: *Amoeba*, *Paramecium* (excluding details of conjugation), *Hydra*, earthworm, cockroach (excluding details of reproductive system and eye), dogfish (excluding urino-genital system), a mammal: *Chlamydomonas*, *Spirogyra*, *Fucus*, a moss (life-history only), a fern, *Selaginella* (life history only), and a flowering plant.

2. The structure and physiology of the cell. Nuclear and cell division. Cell differentiation, and tissue formation, including an elementary knowledge of the histology and functions of: Epithelia, blood, connective, skeletal, muscular and nervous tissues of animals and of the epidermis, parenchyma, collenchyma, sclerenchyma, xylem, phloem, and the primary and secondary meristems (including cork formation) in plants. The structure and functions of the root, stem and leaf of a mesophytic dicotyledon and monocotyledon (secondary thickening in dicotyledon only); and of the liver, kidney, ovary, testis, small intestine, skin and spinal cord of a mammal.

3. Asexual reproduction, fission, spore formation, budding, vegetative propagation. Sexual reproduction. Outlines of Mendelian inheritance for not more than two pairs of characters; the significance of the pairing and subsequent separation of homologous chromosomes (a detailed study of meiosis is not required).

4. The evidence for evolution.

5. Growth and development. Formation, structure and germination of a seed. The development of the fowl up to the completion of the formation of the amnion, in order to show the basic vertebrate characters; the embryonic membranes in the fowl and in a mammal. The modes of nutrition during development.

6. Nutrition in living organisms. The importance of water to living organisms. Photosynthesis. An elementary knowledge of carbohydrates, fats and proteins and their recognition by simple tests. The soil in relation to plant and animal life. The importance of inorganic salts to the plant. The food requirements of an animal. Digestion, absorption, assimilation and defaecation in animals. Enzyme action. The transport and storage of materials in living organisms.

7. Respiration. Sources, storage, liberation and utilisation of energy. Excretion as illustrated by the functioning of the mammalian kidney. Water relations of plants and water regulation in animals.

8. Stimulus and response in plants and animals. An elementary knowledge of the action of endocrines.

9. The parasitic and saprophytic modes of life as exemplified by dodder, *Mucor*, *Saccharomyces*, *Monocystis*, tape-worm (a knowledge of the structure and life-history of these organisms only so far as it is of importance in relation to the special mode of life). An outline study of the malarial parasite and potato blight to show how a knowledge of a parasite and its hosts may be used to combat disease.

10. The life-history and mode of life of a few common insects, such as a butterfly (or moth), a bee, a beetle, a bug, a fly, a dragonfly (detailed structure of the mouth parts not required).

#### *Practical work*

The greatest importance is attached to accurate and intelligent observation and recording. Field studies afford a training towards this end.

The practical work will be based on the above syllabus and should include:

1. Dissection or microscopical examination of the animals and plants cited.
2. In addition to an examination of the general external and internal anatomical features of the earthworm, cockroach, dogfish and rabbit, candidates are expected to have made the following special dissections:

*Dogfish* (a) Heart, afferent and efferent branchial systems

(b) Brain and cranial nerves.

*Rabbit* (c) Heart and principal vessels of arterial and venous systems

(d) External features of brain

(e) Urinogenital system.

3. The skull of the dog and the eye of the ox will be substituted for those of the rabbit.
4. Microscopical preparation, simple staining (excluding double staining) and examination of suitable animal and plant tissues.
5. Simple experiments in plant physiology, and detection of food stores by simple tests.
6. The examination of the whole mounts and representative sections to illustrate the early development of the fowl. The external features of a fairly advanced mammalian embryo attached to the wall of the uterus by the umbilical cord.

Candidates must bring their original notebooks, certified by their teachers as being the record of the work carried out by the candidates in the field and in the laboratory, for inspection at the practical examination. These notebooks must be taken away by the candidates at the end of the examination.

*A Special paper will be set in this subject; see Regulation III (page 4).*

## 4. RURAL BIOLOGY

### ORDINARY LEVEL ONLY

There will be one paper of 3 hours.

This subject is intended only for candidates from schools where the pupils will have free access to outdoor work throughout the year, and may not be taken by candidates taking Biology or Botany. It may be taken only at the Summer examination.

The detailed examination of the types should be carried out with the unaided eye or a simple lens, but the use of the microscope is not precluded.

1. *The characteristics of living organisms* as illustrated by a study of a flowering plant and a mammal, e.g., rabbit. The properties of protoplasm; the fundamental facts of nutrition, elimination of waste, storage of reserve material, respiration, growth and irritability; the differences between, and interdependence of, green plants and animals.

The elementary facts of the circulation of carbon and nitrogen.

The relations of an organism to its environment (e.g., air, soil, water).

2. *The flowering plant: its life history.* (a) The seed. The structure and germination of the broad bean seed, vegetable marrow seed and any one cereal grain. The conditions necessary for germination, studied in the laboratory and in the open. The foods stored in seeds and their economic value.

(b) The living plant. The appearance and structure of the organs of a typical garden plant (e.g., wallflower) and of a cereal plant (e.g., wheat).

The functions of root, stem, and leaf, so far as can be shown by observation and simple experiment. An elementary treatment of absorption, transpiration, photosynthesis, respiration, growth, irritability, and the factors influencing them.

Annuals, ephemerals, biennials and perennials; examples of each including some common weeds. Perennating organs and their use in propagation and as food crops.

(c) The flower: the structure of a simple type of garden flower (e.g., wall-flower) and of the flower of a cereal plant. Insect and wind pollination. Fertilisation (in outline only).

3. *Elementary study of soils.* Types of soil and their influence on plant growth. The principles of soil cultivation in garden and farm. Drainage.

The elements necessary to plants. Manures. The importance of bacteria. Root nodules, the rotation of crops.

4. *The characteristics of a mammal.* The life history of a mammal (e.g., rabbit). An outline of the organisation of the mammalian body in relation to its functions. (Only such details of tissues, organs and systems as are necessary to illustrate the functions.)

5. *Farm animals and their characteristics.*

6. *Farm and garden pests and their control.* (Not more than three examples to be studied in particular.)

7. *Outdoor work* should include: the sowing and care of seeds; garden planning – the choice of soil and site; garden tools and their use; soil management; care of garden crops; fruit cultivation; agricultural implements (including the tractor), their maintenance, and observation of their use in normal farm operations such as ploughing, harrowing, sowing, rolling, and harvesting; the study of the feeding and general care of farm animals and the symptoms, method of treatment and methods of prevention of any one farm animal disease.

Relevant portions of the foregoing should be covered by frequent school visits. Candidates should become acquainted with the appearance of cereal plants, seed crops, and root crops at all stages of their growth, with the appearance and treatment of common field weeds and at least one crop disease, and with the appearance of common soil animals.

The questions set will have regard to the conditions under which these subjects may best be taught practically in schools. Only a minimum of technical terminology is expected and stress will be laid on intelligent observation rather than on memory.

## 5. BOTANY

Botany may not be taken by candidates taking either Biology or Rural Biology.

### ORDINARY LEVEL

There will be one paper of 3 hours.

1. Training in accurate observation and in drawing records of such observation, by study of the external features and of the structure of flowering plants so far as these can be observed with the unaided eye or by the air of a hand lens.

2. The functions of the various organs so far as they can be ascertained by observation and simple experiments.

3. The chief features of the life history of flowering plants as illustrated by common types (excluding the microscopic processes of maturation, fertilisation and development of the seed). A knowledge of the main types of germination of which candidates should have themselves studied some common examples. The habit, mode of branching and method of perennation of flowering plants. The structure of the inflorescence and flower and modes of pollination, studied in such a way that the student can give an intelligent description of any simple type. Fruits and seeds and their mode of dispersal.

4. The nature and macroscopic structure of the vegetable products met with in everyday life, such as common fruits, vegetables, cereals, wood, cork, rubber, sugar, tobacco, and the common beverages.

5. The main features of the soil in relation to the plant, and the significance of the common cultural operations.

6. A knowledge of the chief characteristics of the wild or commonly cultivated members of the following families: Ranunculaceæ, Cruciferae, Caryophyllaceæ, Leguminosæ, Rosaceæ, Compositæ, Scrophulariaceæ, Labiatae, Salicaceæ, Iridaceæ, Liliaceæ, Gramineæ.

7. An elementary knowledge of the nutrition, growth, and irritability of plants, particularly of such facts as can be demonstrated by simple qualitative and quantitative experiments.

(An elementary knowledge will be assumed of the chemical and physical properties of the atmosphere and of water, together with some acquaintance with the use of the barometer and thermometer.)

8. The salient characters of the vegetation and environmental factors of woodlands, hedgerows, pastures, moorland, salt-marshes, sand-dunes, aquatic habitats and arable land.

Only a minimum of technical terminology is expected and stress will be laid on evidence of intelligent observation rather than of memory.

## ADVANCED LEVEL

There will be two papers, each of 3 hours, and a practical examination of 3 hours.

Candidates must satisfy the examiners in the practical as well as in the written examination.

### 1. *General Morphology, Anatomy and Cytology*

The morphology of the flowering plant, its mode of growth and development as illustrated by a study of representative angiosperms. Modifications of plant organs with special reference to their functions.

The plant cell and its divisions, including mitosis. Apical and lateral meristems and their activity. The principal types of cells and tissues. Tissue distribution in the primary plant body of typical dicotyledons. Secondary growth of the stem; the structure of secondary wood and cork in a dicotyledonous tree.

The general distribution of the tissues in a monocotyledonous stem.

### 2. *Special Morphology*

The main sub-divisions of the plant kingdom and their general features.

#### (a) *Spermatophyta*

The differences between gymnosperms and angiosperms, excluding anatomy. The structure of the flower. The morphology of representative inflorescences and flowers considered in regard to their modes of pollination. The micro-

scopic structure of anthers and ovules; including meiosis. Fertilisation and its results. The structure of fruits and seeds. Germination.

The taxonomy of flowering plants studied mainly by reference to the following families: Ranunculaceæ, Rosaceæ, Compositæ, Scrophulariaceæ, Liliaceæ, Gramineæ. Family, generic and specific characters.

(b) Pteridophyta

The general features of the group.

The morphology, life-history and general anatomy of *Dryopteris*. The special features (excluding anatomy) of *Selaginella*. Homospory and heterospory.

(c) Bryophyta

The general features of the group.

The morphology and life-history of *Funaria*.

(d) Algae

The structure and life-history of *Chlorella*, *Spirogyra*, a diatom, e.g., *Pinnularia*, *Euglena*, *Fucus* (excluding anatomy), and the vegetative structure only of a branched filamentous alga, e.g., *Cladophora*, *Ectocarpus*. The concept of phytoplankton.

(e) Fungi

The biology of fungi with special reference to saprophytism and parasitism. *Mucor* (or *Phycomyces*) (structure and life-history); *Saccharomyces* (with special reference to alcoholic fermentation); *Penicillium* and the concept of antibiotics; *Monilia fructigena* (conidial stage of *Sclerotinia fructigena*) as an example of an unspecialised parasite causing a 'brown rot' in apples; *Peronospora parasitica* (structure and life-history, excluding the sexual stage), and the concept of obligate parasitism; a named gill-bearing fungus (life-history). Mycorrhiza.

(f) Bacteria

The general characteristics of bacteria and their special relation to disease and decay: the circulation of nitrogen in nature.

(g) An elementary consideration of viruses.

### 3. Plant Physiology

(a) The plant in relation to water.

Protoplasm as a heterogeneous system: osmosis, turgor and plasmolysis. The absorption, ascent and utilisation of water in land plants. Transpiration.

(b) Metabolism

The mineral requirements of plants. Salt absorption.

An elementary study of fats, proteins and carbohydrates (e.g., glucose, fructose, sucrose, starch and cellulose). Simple tests for food reserves and for the constituents of cell walls.

The general characters of enzymes and of enzyme action, illustrated by simple experiments with diastase (amylase), and invertase (sucrase).

An elementary treatment of biological oxidation; dehydrogenases and oxidases.

Photosynthesis to include a consideration of external and internal factors, raw materials and products: chlorophyll: light and dark reactions: the concept of the photolysis of water.

The special features of the leaf as a photosynthetic structure.

An elementary consideration of the special significance of nitrogen and phosphorus in plant metabolism.

The translocation and storage of food.

Respiration: anaerobic and aerobic, including an elementary consideration of the end products and of the energy liberated.

(c) Growth and irritability

The nature of growth based upon experimental study: etiolation, tropisms, auxins and their location and effects.

(d) Soil

The soil as a medium for plant growth. The structure of soil, to include some reference to its principal components, e.g., mineral and humus fractions, soil water, soil atmosphere and the micro-organisms found in soil.

4. *Ecology*

Some first-hand observational work should be carried out in the field to illustrate the concept of a plant community. Plant succession.

5. *Evolution*

An outline of the concept of evolution and of the origin of species.

6. *Genetics*

The principles of Mendelian inheritance. The concept of the gene. Linkage and linkage groups. An elementary consideration of the evidence connecting inheritance with chromosomes. The origin of new genes by mutation.

#### *Practical Examination*

The practical work will include the macroscopic and microscopic examination of plants and parts of plants. Candidates may be required to make and use temporary microscopical preparations involving simple stains: the preparation of permanent double-stained slides will not be required in the examination. Exercises in plant taxonomy and simple experiments in plant physiology may be set.

Candidates will be expected to show evidence of training in accurate observation and in the careful recording and intelligent interpretation of their observations.

Candidates must bring their original notebooks, certified by their teachers as being the record of the work carried out by the candidates in the laboratory, for inspection at the practical examination. These notebooks must be taken away by the candidates at the end of the examination.

*A Special paper will be set in this subject; see Regulation III (page 4).*

## **6. BRITISH CONSTITUTION**

### **ORDINARY LEVEL**

There will be one paper of 2½ hours.

The main features of the present-day working of the British Constitution should be covered, the subject being studied descriptively rather than analytically. Some knowledge of the chief events of the historical development of the constitution will be expected.

The fundamental characteristics of the constitution and the outlines of central and local government, including the supremacy of Parliament, the electoral system, the Crown and its prerogative, the conventions of the constitution, the Cabinet, Prime Minister and Privy Council.

The general organisation and work of the civil service. The powers and duties of the more important ministries, e.g., the Treasury.

The organisation, structure and procedure of the Judiciary.

The general structure of English local government. The work and powers of the various councils: relationship to the central government. Local government finance: rates and grants in aid.

Relations of the United Kingdom with the other members of the Commonwealth and with the Empire. Differences between dominion, colonies, dependencies and trust territories.

## ADVANCED LEVEL

There will be two papers, each of 3 hours.

The nature, sources and characteristics of the British Constitution. The separation of powers. Parliamentary sovereignty. The Royal prerogative. Constitutional conventions. The party system. Public opinion.

Parliament; its position, functions, personnel and powers. The electoral system. Parliamentary privilege and procedure. Control of national finance.

The Privy Council and the Cabinet. Committees of the Cabinet. Ministerial responsibility. The position of the Prime Minister. The principal government departments. The civil service. The outlines of public administration. Various forms of control over administration, including Treasury control, control by Parliament and the Cabinet, and ministerial and parliamentary control of public corporations.

The organisation and functions of the Judiciary. Administrative tribunals. Delegated legislation.

The constitution and powers of local authorities in England, including central control of local authorities and local government finance.

The British Empire and the Commonwealth of Nations: the relations of the United Kingdom with the other members. Independent members of the Commonwealth, colonies, protectorates and trust territories. Commonwealth unity. The position of the Crown in the Commonwealth. Appeals to the Judicial Committee of the Privy Council. Federalism in the Commonwealth.

Candidates will be expected to have some acquaintance with the chief events in the development of British political institutions since 1832 but the emphasis of the papers will be on the working constitution of the present day.

There will be opportunities for candidates to show knowledge of current constitutional affairs.

## 7. CHEMISTRY

### ORDINARY LEVEL

There will be one paper of 3 hours.

Candidates will be required to give evidence in their answers that they have performed experiments of a simple qualitative and quantitative character

dealing with subjects included in the syllabus. They may use a stencil for drawing apparatus.

1. Chemical and physical properties. Chemical and physical change. Types of chemical change. Elements, compounds and mixtures. Solution, solubility, solubility curves (excluding those indicating a change in the nature of the solute). Crystallisation, including simple examples of fractional crystallisation (separation of potassium nitrate from sodium chloride and of potassium chlorate from potassium chloride). Separation of simple mixtures by solution and filtration, crystallisation, distillation and sublimation.
2. The simpler properties of acids, bases and salts. General methods for the preparation of salts. Normal and acid salts.
3. Laws of conservation of mass, definite proportions and multiple proportions. Boyle's and Charles' laws and calculations. Vapour density of a gas. Equivalent weights of elements. Relation between atomic weight, equivalent weight and valency. Variable valency of iron and its effect on equivalent weight. Determination of the equivalent weights of metals by replacement (hydrogen by metals, and copper or lead by zinc), formation and reduction of oxides, and by electrolytic deposition. The electro-chemical series and related chemical properties including replacement of one element by another, stability and ease of reduction of oxides, and reaction of metals with water and acids. Diffusion of gases and liquids: simple experiments (excluding quantitative illustration of Graham's law): Graham's law and calculations.
4. The concept of atoms and molecules. The idea that atoms are built up of electrons, protons and neutrons. The concept of electro valency. Symbols and formulae. Calculation of empirical formulae and molecular formulae (when given the vapour density of a volatile compound). Chemical equations with calculations. Gay Lussac's law of volumes. Avogadro's hypothesis. Deduction of relationship between vapour density and molecular weight. The gram-molecular volume. Calculation of volumes of gases involved in reactions.
5. Electrolysis. Faraday's laws. Electrolysis of acidified water, and sodium chloride solution, and of copper sulphate solution using copper and platinum electrodes. Simple explanation of these electrolyses using the idea of the preferential discharge of ions. Electrolysis in the preparation of elements (hydrogen, chlorine and sodium), of compounds (caustic soda), and in the purification of metal (copper).
6. Acidity and alkalinity due to hydrogen and hydroxyl ions. The ionisation of water (excluding  $K_w$ ). Equivalent weights of acids and bases. Normal solutions. Quantitative interaction of solutions of the three mineral acids with the hydroxides and carbonates of sodium and calcium and with the bicarbonate of sodium.
7. Reversible reactions illustrated by the thermal dissociation of ammonium chloride, the action of sulphur dioxide with oxygen and of steam on iron. Effect of temperature on the rate of reaction (simple examples only). Catalysts and catalysis exemplified by the effect of manganese dioxide in the decomposition of potassium chlorate and also of hydrogen peroxide, and of platinum in the reaction between sulphur dioxide and oxygen and in the oxidation of ammonia by oxygen.
8. Air: constituents – composition by volume; air a mixture. Oxygen;

laboratory preparation (any one common method). Outline of manufacture from liquid air. Properties and uses. Classification of oxides.

9. Hydrogen. Laboratory preparation (any one common method). Outline of manufacture. Properties and uses.

10. Water. Action of water on sodium, calcium, magnesium, iron. Volume composition of water and steam. Composition by weight. Hydrates and water of crystallisation. Deliquescence and efflorescence. Drying agents. Natural waters. The hardness of water. Water softening. Hydrogen peroxide: simple account of preparation, properties and uses of a dilute solution. Oxidation and reduction (simple examples only).

11. Nitrogen. Preparation from air and from any one nitrogen compound. Properties. Ammonia. Laboratory preparation. Outline of Haber process. Properties and uses. Ammonium hydroxide, chloride, sulphate and nitrate. Laboratory preparation, manufacture and common uses. Nitric acid. Laboratory preparation. Outlines of manufacture from ammonia. Properties and chief uses. Nitrates. Preparation, properties and uses of the nitrates of sodium, potassium, copper and lead. Nitrous oxide, nitric oxide, dinitrogen tetroxide. Preparation, properties and uses.

12. Carbon. Allotropy. Proof of chemical identity of allotropes. Properties and uses. Carbon dioxide. Preparation, properties and uses. Volume composition and formula. Carbonates and bicarbonates with special reference to those of calcium and sodium. Carbon monoxide. Preparation from formic or oxalic acid. Properties and uses. Combustion and flame. Structure of the bunsen flame. Carbon and carbon compounds as sources of energy. Coal gas, producer gas and water gas; an outline of their manufacture and uses.

13. Chlorine. Laboratory preparation, manufacture from salt. Properties, including replacement of bromine and iodine by chlorine. Hydrogen chloride. Laboratory preparation. Properties. Volume composition. Hydrochloric acid. Properties and uses. Chlorides, especially those of sodium, calcium, lead and iron.

14. Sulphur. Occurrence and extraction. Allotropy. Simple properties and uses of sulphur. Hydrogen sulphide. Laboratory preparation. Properties. Precipitation of sulphides of copper and lead. Sulphur dioxide. Preparation and manufacture. Properties and uses. Volume composition and formula. Conversion of sulphur dioxide to sulphur trioxide. Sulphuric acid. Outline of manufacture by contact process. Properties and chief uses. Sulphates, especially those of calcium, barium, zinc, ferrous iron, copper, lead and magnesium.

15. Phosphorus. White and red phosphorus. Uses. Production of 'super-phosphate', orthophosphoric acid, and phosphorus from calcium phosphate.

16. General properties of metals and non-metals. Sodium. Occurrence of compounds. Properties of sodium metal and of the compounds already specified. Copper. Refining of the metal by electrolysis. Laboratory preparation of cupric oxide, nitrate and sulphate. Iron. Common ores. Outline of conversion of haematite to pig iron (with emphasis on the main chemical reactions). Simple account of preparation and properties of wrought iron and steel. Ferrous, ferric and magnetic oxides. Rusting of iron. Lead. Preparation, properties and use of compounds specified above. Zinc. Production and uses of the metal. Reactions with the mineral acids and with caustic alkalis.

17. Simple tests for the radicals carbonate, chloride, sulphate, sulphite, sulphide, nitrate, ferrous, ferric, calcium, zinc, copper, lead, and ammonium.

## \*ADVANCED LEVEL

There will be two papers, each of 3 hours, and a practical examination of 3 hours.

Candidates must satisfy the examiners in the practical as well as in the written part of the examination.

The whole syllabus is to be treated in an elementary manner and as far as possible experimentally. More importance will be attached to a sound understanding of fundamental principles and standard experimental methods than to an acquaintance with advanced theoretical ideas. In calculations emphasis should be given to methods which involve the application of fundamental principles rather than the mere memorisation of formulae.

1. The laws of chemical combination. The atomic and molecular theories. Equivalent weights of elements and methods for their determination. The laws of Gay Lussac and Avogadro; the use of the latter in determining molecular weights by the methods of Regnault, Victor Meyer, and Dumas. Atomic weights by Cannizzaro's method, Dulong and Petit's method and the law of isomorphism.

2. The periodic classification of the elements in relation to the theory of atomic structure and valency, illustrated principally by a simple general study of the elements hydrogen to argon. Simple study of the transition elements chromium and manganese. Candidates should know the positions in the Periodic Table of all the elements selected for special study (Sections 10 and 11) in this syllabus, and should be able to relate their properties, and those of their compounds, to these positions.

3. Simple qualitative treatment of the electronic theory of valency. Electrovalency and covalency. The relationship between position in the Periodic Table and type of valency exhibited. The physical properties (volatility, solubility, electrical conductivity) associated with electrovalent and covalent compounds, as exemplified by typical compounds such as sodium chloride, methane, carbon tetrachloride, phosphorus trichloride, ammonium chloride.

### *Physical Chemistry*

4. The effects of temperature and pressure on the volume of an ideal gas; Boyle's and Charles' laws. Graham's law of diffusion. The law of partial pressures (experimental verification not required).

5. Qualitative application of simple ideas of the kinetic theory to the solid, liquid and gaseous states. Solution: solutions of gases in liquids, Henry's law (treated as a simple consequence of the kinetic theory). Solutions of solids in liquids; solubility and solubility curves (including simple eutectics). Raoult's law of vapour pressure lowering (as a simple consequence of kinetic theory only). Empirical establishment of relationship of molar concentration to lowering of freezing point and raising of boiling point. Determination of molecular weights by freezing point and boiling point methods. Osmotic pressure (to include simple details of one method for its measurement); laws of osmotic pressure.

6. Thermochemistry. Exothermic and endothermic reactions. Heats of reaction, formation, combustion and neutralisation. Hess's law. (Candidates will be expected to be familiar with one or two simple methods for estimating heat of reaction or heat of neutralisation only).

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\*Logarithms and slide rules may be used.

7. Qualitative treatment of the effects of temperature, pressure, concentration and presence of a suitable catalyst on the velocity of a chemical reaction. The law of mass action and its application to equilibrium conditions in homogeneous gaseous and liquid systems. Equilibrium constants. Heterogeneous equilibrium for the dissociation of calcium carbonate, including the idea of dissociation pressure. The principle of Le Chatelier and its application to the effects of temperature and pressure on the position of equilibrium in homogeneous reactions. Thermal dissociation in gases.

8. Electrolysis. Faraday's laws and the explanation of electrolysis in terms of simple electronic theory. The electro-chemical series. Examples of electrolysis of simple acids, bases and salts, in solution and in the fused state. Ohm's law applied to solutions. Specific conductivity and its variation with concentration for strong and weak electrolytes (candidates will not be expected to have knowledge of practical details for the measurement of specific conductivity). Equivalent conductivity. The complete dissociation of strong electrolytes. Application of the law of mass action to weak electrolytes; application of boiling point and freezing point measurements to electrolytes. The ionic product of water. Hydrogen-ion concentration (to include a simple treatment of pH values). Buffer solutions. Qualitative treatment of salt hydrolysis. Simple theory of indicators, including their use in acid/alkali titrations and in rough measurement of pH values. Solubility product treated qualitatively, with examples from qualitative analysis.

9. The colloidal state. Simple methods of preparing colloidal dispersions, such as those of arsenious sulphide, ferric hydroxide, platinum (or silver), starch (or gelatine). Use of these dispersions to show the obvious differences between colloidal dispersions and true solutions.

#### *Inorganic Chemistry*

The study of inorganic chemistry should be conducted on comparative lines wherever possible, being related to the positions in the Periodic Table of the elements concerned. The application of the principles of physical chemistry should be stressed and attention should be given to the relative solubilities in water, acids and alkalis of the substances studied, especially where these influence the methods used for their preparation, or affect their properties and uses.

10. The metallic elements, potassium, sodium, calcium, magnesium, aluminium, zinc, iron, tin, lead, copper, mercury to be studied (including the relevance of their positions in the electro-chemical series) on the following lines:

(a) A comparative general treatment of the methods used for their extraction and purification, with detailed consideration of the chemical principles underlying the extraction of aluminium, magnesium, zinc, and iron; the conversion of iron into steel. (In these, and in the other manufacturing processes mentioned in this syllabus, detailed knowledge of technical processes will not be required.)

(b) Their reactions with oxygen, chlorine, water, the mineral acids and the alkali hydroxides.

(c) The laboratory preparation and properties of compounds of the following types that are in common use: oxides, hydroxides, sulphides, chlorides, sulphates (including double salts), nitrates, carbonates and ortho-phosphates.

(d) The manufacture of sodium bicarbonate and sodium carbonate (Solvay process), sodium hydroxide, calcium oxide, bleaching powder, sodium hypochlorite.

(e) The more important properties of potassium bromide, potassium iodide and potassium iodate.

11. The non-metallic elements, hydrogen, carbon, nitrogen, oxygen, phosphorus, sulphur, chlorine, bromine, iodine, to be treated on the following lines:

(a) Their important properties and their isolation on a commercial scale.

(b) The laboratory preparation and properties of the elements and of their hydrides, oxides and chlorides, which are in common use.

(c) Methods of manufacture, properties and more important uses of: ammonia and ammonium salts, nitric acid, hydrogen chloride, sulphur dioxide, sulphuric acid, carbon dioxide, producer gas, water gas, coal gas, calcium carbide.

12. Silicon, silica, glass, water-glass.

13. Oxidation and reduction, including elements with variable valency and simple cases of electron transfer.

14. The chemistry involved in the syllabus of practical work treated mainly from the standpoint of the ionic theory.

### *Organic Chemistry*

15. The quadrivalence of carbon and its power of forming stable covalent bonds with non-metallic elements, and especially with itself, related to the number, range and stability of the organic compounds. The steps involved in the elucidation of the molecular formula of a simple organic compound: purification; detection of carbon, hydrogen, nitrogen, sulphur, chlorine, bromine, iodine; calculation of empirical formula from results of ultimate analysis for the above elements (details of methods of performing such analyses not required); determination of molecular formula. Structural formulæ. Homologous series. Optical isomerism.

16. A study of the following homologous series as exemplified by the compounds given, with the essential practical details of the methods of laboratory preparation and purification for those shown in CAPITALS. In considering isomeric relationships, candidates will not be expected to be familiar with those applying to compounds containing more than four carbon atoms. The paraffins (methane, ethane, propane, the butanes). The olefins (ETHYLENE) and the acetylenes (acetylene), with special reference to their unsaturated nature (ETHYLENE DIBROMIDE). The monohydric alcohols (methyl alcohol, ETHYL ALCOHOL, the propyl alcohols, the butyl alcohols); differences between primary, secondary, and tertiary alcohols illustrated by their behaviour on oxidation; evidence for the structural formula of ethyl alcohol. The alkyl halides (methyl bromide, ETHYL BROMIDE, methyl iodide, ETHYL IODIDE). The ethers (DIETHYL ETHER). The aldehydes (formaldehyde, acetaldehyde), including addition of HCN, NH<sub>3</sub> and NaHSO<sub>3</sub>, and evidence for the structural formula of acetaldehyde. The ketones (acetone) compared and contrasted with the aldehydes. The monobasic carboxylic acids (formic acid, acetic acid), evidence for the structural formula of acetic acid. The esters of the monobasic carboxylic acids (ETHYL ACETATE), their hydrolysis, including identification and estimation of the products. The acid anhydrides (acetic anhydride), chlorides (acetyl chloride) and amides (ACETAMIDE). The primary amines (methylamine). The nitriles (ACETONITRILE). In this section emphasis should be laid on the behaviour of the groups which typify each series.

17. Benzene, its isolation from coal tar and its special properties as revealed in the contrast between its reactions with bromine, sulphuric acid and nitric acid, and those of the aliphatic hydrocarbons. (Evidence for the structural formula of benzene will not be required; the Kekulé formula may be assumed where necessary). The preparation of phenol from benzene-sulphonic acid. Comparison of properties of the —OH group in phenol with those of the —OH group in ethyl alcohol. The preparation of NITROBENZENE from benzene. The preparation of ANILINE from nitrobenzene. Comparison of properties of the —NH<sub>2</sub> group in aniline with those of the —NH<sub>2</sub> group in methylamine. The preparation of ACETANILIDE.

#### *Practical Examination*

Candidates must bring their original laboratory notebooks certified by a teacher to be a record of the student's own experimental work carried out in the laboratory for inspection at the practical examination. These notebooks must be taken away by the candidates at the close of the examination. Candidates may use in the practical examination any book or books they desire, including their own laboratory notebooks.

18. Qualitative analysis of mixtures of simple salts, containing not more than *four* inorganic radicals, of which no two metallic radicals will be in the same section as defined below. Phosphate separations will not be required. The radicals selected will be from the following:

lead, silver, mercurous;

mercuric, bismuth, copper, cadmium, tin, antimony;

iron, aluminium, chromium;

nickel, cobalt, manganese, zinc;

barium, calcium;

magnesium, potassium;

ammonium;

chloride, bromide, iodide, carbonate, nitrate, phosphate, sulphate, sulphite, sulphide.

Full credit will be given only for a systematic analysis. Semi-micro methods may be used.

19. The use in volumetric analysis of solutions of acids and alkalis, potassium permanganate, potassium dichromate (excluding its titration with ferrous salts), sodium thiosulphate, iodine, silver nitrate (excluding Voltard).

*A Special paper will be set in this subject: see Regulation III (page 4).*

## **8. COMMERCE**

### **ORDINARY LEVEL ONLY**

This subject may only be taken at the Summer examination.

There will be one paper of 2½ hours, and candidates must answer five questions.

Candidates should understand the nature and purpose of Commerce and the influence of industrial expansion on its growth. The study should include an elementary treatment of specialisation, of the location of industry due to natural advantages, and of the changes due to improved transport, the easy transmission of power and the changes in industrial methods. Attention should be given to the reasons for the position of Great Britain as a leading

commercial nation and to the work of Government departments in commerce. A knowledge of the functions of the various documents normally used in the daily conduct of business will be expected, but this should not be detailed; it will be assumed that candidates have had no business experience. They should be encouraged to include suitable local conditions in their study, which should be more concerned with the structure of the business world than with the description in detail of types of business concerns.

*Commerce.* Specialisation and the need for exchange; the nature and purpose of commercial activities; the localisation of production; the effects of transport and invention in reducing localisation.

*Retail Trade.* Function of the retailer; forms of retail organisation and the reasons for their existence; independent shops, multiple shops, department stores, chain stores, self-service stores, supermarkets, the retail market, mail order, mobile shops, and direct selling by manufacturers.

*Wholesale Trade.* Function of the wholesale warehouseman, the purpose and organisation of the wholesale warehouse; services of the wholesaler to the manufacturer and to the retailer; methods of eliminating the wholesaler. Wholesale produce markets and exchanges, their purpose and organisation; the functions of merchants, agents and brokers.

*Purchase and Sale of Goods.* The functions of the main documents used. Trade discount, Cash discount. Hire purchase; its importance; advantages and disadvantages for the producers and the purchasers of consumption and capital goods.

*Business Units.* Sole traders; partnerships; public and private limited liability companies; publicly owned undertakings, local and national, wholesale and retail co-operative societies. Reasons for the emergence of the different kinds of business unit; methods of obtaining capital and dealing with profits or losses.

*Capital.* Nature and forms of fixed and circulating capital; the capital owned and the capital employed by a business. Gross profit, net profit, relation to turnover and to the capital invested; importance of rate of turnover and its variation in different types of business.

*Finance.* Means of payment, including those provided by the Post Office; the development of banking; different kinds of banks: savings, commercial, industrial and their functions; services of commercial banks to the business world with special reference to the cheque system, traders' credit facilities, overdrafts and loans. The Bankers' Clearing House; the Bank of England. Services of commercial banks to private persons; loans and cheques.

*Foreign Trade.* Elementary treatment; problems arising from differences of language, currency, weights and measures; the work of H.M. Customs; visible and invisible imports and exports; the importance of foreign trade to Great Britain; services of commercial banks to importers and exporters methods of payment.

*Transport.* The importance of transport to Commerce; the various methods; road, rail and inland waterways; sea transport, services of liners, tramps and coasters; methods of arranging shipments; necessity for efficient docks and harbours, the work of port authorities; advantages and limitations of air transport.

*Insurance.* Nature and purpose; importance in modern business; its statistical basis; meaning of insurable interest, utmost good faith and indemnity. Importance of British insurance offices and of 'Lloyds' in world commerce.

*Communications.* Importance of rapid and accurate transmission of commercial information; the services rendered by the Cable Companies and the Post Office in the transmission of information.

## 9, 10, 11. DOMESTIC SUBJECTS

### ORDINARY LEVEL

The examination may only be taken at schools approved for the purpose which have suitable equipment for practical tests. All the materials for these tests must be provided by the school.

A candidate offering the full syllabus in both sections will be required to pay fees for each section as a separate subject.

The examination will comprise the theory and practice of *either* (a) Cookery, or (b) Needlework. At the Summer examination only candidates may offer the full syllabus in both Cookery and Needlework as given below, and the Certificates will record Domestic Subjects (Cookery) or Domestic Subjects (Needlework) or both as the case may be. Regulation IV (1) on page 6 refers to entry for both options in the January examination.

Schools wishing to enter candidates for Domestic Subjects covering a different or wider range than either Needlework or Cookery are invited to submit their own syllabuses designed to correspond with the equipment and accommodation available at the school. If this syllabus includes Cookery, the subject may not be taken with the subject Cookery; if it includes Needlework, the subject may not be taken with the subject Needlework.

All the work should have a scientific basis; a preliminary course in Physics and Chemistry and some knowledge of Hygiene is presupposed.

The examination will consist of:

1. A theory paper of 2½ hours; candidates must answer five questions.
2. A practical test of 2½ hours.

Candidates must satisfy the examiners in the practical as well as in the written part of the examination.

#### A. Cookery (Subject number 9)

*In the theoretical paper questions will be set on the scientific basis of the work.* Management and planning of larder, storeroom and kitchen. The care of stores and perishable goods, kitchen hygiene. Marketing. Simple home preservation of garden produce.

Basic cookery processes related to meal planning.

Planning meals taking into consideration such factors as the health, age and occupation of those catered for, and the foods in season.

#### B. Needlework (Subject number 11)

*In the theoretical paper questions will be set on the study of fabrics used, their reaction to simple chemicals and their physical properties.*

Fabrics. Study of the materials used, their nature, appearance, properties, reaction to moisture, to heat and to detergents, and the removal of stains.

Garment making. The choice of clothes in relation to the individual (colour, style and occasion). The use and adaptations of bought paper patterns. The purchase of materials. Cutting out and making of undergarments, overalls, frocks and blouses, including their decoration.

Care and repair of garments and household linen.

The use, care and cleaning of the sewing machine and other needlework equipment.

In addition to the practical test, the examiner may require from candidates at schools which will be notified in May each year the production of one garment made during the year of the examination showing skill in both hand and machine work, and one article or garment repaired, to be submitted not later than the date of the theory paper, with the following details in each case:

Material, processes used, cost, time taken and any other suitable observations.

These descriptive details together with a teacher's assessment of one garment and one repair will be required at the time of the examination, whether the course work is actually called for or not.

## ADVANCED LEVEL

This subject may be taken at the Summer examination only, when three written papers, each of 3 hours, and two 3-hour practical tests will be set:

Paper I. A general paper.

Paper II. Cookery and Nutrition (Theory and Practical).

Paper III. Dressmaking and Textiles (Theory and Practical).

Candidates must take Paper I and *either* one of Papers II and III *or* both: those offering both Papers II and III will be required to pay fees for each as a separate subject.

### PAPER I. GENERAL PAPER

Candidates must answer questions from only one of sections (a), (b) and (c).

#### (a) Home Environment

The house: choice of site. The effects of damp. Building construction related to insulation from damp and gross temperature fluctuations. Methods of efficient lighting, heating and ventilation.

The significance of a safe and adequate water supply. Sources of water and their characteristics, especially the relative probability of contamination.

Hard and soft water. Piped water systems.

Disposal of waste, refuse and sewage from the house and outline of further dispersal protecting the community.

Accidents: mortality. Main causes. Preventive measures.

Infection (outline only): Bacteria and viruses – their nature and ways in which they may enter the body and be spread by infected dust, 'droplet infection,' ingestion, or through the skin. Principles involved in prevention of spread – early detection, contacts, carriers, isolation, disinfection. The general nature and early symptoms of infections as showing the typical response of the body to invasion by pathogens.

Immunity (resistance to infection): natural, acquired and induced. The value of protective inoculation in some diseases, e.g., diphtheria, whooping cough.

Bacterial contamination of food. The production of clean milk. Milk-borne disease; pasteurisation, sterilisation. Designated milks. Food and processed foods as possible sources of infection. Preparation of food and food handling as causes of contamination.

Animal vectors, infestation. Characteristics and life-history, preventive and control measures – mosquito, housefly, lice, bed-bug, itch-mite (scabies), flea, cockroach, rats, and mice.

*(b) House Planning and Management*

Types of housing suitable to different sections of the community. Planning in relation to comfort, health and labour saving.

Good design and suitability for purpose in relation to interior decoration, furnishing and labour-saving equipment.

Buying or renting accommodation: help in purchasing a house through loans or mortgage. Types of lease.

Types of insurance, e.g., household, personal, and third-party risk. Combined insurance and house purchase. How to take out a policy and make a claim.

The Home Budget: the value of a simple account of income and expenditure in the smooth running of the home – importance of classifying and balancing expenditure against income under headings such as: sources of income, including family allowances, income from savings. Expenditure: payments on house purchase or rent, rates, upkeep of insurances; capital expenditure such as furniture, furnishings, equipment. Hire purchase: upkeep costs; renewals, decorations and repairs; household and personal expenses. (Details of actual amounts allocated are not expected.)

*(c) The Social Services*

The central and local government departments concerned with the social services. The part the individual can play in local government.

National Insurance: its contributions and benefits including those affecting a wife. How these are paid. Insurance of domestic servants and casual labour. National Assistance.

The National Health Service: the general practitioner, specialist and hospital services. The work of the district nurse, the health visitor, and the home help. General outline of the educational system in England. Maternity and Child Welfare. School Health Service.

Voluntary social services. Welfare provision made by industry and employers.

**PAPER II. COOKERY AND NUTRITION** (*Subject number 9*)

The essential constituents of natural foods (proteins, fats, carbohydrates, vitamins, mineral salts, water) in relation to their biological functions. The concept of a balanced diet. Influence of occupation, climate, and age.

The alimentary canal in relation to ingestion, digestion, absorption and elimination. The importance of culinary preparation to facilitate these processes.

Effects of cooking on the nutritive value of foods.

Menu planning – factors to be considered. Family meals at all seasons. Feeding young children, invalids and convalescents. Menus for special occasions.

Importance and general principles of food and kitchen hygiene, including food storage in relation to temperature, light, humidity, etc.

Development of modern cooking appliances and equipment – suitability for purpose, mode of action, control and care.

*Methods of cooking:* roasting, baking, grilling (including infra-red grilling), frying, boiling, steaming (including pressure cooking), stewing and braising, as applied to different types of food and including reference to modes of heat transfer from the source to the food involved in the different methods (brief reference should be made to electronic cooking where the heat is generated

in the food itself). Use of cooked foods and precautions to be taken in re-heating.

*Vegetables and fruit:* classification, structure and composition; changes in storage and cooking. Various methods of cooking including dressed vegetables, vegetarian dishes – salads and appropriate dressings. Preparation of raw fruits and fruit jellies. Principles and practice of home preservation.

*Stock and soup making:* consommé may be excluded from practical work.

*Sauce making:* to include foundation roux sauces with variations as well as egg sauces and miscellaneous sauces including apple and bread sauce, as suitable accompaniments to various dishes.

*Meat:* structure and composition of muscular tissue, factors promoting tenderness, general effects of dry and moist heat, cuts of meat, including offal, and methods of cooking.

*Fish:* chief characteristics of various types, structure and composition. Factors affecting choice; effects of method of cooking. Use of sauces and stuffings. (Shell fish may be excluded from practical work.)

*Milk:* composition and colloidal nature. Coagulation of proteins by heat, acid, rennin, salts, tannins – effect of varying conditions and their influence on the use of milk in cookery.

*Eggs:* uses in cookery and methods of cooking related to coagulation of protein. Use as a stabilising agent in foams and emulsions.

*Cheese:* outline of cheese-making processes, types and varieties. The use of cheese and suitable methods of cooking.

*Cereals and flour:* structure and composition of grains, comparison of various types, chemical and physical changes in cookery with special reference to starch and gluten. Application in sauce making; batters; pastries, bread and yeast mixtures, cake and pudding mixtures. General principles in aeration of flour mixtures and modes of action of raising agents.

### PAPER III. TEXTILES AND DRESSMAKING (Subject number 10)

#### A. Textiles

Fibres (natural and synthetic): sources. Outline of the processes concerned in the production of yarns. Varieties of each kind and the outstanding characteristics of the different varieties. Study of physical structure of fibres, including microscopic examination; physical properties. An outline of their chemical constitution and chief chemical properties.

Tests for distinguishing kind of fibre.

Fabrics: fabric construction; properties of fabrics due to fibres, weave or finish and affecting suitability for purpose; strength, resistance to friction, elasticity, water absorption, rate of drying, heat insulation, electrostatic properties, reactions to ironing temperatures, acids, alkalis and solvents. Suitability for various articles of clothing, wearing qualities, washability and possible effects of the usual methods of stain removal.

#### B. Choice of clothing

Choice of suitable materials, styles and approximate prices.

For infants (including layette), pre-school children, school children – boys and girls, adolescents. To include underwear, nightwear, outerwear, accessories and footwear for summer and winter.

### *C. Making up of garments*

Necessary preparation of material and knowledge of pattern lays for all types of materials.

Choice of materials, including suitability for and precautions to take when machine stitching. Estimation of prices and quantities required according to widths of materials.

Fitting and adaptation of trade patterns.

Methods of marking out patterns with tailor tacking, trace tacking, tailor's chalk, tracing wheel, and dressmaker's carbon.

Method of assembling garment for first fitting.

Order of work for completion of garment.

*Processes to include* worked buttonhole, bound buttonhole, shaped facings, correct method of attaching fastenings, i.e., buttons, hooks and eyes, press studs and zip fastenings. Making openings to include tailored or strap openings for shirt blouse and simple placket for tailored skirt. Setting in sleeves. Method of setting on 'Peter Pan' and straight collars. Patch pockets, set in pockets, i.e., welt and bound. Application of petersham to skirt waist. Seams and methods of neatening seams.

Methods of finishing hems, to include circular and flared skirt hems. How to level hems.

Simple decorative stitches suitable for dressmaking.

### *D. Dressmaking equipment*

Knowledge of and correct use of tools required for dressmaking.

The care and cleaning of household sewing machines.

Use of sewing machines for constructive and decorative purposes, to include the use of attachments for hemming, gathering, ruffling, machine darning and cording foot for piping and inserting zip fasteners.

Use of the iron in dressmaking, including shrinking of woollen fabrics and pressing.

### *E. A comprehensive study of garment repairing including lining repairs.*

During the course candidates must have made for themselves a blouse and skirt or a dress of a material suited to the style selected. The garment chosen is to be submitted for inspection with the examination piece at the end of the practical examination.

## **12. ECONOMICS**

### **ORDINARY LEVEL**

There will be one paper of 2½ hours.

A description of the main features of the present-day economic structure and activity of the United Kingdom, in conjunction with the elements of the theory of demand and supply.

Population: size, sex- and age-distribution. Geographical and occupational distribution.

The location of some major industries and the reasons determining their location.

The division of labour and the advantages of international trade. Imports and exports: their character and geographical distribution.

- Production for the market. How price changes affect demand and supply.
- Large and small firms. Private and public enterprise. Specialisation among firms. The stages in the flow of goods and services to the final consumer.
- The different forms of money. The functions of a bank. The Bank of England. The Stock Exchange.
- The main kinds of taxes: the main objects of public expenditure.

## ADVANCED LEVEL

The examination will consist of two three-hour papers.

Candidates will be expected to show that they understand the elements of economic analysis included in the syllabus and to apply their knowledge to simple problems. They will also be expected to show a knowledge of the main economic institutions and problems of the United Kingdom (or of their own country) and to discuss government policy in relation to them.

Neither a knowledge of the history of economic thought nor of any but the simplest analytical methods is required. In general, while elementary diagrammatic treatment is required, the syllabus does not demand advanced geometrical and algebraic methods although they may be used.

*Paper I:* The basic economic problem of scarcity and choice, and the significance of opportunity costs. The functions of the price system.

The relative importance of the main industries and services (including agriculture) as contributors to the National Product, as employers of labour and as providers of exports and consumers of imports.

The rôle of markets and of firms. Forms of business organisation, including Co-operative Societies and nationalised industries. Exchange and specialisation (including international specialisation). The principle of comparative costs. Internal and external economies. The location of industry; concentration and diversification. Factors affecting the size of firms; vertical and horizontal integration.

Demand and supply analysis of prices in goods markets and factor markets, and the application of elementary price theory, e.g. price instability and the stabilisation of primary product prices, minimum and maximum price controls.

Changes in the size and composition of the population: its occupational and geographical distribution. Mobility of labour. The institutions of the labour market, e.g. Trade Unions and Ministry of Labour services.

The introductory treatment of market forms (perfect competition and monopoly). The causes of monopoly. Monopoly and public policy.

*Paper II:* The level of money National income and the flow of money income between households, firms and the government. The elementary treatment of aggregate demand and supply in relation to changes in the general level of prices, output and employment, and the effects of government economic policy.

Nature and functions of money. Price indices. The rôle of a Central Bank and of the commercial banks. The capital market and the finance of industry and trade.

The composition and elementary theory of the balance of payments. The terms of trade. Changes in the external value of currencies. International economic organisations. Elementary treatment of arguments for tariffs, e.g. protection against low-wage imports, the employment argument.

Government expenditure and the main sources of its revenue. The effects of taxes and subsidies, including the redistribution of income.

The growth of the real National Product and the broad determinants of real income per head.

*A Special paper will be set in this subject; see Regulation III (page 4).*

### 13. ELEMENTARY SURVEYING

This subject may only be taken at the Summer examination.

#### ORDINARY LEVEL ONLY

There will be one written paper of 3 hours and a 3-hour practical test.

The making of small surveys with chain and tape.

Keeping the field book.

The use of tie-lines, check lines and offsets.

Chaining on sloping ground and around obstructions; sources of error in chaining.

Simple hand instruments such as the cross staff, optical square, Abney level, box sextant, hand level and clinometer.

The prismatic compass; whole circle and reduced bearings; magnetic declination.

Traversing with a compass; graphical adjustment of compass traverse.

Plane table surveying.

Simple construction and temporary adjustments of the surveyor's level.

Simple levelling; booking and checking readings.

Ordnance datum; bench marks.

Contours and simple methods of contouring. Determination of gradients from a line of levels or a contoured plan.

Measurement of buildings for block plans.

Determination of areas of common plane figures, such as the triangle, trapezoid, circle; areas of irregular rectilinear figures and figures with irregular boundaries, graphically or from field notes, including Simpson's rule.

Determination of volumes of solids, such as the prism, cylinder, pyramid, cone, wedge and prismoid.

#### *Practical Examination*

Plotting a survey from field notes.

Construction of scales; copying, reducing and enlarging plans.

Plotting sections from level book notes. Plotting plans of simple buildings.

Determination of areas and volumes from contoured plans.

A general knowledge of the large and medium scale maps of the Ordnance Survey.

## 14. ENGLISH LANGUAGE

### ORDINARY LEVEL ONLY

The examination will consist of two papers:

*Paper I:* A composition paper (1 hour) to test a candidate's ability to write good English.

Six subjects will be set, of which only one is to be attempted. The subjects may include narrative, description, argument, and factual and imaginative topics; the exercise may require the use of letter form. Emphasis will be placed on the orderly presentation of material.

*Paper II:* A paper (2 hours) consisting of:

(a) A prose passage to be summarised by the candidate, to test ability to understand it and to express its main line of thought or argument.

Candidates are expected to devote about 45 minutes to this exercise.

(b) A prose passage to test comprehension by means of questions on its general sense and on particular points.

(c) Two questions, of which the candidate will be required to answer one. One will be a grammar question, which will be sub-divided so that knowledge of different aspects of grammar is tested. One of the parts will concern the function of clauses. The remaining question will deal with one or more of a variety of topics, such as vocabulary, figurative language, definitions, paraphrase, punctuation. No question on punctuation will take the form of an exercise in inserting punctuation into a continuous unpunctuated passage.

Incorrect spelling and punctuation will be penalised in all parts of the papers.

## 57. ENGLISH LANGUAGE WITH SPOKEN ENGLISH

A candidate for English Language may also take an optional oral test. This will consist of two parts, a candidate being required to read aloud a short passage supplied by the examiner and then to converse on simple topics, including questions on the passage read. The candidate must satisfy the examiner in both parts.

Both tests will aim at assessing the candidate's power of articulation and fluency rather than mere pronunciation. Each candidate will be tested for about ten minutes. Candidates will not be penalised for any local dialect or intonation provided that it does not interfere with their ability successfully and intelligently to communicate their thoughts to the examiner. Entry will be limited to school candidates. A candidate who is successful in both the written and the oral tests will be informed that he has been awarded one of three grades of pass in Spoken English. All broadsheets of results will show separately the grades for both the oral and for the written parts of the examination.

## 15. ENGLISH LITERATURE

No particular edition of Shakespeare's plays is prescribed, but for the purpose of setting context passages the examiners will use the edition of the plays edited by W. J. Craig, published by the Oxford University Press.

## ORDINARY LEVEL

### SYLLABUS A

There will be one paper of 2½ hours containing questions testing knowledge of prescribed English books. Candidates must answer five questions, choosing at least one but not more than two from each of the Sections A, B and C. In Section A candidates must answer one question containing a passage set to test their knowledge of the meaning and subject-matter, but they will not be expected to show knowledge of points of linguistic detail.

The following books are prescribed for Summer 1966 and January 1967:

Section A: Shakespeare:

1. *A Midsummer Night's Dream*.
2. *Julius Caesar*.

Section B:

1. Chaucer: *The Nuns' Priest's Prologue and Tale* (to be studied in the original) (ed. K. Sisam, O.U.P.)
2. Book of Narrative Verse (ed. V. H. Collins, World's Classics, O.U.P.), the following poems:

Old Ballads

*Sir Patrick Spens; Thomas the Rhymer; Edom o' Gordan; Jock o' the Side; Edward, Edward; Mary Ambree*

William Wordsworth: *Michael*

S. T. Coleridge: *The Rime of the Ancient Mariner*

John Keats: *The Eve of St. Agnes*

Lord Tennyson: *Morte d'Arthur*

Matthew Arnold: *Sohrab and Rustum*

G. K. Chesterton: *Lepanto*

3. Rhyme and Reason: Ed. O'Malley and Thompson (Queen's Classics, Chatto & Windus), the sections entitled—Sea and Adventure, War, Country Life and the Seasons, People
4. Pope: *The Rape of the Lock*.

Section C:

1. Hudson: *Far away and Long ago* (Dent)
2. Conrad: *The Rover*
3. Goldsmith: *She Stoops to Conquer*
4. C. S. Forester: *The Gun*.

### SYLLABUS B (*Subject number 16*)

There will be one paper of 2½ hours. Candidates must answer five questions from three sections, choosing two from each of sections A and C and only one from Section B.

The following books are prescribed for Summer 1966 and January 1967.

Section A. *Plays*.

Three plays, including two by Shakespeare, are prescribed. Candidates must answer questions on two plays. No context questions will be set.

Shakespeare: *Macbeth*; *A Midsummer Night's Dream*.

Shaw: *The Devil's Disciple*.

### Section B. *Poetry.*

A set author, or a set anthology, or an unseen poem.

Robert Frost: Selected Poems (Penguin Books) pp. 33-84 inclusive and also *Fire and Ice*; *Dust of Snow*; *The Runaway*; *Stopping by Woods on a Snowy Evening*; *Goodbye and Keep Cold*; *Two Look at Two*; *Two Tramps in Mud-Time*; *At Woodward's Gardens*; *Desert Places*; *A Considerable Speck*.

Rhyme and Reason: Ed. O'Malley and Thompson (Queen's Classics, Chatto & Windus), the sections entitled – Sea and Adventure, Machinery and Town Life, Country Life and the Seasons, People, Animals.

### Section C. *Prose.*

Six books are prescribed; (a) three novels and (b) three other prose works, including travel books, short stories, etc. Three of the six will be twentieth-century works. Candidates must answer questions on two books, one of which must be a novel chosen from list (a).

(a) George Eliot: *Silas Marner*

Mark Twain: *Pudd'nhead Wilson* (Chatto & Windus)

H. G. Wells: *Kipps*

(b) W. H. Davies: *Autobiography of a Super-Tramp* (Cape)

Sir Arthur Grimble: *A Pattern of Islands* (unabridged edition, Murray)

*Twentieth Century Short Stories* (ed. Barnes and Egford, Harrap).

### ADVANCED LEVEL (*Subject number 15*)

There will be three papers, one of 3 hours, one of 2½ hours and one of 2 hours.

*Paper I* (3 hours): Chaucer and Shakespeare. The paper will consist of a compulsory question on the texts of the two prescribed Chaucerian works and of the play by Shakespeare which is to be studied in detail. In addition candidates must answer three other questions, one on Chaucer and one on each of the two prescribed plays of Shakespeare.

Shakespeare: *The Winter's Tale* and *Antony and Cleopatra*; *Antony and Cleopatra* to be studied in detail.

Chaucer: *The Prologue to the Canterbury Tales* and *The Pardoner's Prologue and Tale*.

*Paper II* (2½ hours): Set Books. The paper will consist of two sections (A and B) of which candidates must choose one.

*Section A.* The paper will consist of questions on the content, form and style of the following books in Summer 1966 and January 1967. Candidates must answer one question on each of four books, of which at least one must be chosen from numbers 1 to 5.

1. Spenser: *The Faerie Queene*, Book I
2. Marlowe: *Edward II*
3. Milton: *Paradise Lost*, Books I and II
4. Fielding: *Tom Jones*
5. Johnson: *Rasselas*
6. Poems of Wordsworth (ed. Matthew Arnold, Golden Treasury Series, Macmillan): pages 59-225, 243-263
7. Byron: *Childe Harold*, Cantos III and IV
8. Shelley: *Selected Poems* (ed. Holloway, Heinemann)
9. Jane Austen: *Mansfield Park*
10. G. M. Hopkins: *Selected Poems* (ed. J. Reeves, Heinemann, or W. H. Gardner, Penguin Books)

11. Virginia Woolf: *To the Lighthouse*  
 12. T. S. Eliot: *Murder in the Cathedral*.

*Section B.* Candidates must choose one of the following periods (i) to (v), in each of which six books are prescribed in Summer 1966 and January 1967. Those marked with an asterisk are to be studied in some detail; a less thorough knowledge will be required of the remainder.

The paper for each period will consist of questions on the content, form and style of the prescribed books; no textual questions will be set. Candidates must answer four questions of which two must be on books marked with an asterisk.

- (i) 1579 – 1630  
 \*Spenser: *The Faerie Queene*, Book I  
 \*Marlowe: *Edward II*  
 \*England's *Helicon* (Muses Library, Routledge)  
*Elizabethan Voyages* (ed. Winny, Queen's Classics, Chatto & Windus)  
 John Earle: *Microscosmography*  
 Webster: *The Duchess of Malfi*.
- (ii) 1625 – 1700, with the Metaphysical Poets  
 \*Milton: *Paradise Lost*, Books I and II  
 \*Eight Metaphysical Poets (ed. Dalglish, Heinemann): Poems by Donne, Herbert, Carew, Vaughan and Marvell  
 \*Bunyan: *The Pilgrim's Progress*  
 Sir Thomas Browne: *Religio Medici*  
 Dryden: *Absalom and Achitophel*, Part I  
 Congreve: *The Way of the World*.
- (iii) 1790 – 1832  
 \*Poems of Wordsworth (ed. Matthew Arnold, Golden Treasury Series, Macmillan): pages 59-225, 243-263  
 \*Shelley: *Selected Poems* (ed. Holloway, Heinemann)  
 \*Keats: *Poems of 1820*  
 Byron: *Childe Harold*, Cantos III and IV  
 Jane Austen: *Mansfield Park*  
 The Best of Hazlitt (ed. Howe, Methuen)
- (iv) 1832 – 1900  
 \*Emily Brontë: *Wuthering Heights*  
 \*Browning: *Men and Women* (ed. G. E. Hadow, O.U.P.)  
 \*G. M. Hopkins: *Selected Poems* (ed. J. Reeves, Heinemann, or W. H. Gardner, Penguin Books)  
 Dickens: *Bleak House*  
 George Eliot: *Felix Holt* (Dent)  
 Wilde: *Lady Windermere's Fan and The Importance of Being Ernest*.
- (v) 1900 - 1960  
 \*Shaw: *Saint Joan* (*Questions will not be set on the Preface*)  
 \*Virginia Woolf: *To the Lighthouse*  
 \*T. S. Eliot: *Selected Poems* (Faber & Faber)

Conrad: *The Secret Agent*

R. Bolt: *A Man For All Seasons* (Penguin Books or Heinemann)

W. H. Auden: *A Selection* (ed. Hoggart, Hutchinson).

*Paper III* (2 hours): Comprehension and Appreciation. The paper will consist of passages of verse and prose on which questions will be set to test the candidates' ability to elucidate their meaning and to show appreciation of their literary form and content. Two questions will be set, one on verse and one on prose, and candidates must answer both.

*A Special paper will be set in this subject; see Regulation III (page 4).*

## 17. FRENCH and 36. ITALIAN

### ORDINARY LEVEL

The written examination will consist of a 3-hour paper containing:

1. passages for translation from the language,
2. a passage for translation into the language,
3. four subjects for free composition of which the candidate is to treat one,
4. a half-hour test in dictation.

There will also be an oral examination, consisting of:

(a) Reading a passage of some ten lines supplied by the examiner. The candidate will be allowed to study for two or three minutes the passage to be read.

(b) Conversation on simple topics which will include questions on the passage read.

### ADVANCED LEVEL

The examination will consist of three written papers and an oral test (see p. 51). Italian may be taken at the Summer examination only.

*Paper I* (1½ hours). Unprepared translation into English from the language.

*Paper II* (2½ hours). (a) Translation of two continuous prose passages, one of which will be designed to test more particularly the candidates' command of accident and syntax.

(b) Essay in the language on a general subject, six topics to be set.

Candidates must satisfy the examiners in Papers I and II taken together.

*Paper III* (3 hours). Questions on the text and subject-matter of the literature studied.

*A Special paper will be set in French; see Regulation III (page 4).*

**FRENCH.** Candidates must answer five questions, one on each of five texts.

At least one text must be chosen from each of the Sections A, B and C.

The following books are prescribed for Summer 1966 and January 1967:

#### *Section A:*

1. Corneille: *Cinna*
2. Racine: *Phèdre*

3. Molière: *Le Tartuffe*
4. La Fontaine: *Fables*, Book I: 1, 6, 9, 10, 16, 18, 19, 22; Book II: 11, 12, 17; Book III: 1, 14; Book IV: 18, 20, 22; Book V: 1, 2, 3, 20; Book VI: 1, 2, 5, 9, 10, 11, 18; Book VII: 1, 4, 9, 10, 16; Book VIII: 2, 17; Book IX: 2, 4, 9 (these are to be found in *Fables* by La Fontaine, ed. by R. P. L. and D. M. Ledésert, published by Harrap)
5. Voltaire: *Candide*
6. Beaumarchais: *Le Barbier de Séville*.

*Section B:*

7. Flaubert: *Trois Contes* (Harrap)
8. Douglas Parmée: *Twelve French Poets 1820-1900* (Longmans). The poems of Lamartine, Vigny, Hugo (omitting *Le Satyre*, pp. 108-122) and Musset
9. Musset: *On ne badine pas avec l'amour*
10. Hugo: *Hernani*
11. Balzac: *Gobseck*
12. Mérimée: *Chronique du règne de Charles IX*.

*Section C:*

13. Douglas Parmée: *Twelve French Poets, 1820-1900* (Longmans). The Poems of Gautier, Leconte de Lisle, Baudelaire, Mallarmé, Verlaine and Laforgue.
14. Mauriac: *Le Nœud de vipères*
15. Anouilh: *Becket*
16. Cocteau: *La Machine infernale*
17. Sartre: *Les Jeux sont faits*
18. Gide: *La Porte étroite*.

The following books may be consulted by candidates who are interested in the cultural, social, historical or geographical aspects of French life, and an opportunity to show knowledge of this kind will be afforded in the essay subjects set in Paper II:

- Lytton Strachey: *Landmarks of French Literature* (Butterworth)  
 Ritchie: *A Companion to French Studies* (Methuen)  
 J. Lough: *An Introduction to Seventeenth-Century France* (Longmans)  
 J. Lough: *An Introduction to Eighteenth-Century France* (Longmans)  
 Vidal de la Blanche: *La Personnalité géographique de la France*  
 Louis Gérard: *Histoire de France* (4 Vols.) (A French publication distributed by Harrap in this country)  
 Ledésert and Holland Smith: *La France* (Harrap)  
 F. C. Roe: *Modern France* (Longmans)  
 C. Seignobos: *Histoire sincère de la nation française*.

*ITALIAN.* Candidates must answer five questions, one on each of five texts. At least one text must be chosen from each of the Sections A, B and C. The following books\* are prescribed for Summer 1966:

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\*The editions set out are given for the guidance of candidates, and are not compulsory. Any good edition may be used.

*Section A:*

1. Dante: *Inferno*, Canti 1-10 (Editions with notes - Casini-Barbi; Scartazzini; Sapegno, Ediz. La Nuova Italia, Firenze)
2. Oxford Book of Italian Verse: (Second Edition) 1952: *either* Nos. 14-30, 62-79; *or* 208-219, 268-270, 299-305, 349-360.
3. B. Castiglione: *Il Cortegiano*, Book II, Chapters 1-41
4. Goldoni: *I. Burbero Benefico*
5. Parini: *Il Mezzogiorno* (from *Il Giorno*).

*Section B:*

6. Alfieri: *Antigone*. (Ediz. La Nuova Italia, Firenze)
7. S. Pellico: *Le Mie Prigioni*
8. Verga: *Pane Nero and other Stories* (ed. D. Maxwell White, Manchester University Press)
9. A. Palazzeschi: *Le Sorelle Materassi*. (Edit. Vallecchi, Firenze)
10. Leopardi: *Canti: All'Italia, Sopra il Monumento di Dante, L'Infinito, Il Sogno, La Sera del Di di Festa, La Vita Solitaria, A. Silvia, Il Passero Solitario, La Quietude dopo la Tempesta, Il Sabato del Villaggio, Canto Notturmo, La Ginestra.*

*Section C:*

11. Deledda: *La via del Male* (Ediz. Garzanti, Milano)
12. E. De Marchi: *Il Cappello del Prete* (Manchester University Press)
13. Pirandello: *L'Uomo dal Fiore in Bocca, La Giara* (Manchester University Press)
14. Fucini: *All'Aria Aperta* (Ediz. Trevisini, Milano)
15. Levi: *Cristo si è fermato a Eboli*.

The following books may be consulted by candidates who are interested in the cultural, social, historical or geographical aspects of Italian life, and an opportunity to show knowledge of this kind will be afforded in the essay subjects set in Paper II:

- J. H. Whitfield: *A Short History of Italian Literature* (Pelican)  
Prezzoloni: *The Legacy of Italy* (Vanni, New York)  
Burckhardt: *The Civilisation of the Renaissance in Italy* (Phaidon Press)  
Header and Waley: *Short History of Italy* (Cambridge University Press)  
Whyte: *The Evolution of Modern Italy* (Blackwell)  
Berenson: *Italian Painters of the Renaissance* (Phaidon Press).

*Oral test*, comprising:

- (1) Dictation given by the examiner.
- (2) Reading at sight a passage of some twenty lines supplied by the examiner.
- (3) Conversation with some reference to the books studied.

## **18. GENERAL SCIENCE and 19. ADDITIONAL GENERAL SCIENCE**

### **ORDINARY LEVEL ONLY**

This syllabus is intended to provide an introduction to science in terms of some aspects of its physical, chemical and biological branches. In order that its requirements may be conveyed with some precision it is detailed in

three sections, broadly corresponding to these headings, but in the presentation of the subject there should be frequent cross-reference between the branches into which it is here sub-divided to show their inter-relationships and to make use of one branch in the study of another. For example, an understanding of the functional aspects of biology must have a sound basis in a knowledge of the physical and chemical properties of the atmosphere, of water and of aqueous solutions, and an elementary appreciation of the characteristics of chemical reactions and of the energy exchanges which may accompany them.

Emphasis should be placed on the foundation of scientific study in personal observation and experiment. Quantitative methods should be included in so far as they may be necessary for the proper understanding of principles or to exemplify the essential element of precision in scientific method.

The examination will consist of three papers: (I) One 1-hour paper of short questions on the fundamental facts and basic principles of the subject to be answered on the question paper. There will be no choice of questions, thus ensuring that no substantial part of the syllabus has been neglected by the candidates. (II) One 2½-hour paper consisting of three sections each containing five questions of a simple and straightforward type. Six questions in all must be answered, two from each section. Paper I is to be regarded as a hurdle and the performance in Papers I and II taken together will determine the final decision. (III) One 3-hour paper with harder questions covering the combined General Science and Additional General Science syllabuses. Six questions in all must be answered, at least one but not more than three from each section. Papers I and II will count as one subject (General Science). Paper III will count as another subject (Additional General Science) providing the candidate has passed in Papers I and II taken together at the same or a previous examination. All candidates must take Papers I and II, but Paper III is optional and intended only for those wishing to take Additional General Science.

Neither subject may be taken at the same examination as Botany, Biology, Physics, Chemistry, Physics with Chemistry or Rural Biology.

## GENERAL SCIENCE

### SECTION A

Solids, liquids and gases in terms of simple molecular theory. Density by direct measurement. Relative density (volume by displacement).

Velocity, acceleration. Force. Mass and weight. Use of spring balance. Work (ft. lb. weight). Energy and its transformation. Power: horse power.

Pressure, fluid pressure. Barometers. Manometer. Water supply. Siphon.

Boyle's law. Bicycle pump; lift and force-pumps. Hydraulic press or jack.

Flotation; Plimsoll line, hydrometers, Archimedes' principle, balloons. Simple experiments to illustrate surface-tension, capillarity, diffusion and osmosis. The importance of these in natural phenomena (cf. Section C).

Parallel forces. Centre of gravity and stability. Simple machines, levers, moments, fixed and movable pulleys. Friction, principle of work, mechanical advantage, velocity ratio, efficiency.

Thermal expansion treated qualitatively. Conduction and convection; heating systems. Temperature, C. & F. scales and their conversion. Thermometers. Expansion of water on freezing, and its consequences. Quantity of heat; calorie, kilo-calorie, B. Th. U. Calorific value of food and fuel. Capacity for heat; specific (capacity for) heat (qualitative treatment only). Conse-

quences of different specific heats. Change of state; latent heat; cooling effect of evaporation; refrigeration. The sun as a source of energy. Radiation; thermos flask.

Light; shadows and eclipses, pin-hole camera. Reflection at plane and spherical surfaces. Qualitative treatment of refraction. Refraction through a prism; simple lenses. Graphical methods for size and position of images. Comparison of eye and camera. Short and long sight, and their correction. The spectrum; colour.

Production, transmission and reflection of sound. Velocity of sound by echo method. Properties of musical sounds; noise. Vibration of a string and of an air column closed at one end.

Simple magnets, permanent and temporary. The earth as a magnet. Three effects of an electric current treated qualitatively: (a) magnetic effect: field of straight wire and solenoid, electro-magnet, electric bell, telephone receiver, use of ammeter and voltmeter; (b) heating effect: filament lamp and heating elements, fuses; (c) chemical effect: electrolysis of dilute sulphuric acid and of copper sulphate solution. Simple cell and its defects, dry cell and battery. Simple treatment of the lead accumulator. Ohm's law. Direct and alternating current. Volt, ampere, ohm, watt, kilowatt, kilowatt-hour.

## SECTION B

Elements, compounds and mixtures. Use of symbols, formulæ and chemical equations to represent simple reactions.

The atmosphere. Experimental determination of the volume percentage of oxygen in air. The preparation and collection of oxygen from mercuric oxide and from potassium chlorate (with catalyst). Properties and uses of oxygen. The combustion in air of carbon, sulphur, phosphorus, calcium and magnesium. Acidic and basic oxides.

Water. Solution, crystallisation, evaporation. Solubility of gases and solids. Dissolved air and its importance (cf. Section C). Tests for water. Liberation of hydrogen from water and dilute acids by metals. Synthesis of water by burning hydrogen and by reduction of copper oxide. Simple treatment of oxidation and reduction. Acids, bases and salts. Preparation of salts from metals, oxides, hydroxides and carbonates, and by double-decomposition. Caustic soda, washing soda and baking soda.

Forms of carbon. Carbon as the basis of living matter and of organic compounds, e.g., simple carbohydrates. Laboratory preparation and uses of carbon dioxide: its formation by combustion, respiration, fermentation and decay (cf. Section C). Carbon monoxide, its physiological effect and its origin as a by-product of incomplete combustion. Simple destructive distillation of coal.

Calcium carbonate in nature. Quick lime and slaked lime. Reactions between lime-water and carbon dioxide. Stalactites and stalagmites. Hard water; causes of hardness, removal of hardness. Use of soap.

The reactions of sulphur with oxygen and with iron. Action of dilute hydrochloric acid on iron sulphide and on a mixture of iron and sulphur. Uses of sulphur dioxide in bleaching, fumigation and in the manufacture of sulphuric acid (contact process). The action of concentrated sulphuric acid on organic materials (e.g., sugar, paper) and on copper sulphate crystals.

Sodium chloride. Preparation and properties of hydrogen chloride, hydrochloric acid and chlorine. Use of chlorine for bleaching and for sterilisation of water.

Electrolytes and non-electrolytes. Electrolysis of water (dilute sulphuric acid) and of cupric sulphate solution, using platinum electrodes and copper electrodes (cf. Section A).

Nitric acid and its laboratory preparation. Action of heat on nitric acid, potassium nitrate and lead nitrate. Oxidising action of nitric acid (e.g., action on warm sawdust) and of nitrates (e.g., in gunpowder).

Ammonia: laboratory preparation and simple properties. Outline of Haber process. Production of ammonium sulphate (cf. gas works, Section A). Nitrates and ammonium salts as fertilisers (cf. Section C).

Distinctive properties of metals and non-metals. Chief properties and uses of aluminium, zinc, iron, lead, copper. Rusting of iron and its prevention. Constituents and uses of three common alloys.

### SECTION C

Characteristics of living organisms, illustrated under the headings given below, mainly by reference to the simple anatomy and physiology of a mammal and a flowering plant. *Amoeba* and *Spirogyra* as simple organisms, to illustrate the concept of the cell as a biological unit.

Respiration in plants and animals: gaseous exchanges. The source, transformation and utilisation of energy.

Nutrition: the raw materials used by green plants: absorption of water and minerals: importance of chlorophyll in photosynthesis. Further synthesis: proteins, special importance of fixed nitrogen. Nature, sources and importance of animal foods. Ingestion, digestion, absorption, assimilation and storage of food. Hibernation and perennation.

Transport: vascular transport: sap flow in plants: transpiration. Composition, functions and circulation of the blood. Transport of food substances in solution. Importance of osmosis (cf. Section A).

Excretion: excretory systems: the kidney (outline only).

Irritability: perception of and response to stimuli in plant shoots (to light and gravity) and in roots (to gravity). The central nervous system (outline only): simple reflex arc. Sense organs, simple treatment of eye and ear.

The skin: its structure and functions.

Support and movement: general features of the skeleton, simple limb joints and the action of muscles in their main movements. Support in plants: turgor: wilting: woody tissues.

Reproduction: sexual reproduction in a mammal: gametes and fertilisation; function of the placenta. Structure of a named flower. Pollination, rôle of insects and wind. Fertilisation: formation of fruit and seed. (Microscopic details of gametogenesis and embryo sac not required.) Dispersal mechanisms. Vegetative propagation by bulb, corm, stem-tuber, runner.

Growth and development: changes in form, size or dry weight. Germination of pea or bean.

The external features, life history and adaptation to environment of the butterfly and frog.

Saprophytism, as exemplified by *Mucor*; fermentation by yeast. Importance of decay; role of fungi and bacteria in decay and disease. C. & N. cycles: the energy cycle. Interdependence of animals and plants.

Parasitism, exemplified by the tape worm. Insects (housefly and mosquito) as carriers of disease.

Soils: simple physical, chemical and biological factors in soils. The main components of soil and their importance in relation to plant growth: the

importance of earthworms, bacteria and fungi in the soil. Simple experiments on capillarity, water-holding capacity and drainage.

## ADDITIONAL GENERAL SCIENCE

### SECTION A

Newton's laws of motion, treated qualitatively. Dependence of acceleration on force and mass. Momentum.

Definitions of dyne, poundal, erg and foot-poundal.

Measurement of relative density by balancing columns, and by the application of Archimedes' principle.

The parallelogram and triangle of forces (and velocities).

The inclined plane, screw and screw jack. Weston differential pulley. Gear ratios.

Experimental determination of specific heats of solids, and of latent heat.

Determination of the coefficient of linear expansion of solids. Volume expansion of liquids and gases. Charles' law. Absolute temperature. Correction of gas volumes for temperature and pressure.

Maximum and minimum thermometers (including Six's). Vapour pressure.

Determination of vapour pressure and its relation to the boiling point. The influence of dissolved substances on the freezing point and boiling point of water. Atmospheric humidity; dew-point.

Mechanical equivalent of heat; its determination by simple methods.

Inverse square law; photometers. Snell's law; total internal reflection; mirage. Simple methods of determining the focal length of convex lenses and concave mirrors; use of formulae. Projection lantern, simple telescopes, the compound microscope. Production of a pure spectrum; ultra-violet and infra-red regions. Emission and absorption spectra; (Fraunhofer lines and the chlorophyll spectrum).

Use of sonometer. Measurement of the velocity of sound by resonance tube.

Simple illustration of the Doppler effect. Quality of a musical note.

Plotting of the magnetic field of a magnet in the earth's field; neutral points.

Series and parallel circuits; equivalent resistances. Electromagnetic induction.

Lenz' law. Transformers; transmission of power.

Induction coil. Simple dynamo (Fleming's rule). D.C. and A.C. generators.

Joule's law. Faradays' laws of electrolysis; electro-chemical equivalent.

### SECTION B

The position of metals, relative to hydrogen in the activity series (limited to sodium, calcium, magnesium, zinc, iron, lead and copper).

Determination of equivalents of elements by (i) relation to hydrogen (ii) conversion of a metal (e.g., copper) to its oxide and vice versa. Relationship of equivalent and atomic weights. Valency. Simple mass calculations from equations. Laws of Gay Kussac and Avogadro (illustrated by the volume composition of water, carbon dioxide and hydrogen chloride).

Relative density of gases and its relationship to molecular weight (no proof required). Gram molecular volume, and calculations on gas volumes from equations including temperature and pressure corrections (cf. Section A).

Acid and alkali titrations. Equivalents of acids and alkalies. Normal solutions and calculations on these.

The production of ethyl alcohol and acetic acid; the preparation of soap from fats.

Sources of sulphur (native, metallic sulphides, anhydrite). Laboratory preparation of hydrogen sulphide; its properties as an acid, as a reducing agent, and as a precipitating agent for sulphides.

The concepts of oxidation and reduction, extended to include change of valency.

The ionic explanation of electrolysis. The use of electrolysis in the production of aluminium, the purification of copper and the preparation of chlorine, sodium hydroxide and sodium hypochlorite.

Action of very dilute nitric acid on magnesium and of dilute and concentrated nitric acid on copper. Nitrogen dioxide. Preparation of nitrous oxide.

The catalytic oxidation of ammonia to nitric acid.

The meaning of: reversible reaction (iron and steam); thermal decomposition (ammonium nitrate, mercuric oxide); thermal dissociation (ammonium chloride).

Sand and silica; water glass, glass.

### SECTION C

The principal essential minerals for plants: culture experiments. Carnivores and herbivores: dentition in relation to diet. Food chains.

Nervous and chemical co-ordination of the body functions. Hormones; importance of thyroxin, adrenalin and insulin.

More specialised pollination mechanisms, e.g., primrose, snap-dragon, lupin or comparable examples. Vegetative propagation by cuttings and grafts.

Comparison of sexual reproduction and reproduction by other means.

Germination of sunflower and of wheat or maize. Etiolation. Annual and biennial herbs; herbaceous and woody perennials. Growth in animals and plants simply compared. Reactions and adaptations to seasons.

The general characteristics of an earthworm, a spider, a fish, a lizard, a bird, a seaweed, a fern and a conifer, to illustrate more widely, the varied forms of animals and plants.

Importance of asepsis and antisepsis in relation to wound healing and prevention of disease. Antibiotics. Simple treatment of vaccination, inoculation, immunisation.

## 20. GEOGRAPHY

Temperatures will be expressed in degrees Centigrade in question papers at both levels. Candidates may give temperatures in either Centigrade or Fahrenheit when answering questions.

### ORDINARY LEVEL

There will be two papers, each of 2 hours.

Candidates will be expected to have studied an area of which they can gain first-hand knowledge, and opportunity may be given on either paper for such knowledge to be shown in the examination.

#### *Paper I.*

Candidates must answer four questions including one on the Ordnance Survey map.

(a) Map reading and interpretation with special attention to Ordnance Survey maps on scales of 1 inch and 2½ inches to the mile.

(b) The physical and human geography of the British Isles.

It is expected that (a) and (b) will be studied in conjunction with one another.

*Paper II.*

Candidates must answer four questions, choosing two from each section.

(a) The physical and human geography of *either* North-western Europe (France, Belgium, Luxembourg, The Netherlands, Germany, Switzerland, Denmark, Norway, Sweden) or North America (Canada and the U.S.).

(b) The outlines of the physical and human geography of the world.

Questions on both physical and human geography may be set in either section of either paper on topics which may include: the earth as a planet in relation to the sun; latitude, longitude and time; the relief and surface features of the land; chief land forms and the agencies modifying them; chief surface movements in oceans and seas (omitting theories of tides); elementary weather study based on local observations and weather maps; the chief factors which affect climate; the major climatic, vegetational and human regions; the major occupations and activities of man in relation to his geographical environment; the distribution of population and the growth of large towns; and the principal means of transport.

*Prizes in memory of Mr. Arthur Thomas Simmons, who was Inspector of Secondary Schools for the University from 1904 to 1921, will be awarded to the boy and girl in attendance at a school who present the best work in Geography at the Ordinary level in the Summer examination.*

## ADVANCED LEVEL

There will be three papers, one of 2 hours and two of 2½ hours each.

Candidates will be expected to have received instruction in the field: questions involving first-hand observation will be set, and candidates will be expected to use their experience in the field when answering any relevant question in any paper.

*Paper I. Map Work (2½ hours).*

The interpretation and study, by pictures and/or other means, of Ordnance Survey maps and plans. This work should begin with the maps relevant to the study of the school district or of any other relatively small area of which it is possible to gain first-hand experience, and should be extended to include typical areas in Great Britain.

The study and interpretation of relevant statistics of climate and weather, production and trade, and population, together with simple methods of representing such data in maps and diagrams, including weather reports.

The question on the Ordnance Survey map will be compulsory, and there will be a choice of other questions from which candidates must answer one.

*Paper II. Physical Geography (2 hours).*

Candidates must answer three questions, choosing at least one from each of the two sections:

(a) *The Land.*

Nature and effects of tectonic, erosional and depositional processes in the evolution of landscape including: (1) the general character of igneous and sedimentary rocks as seen in the field; (2) the results of folding, faulting, elevation, depression, vulcanism and earthquakes; (3) the work of wind, ice and water (including waves and underground water); (4) rivers and river systems and lake, sea and ocean basins.

(b) *Climate and Vegetation.*

The seasonal distributions of temperature, pressure, winds and rainfall, and the factors including the movements of the earth and the surface movements of the ocean waters, that give rise to these distributions. The characteristics of the different climatic regions of the earth.

The general distribution of forest, woodland, grassland, scrub and desert in relation to climate and surface features, including soils.

*Paper III. Regional and Human Geography (2½ hours).*

Candidates must answer four questions, choosing two on each of the regions selected:

(a) One region selected from the following: North-Western Europe; Monsoon Asia; the Mediterranean Lands; the Union of Soviet Socialist Republics.

North-Western Europe—British Isles, France, the Netherlands, Belgium, Luxembourg, Germany, Switzerland, Denmark, Norway and Sweden.

Monsoon Asia—the Indian sub-continent and Burma, Ceylon, Indo-China, Thailand, Malaya, Indonesia, the Philippines, China proper, Manchuria, Korea and Japan.

The Mediterranean Lands—Spain, Portugal, Mediterranean France, Italy, Balkan Lands, Asia Minor, Syria, Jordan, Lebanon, Israel, Egypt, and the islands and coast lands of North Africa.

(b) One region selected from the following: Africa, south of the Sahara; South America; Australia and New Zealand: U.S.A. and Canada.

Each region should be studied in its world setting and relationships. The study should include the main facts of position, size, structure, surface features, climate and natural vegetation affecting human economy; the distribution of population, the character and development of settlement, the salient features of the geography of agricultural, mineral and manufacturing production; the distribution and use of sources of power and communications.

*The Royal Geographical Society awards an annual prize to the candidate in attendance at a school who submits the best work in Geography at the Advanced level in the Summer examination.*

*A Special paper will be set in this subject; see Regulation III (page 4).*

## 21. GEOLOGY

### ORDINARY LEVEL

There will be one paper of 3 hours.

1. Weathering of rocks. Action of rivers, ice, wind and the sea as agents of erosion, transport and deposition. Effects of change of sea level.

2. Simple relationships between geology and topography as seen in sea coasts and in forms of hills and valleys.

3. Volcanoes, forms of igneous rocks (lava flows, dykes, sills, stocks, laccoliths, batholiths). Contact metamorphism (metamorphic aureole, production of hornfels and chistolite-slate). Earthquakes (excluding seismological deductions), mountain building, regional metamorphism (production of gneiss, schist, slate, quartzite, marble).

4. Composition, diagnostic, physical (not crystallographic) properties and mode of occurrence of the common rock-forming, ore and gangue minerals:

quartz, feldspars, mica, augite, hornblende, olivine, garnet, calcite, galena, sphalerite (blende), pyrite, chalcopyrite, magnetite, haematite, limonite, cassiterite, malachite, fluorspar, barytes, gypsum, rock-salt.

5. Mode of occurrence, origin, simple textural and mineralogical properties and economic uses of the commoner igneous, metamorphic and sedimentary rocks: granite, microgranite, rhyolite, obsidian, pumice, gabbro, dolerite, basalt; gneiss, schist, slate, quartzite, marble; conglomerate, breccia, sandstone, shale, clay, limestone, coal, chert (including flint); agglomerate.

6. Features of rock bodies, e.g., induration, stratification, jointing; unconformity, overstep, overlap.

7. The principal type of folds (symmetrical and asymmetrical synclines and anticlines, overfolds, plunging folds) and faults (normal, reverse and thrust) and combinations of folds and faults.

8. The nature of fossils and their modes of occurrence. Uses made of fossils. General characteristics of the commoner groups of invertebrate fossils; corals, echinoids, brachiopods, lamellibranchs, gastropods, ammonites, belemnites, trilobites, graptolites.

9. The order of succession of eras and periods in the geological column. The general character of the main rock types and fossils and the broad palaeogeographical settings during Lower Palaeozoic, Devonian, Lower and Upper Carboniferous, Permo-Triassic, Jurassic, Cretaceous and Tertiary times. Present day distribution of main outcrops within the British Isles. Distribution in time of the main mountain building episodes and of the major groups of fossils.

10. Exercises on simple black and white geological maps including the use of block diagrams. Three-point and strike line principles as used for determination of dip, completion of outcrop, throw of faults and the thickness of beds. The drawing of sections and the interpretation of simple structures from outcrop evidence. Maps of H.M. Geological Survey (1 inch) should be studied although exercises upon these will not be set in the examination.

### *Practical Books*

Notebooks containing a record of the candidates' practical work must be sent to the University not later than the date of the written paper. The work contained in these notebooks is taken into account in assessing marks.

Practical books should contain evidence that candidates have received instruction in the field (a minimum of 3 half-day or day excursions is recommended), have handled, studied and described specimens of the commoner rocks, minerals and fossils and have carried out map exercises. Minerals showing good crystal forms and rocks illustrating well-defined textures should be drawn. In studying rocks attention should be paid to both their texture and their structure. Details of texture should include coarse or fine grained, even or uneven grained, colour, size, shape and mineralogy of particles if visible and such distinctive textures as porphyritic and oolitic. Structures should include lamination, cross-bedding, fossil impressions, schistosity. Drawings of fossils should have the chief parts clearly drawn and accurately labelled.

The use of a hand lens for the study of specimens is considered essential.

### ADVANCED LEVEL

There will be two papers, each of 3 hours, and two practical examinations of 2 hours each. Candidates must satisfy the examiners in the practical as well as in the written parts of the examination.

## I. *Physical Geology*

- (a) The origin of the earth; evidence relating to the nature of its crust and interior.
- (b) The nature, distribution and origin of the major features (physiographical and structural) of the earth's surface including the ocean basins and continents, shield areas, mountain chains, volcanoes, rift valleys.
- (c) Localised effects of earth movement, e.g., earthquakes, joints, folds, faults.
- (d) The work of geological agents, e.g., atmospheric, fluvial, marine, aeolian and glacial, on the surface of the earth and the resulting landforms.
- (e) The nature and occurrence of coal, mineral ores, underground water and oil.

## II. *Mineralogy and Petrology*

- (a) The physical properties of minerals with particular reference to their crystal forms. The elements of crystallography, the principles of symmetry, the crystal systems.
- (b) The composition, properties and distribution of the main groups of rock-forming minerals. The nature and mode of occurrence of ore and gangue minerals.
- (c) The general character and mode of occurrence of volcanic and intrusive igneous rocks. Principles governing the deposition and character of the main types of sedimentary rocks. Elementary principles of metamorphism relating to the formation of quartzites, marbles, slates, schists and gneisses. Economic uses of rocks.

## III. *Palaeontology*

The nature and preservation of fossils, their role as rockformers and indicators of geological age. The occurrence, essential morphological features and geological history of the main groups of invertebrate fossils: rugose and tabulate corals, crinoids, regular and irregular echinoids, inarticulate and articulate brachiopods, active and fixed lamellibranchs, gastropods, nautiloids goniatites, ammonites, belemnites, trilobites, graptolites.

## IV. *Stratigraphy*

The geological systems, their broad characters and distribution in the British Isles, treated to illustrate the general principles of stratigraphy, e.g., orogenic movements, marine transgression and regression, unconformities, cycles of sedimentation, geosynclinal, shelf sea and continental environments, change of facies. The principles of the dating and correlation of strata.

### *Practical Work*

Description and interpretation of geological maps (including those of the Geological Survey) representing simple structures, illustrated by graphic methods or by profile cross-sections, sketch-maps and sketch-sections.

The interpretation of photographs of geological interest (other than vertical aerial photographs).

Relation of topography to geology and structure.

Identification and description of the common minerals such as quartz, feldspars, olivine, augite, hornblende, biotite, muscovite, garnet, tourmaline, native copper, pyrite, chalcocopyrite, blende, galena, magnetite, limonite, hematite, cassiterite, calcite, dolomite, aragonite, barite, gypsum, fluorite and rock-salt.

Description of natural crystals and crystal models (including system and symmetry but excluding indexing of faces).

Description and identification of common rock types in hand specimen. Recognition of simple structural and textural criteria relating to the igneous, sedimentary and metamorphic origin of a rock. The common rocks are taken to include basalt, dolerite, gabbro, glassy volcanic rocks, quartz-porphyrines and granite rocks: conglomerates, breccias, sandstones and limestones; slates, marbles, quartzites, schists and gneisses.

Candidates will not be examined in the identification of rocks and minerals in thin-sections. It is emphasised that whilst preparing for the examination, the petrological microscope may be used to advantage in demonstrating textural and other features of rocks.

Identification and description of common fossils, including the main Coal Measure plants, and their reference to major biological groups and broad geological age.

Candidates are expected to have received adequate instruction in the field (at least ten days during their course is recommended) and to be familiar with the geology of an area of their choice. They must bring to the practical examination their original field-books showing, in particular, the candidates' personal field observations.

*A Special paper will be set in this subject; see Regulation III (page 4).*

## 23. GERMAN

### ORDINARY LEVEL

Syllabus as for French and Italian (*See page 49*).

### ADVANCED LEVEL

The examination will consist of three written papers and an oral test.

*Paper I* (2 hours). Translation into English of unprepared passages and passages from set works.

Candidates are recommended to spend about 1½ hours on the unprepared translation. In addition, there will be a passage for translation from each of the eight texts set in Section I of Paper III, and candidates must translate two of these.

*Paper II* (2½ hours). (a) Translation into German of two continuous prose passages, one of which will be designed to test more particularly the candidates' command of accidence and syntax.

(b) Essay in German on a general subject, six topics to be set.

Candidates must satisfy the examiners in Papers I and II taken together.

*Paper III* (2½ hours). Questions on the text and subject-matter of the literature studied. Candidates must answer four questions, one on each of four texts. Two texts must be chosen from Section A and two from Section B.

The following books are prescribed for Summer 1966 and January 1967:

*Section A* (Passages for translation from these books will be set in Paper I):

1. Schiller: Don Carlos
2. Tieck: Der blonde Eckbert; and Brentano, Geschichte vom braven Kasperl und dem schönen Annerl (Blackwell)
3. Chamisso: Peter Schlemihl

4. Thomas Mann: Tonio Kröger
5. Kafka: Die Verwandlung
6. Bergengruen: Die drei Falken (Blackwell); Die Feuerprobe (Reclam)
7. Dürrenmatt: Der Richter und sein Henker (Harrap)
8. Brecht: Leben des Galilei.

*Section B*

9. Goethe, Poems (ed. Fairley, Heinemann)
10. Goethe: Götz von Berlichingen
11. Kleist: Das Erdbeben in Chili *and* Die Verlobung in St. Domingo
12. Grillparzer: Der Traum ein Leben
13. Storm: Der Schimmelreiter
14. Mörike: Mozart auf der Reise nach Prag
15. Keller: Romeo und Julia auf dem Dorfe
16. Penguin Book of German Verse, p. 367 to end.

*Oral test*, comprising:

- (1) Dictation, given by the examiner.
- (2) Reading at sight a passage of some twenty lines (in Latin characters) supplied by the examiner.
- (3) Conversation in German with some reference to the books studied.

*A Special paper will be set in this subject; see Regulation III (page 4).*

## 24. GREEK

This subject may not be taken by candidates taking Greek Literature in Translation.

### ORDINARY LEVEL

There will be two papers, one of 2 hours and one of 2½ hours.

*Paper I* (2 hours). A paper on easy unprepared translation, grammar and simple and easy sentences of English for translation into Greek, and, as an alternative to such sentences, an easy continuous piece of English prose.

*Paper II* (2½ hours). A paper on prepared books (one in prose and one in verse), including questions on the language and subject-matter; or, alternatively, a paper on unprepared translation.

Special stress is laid on accuracy in the answers to the grammar questions and on the correct rendering of English into Greek. Candidates will be expected to be able to scan hexameter and iambic trimeter verses where these occur in the texts offered.

The following books are prescribed for Summer 1966 and January 1967:

Xenophon: Anabasis Book II, chapters 1-4, *or* Plato, Crito.

Homer: Odyssey, Book XI, 1-540; *or* Euripides: Helen (in Selections from Rhesus and Helen, E. C. Kennedy, (Macmillan)).

Except where a particular edition is prescribed, the examiners will use the Oxford Classical Texts (Clarendon Press, Oxford), or, if a text is not published in this series, the Teubner edition.

### ADVANCED LEVEL

There will be three papers, two of 2½ hours and one of 3 hours.

*Paper I* (2½ hours). Prose composition.

*Paper II* (2½ hours). Unprepared translation, consisting of two prose passages and one verse passage. In the case of the verse a choice will be allowed between a passage from Homer and a passage from another author.

Candidates must satisfy the examiners in Papers I and II taken together.

*Paper III* (3 hours). Translation from prescribed texts, and questions thereon.

The following books are prescribed for Summer 1966 and January 1967. Candidates may offer:

*Either* (i) One prose and one verse book selected from the following:

(a) Thucydides: Book III, 1-50

Plato: *Phaedo*, omitting 77b-107b and 108-113c

Herodotus, Book VIII, 1-93

(b) Homer: *Iliad*, Book XI

Euripides: *Bacchae*

Aristophanes: *Frogs*

No grammatical questions will be set except on the books prescribed.

*Or* (ii) All four of the following:

Thucydides: Book III, 1-50

Plato: *Phaedo*, omitting 77b-107b and 108-113c

Homer: *Iliad*, Book XI

Euripides: *Bacchae*.

For candidates offering alternative (ii) the test will consist of translation and questions on the subject-matter.

Except where a particular edition is prescribed, the examiners will use the Oxford Classical Texts (Clarendon Press, Oxford), or, if a text is not published in this series, the Teubner edition.

*A Special paper will be set on this subject; see Regulation III (page 4).*

## 25. GREEK LITERATURE IN TRANSLATION

This subject may not be taken by candidates who are taking either Modern or Classical Greek, and may only be taken at the Summer examination.

### ORDINARY LEVEL ONLY

There will be one paper of 3 hours.

Candidates must answer questions from each of four sections.

Any reputable translation of complete works may be used; those named are recommended but not prescribed.

Section 1. *Either* Homer: *Iliad* (Lang, Leaf and Myers, or Rieu (Penguin Classics))

*or* Homer: *Odyssey* (Butcher and Lang, or Rieu (Penguin Classics)).

Section 2. *Any one* of the following plays:

(a) Aeschylus: *Agamemnon* (Murray or MacNeice)

(b) Sophocles: *Oedipus Tyrannus* (Murray or Watling (Penguin Classics))

(c) Euripides: *Electra* (Murray)

(d) Aristophanes: *Birds* (Murray, or Rogers).

- Section 3. *Either* (a) The Homer not taken under Section 1  
 or (b) One further play from Section 2  
 or (c) *Either* selections from 'Portrait of Socrates' by Livingstone (O.U.P.): Apology; Crito; Phaedo, chaps. 1-5, 63-66. Or 'Last Days of Socrates' (Penguin Classics, trans. H. Tredennick): Apology; Crito; Phaedo, 1959 edn., pp. 99-104, 178-183.
- Section 4. *Either* (a) Herodotus, Book II (Rawlinson, Everyman's Library; or de Selincourt, Penguin Classics)  
 or (b) Thucydides, Books VI and VII (Crawley, Everyman's Library; or Rex Warner, Penguin Classics).

## 26, 27, 28. HANDICRAFT

### ORDINARY LEVEL

Candidates may enter for (a) Embroidery or (b) Metalwork or (c) Woodwork. At the Summer examination only, candidates may offer the full syllabus in both Woodwork and Metalwork as given below, and the certificates will record Handicraft (Woodwork) or Handicraft (Metalwork), or both, as the case may be. Regulation IV (1) on page 6 refers to entry for both options in the January examination. Those who enter for Woodwork will be expected to have some knowledge of the simpler processes in Metalwork such as filing, drilling, cutting and soldering. All materials for the test must be provided by the school. Embroidery may only be taken at the Summer examination.

#### (a) Embroidery (Subject number 26)

The examination will be in three parts and candidates must satisfy the examiners in each part.

##### 1. Theory (2 hours)

Materials and tools, their application, use and cost. The adaptation of stitches to material, and their use in articles of dress and furnishing. The most common methods of making up embroidery. The use of a simple alphabet suitable for embroidery. A simple outline of the history of English embroidery from Saxon times to the present day.

##### 2. Design (3 hours)

Candidates will be required to produce an original design suited to some given object. Choice of material and stitches to be indicated. The design may be presented in any medium which includes the use of colour.

##### 3. Practical Test (2½ hours)

A motif to be worked on material to be prescribed by the examiner at the time of the examination. The design to be based on stitches in the following list with the addition of other stitches if desired:

- |                        |                         |
|------------------------|-------------------------|
| (i) Back stitch        | (vii) Couching          |
| (ii) Buttonhole stitch | (viii) Cretan stitch    |
| (iii) Feather stitch   | (ix) Double back stitch |
| (iv) Chain stitch      | (x) Hem stitch          |
| (v) Chevron stitch     | (xi) Herringbone stitch |
| (vi) Cross stitch      | (xii) Stem stitch.      |

**(b) Metalwork** (*Subject number 27*)

The examination will be in two parts of 3 hours each and candidates must satisfy the examiners in both parts.

1. *Drawing and Theory*

*Drawing* (1½ hours). A compulsory question will be set to test draughtsmanship, knowledge of construction and design.

(a) Ability to make and to read properly dimensioned working drawings to scale, in orthogonal projection, and according to British Standards Engineering Drawing Practice, B.S. 308A : 1964 (pub. by British Standards Institution, 2 Park Street, W.1), using drawing board, tee square and drawing instruments.

(b) Details of construction may be shown by means of freehand sketches, isometric or oblique projection, or other methods of pictorial representation.

(c) Sections shown to be parallel to vertical or horizontal planes only.

(d) The making of geometrical developments suitable for sheet metalwork.

*Theory* (1½ hours)

An elementary knowledge of:

(a) Tools; common kinds and their uses, construction, sharpening and upkeep. Elementary knowledge of the simple lathe.

(b) Materials; elementary knowledge of the various metals and alloys in common use in the handicraft room; knowledge of their production and preparation for various purposes; the nature and use of solders, fluxes, lubricants.

(c) Construction, processes, and finishes; methods of fastening used in metalwork; simple decorative treatments and appropriate finishes.

(d) Development of construction in metal with reference to various aspects of the craft, e.g. forging, rolling, casting, turning, shaping, sheet metalwork and beaten metalwork, welding.

(e) An elementary knowledge of design as applied to metalwork.

2. *Practical Test* (3 hours)

This will test work in common metals and alloys, basic constructional processes, e.g., setting out; filing; riveting; soft and hard soldering; hardening-tempering and annealing; the use of stocks, dies and taps, simple sheet metal work.

According to the equipment available, the course should also include some or all of the following: simple forgework; piercing, hollowing, raising and planishing; the decoration and finishes appropriate to articles made by these processes; elementary lathe work including plain turning and boring.

In the practical examination alternative tests will be set,

either (a) involving the use of hand-tools only,

or (b) including the use of the lathe:

schools must notify the University at the time of entry of the number of candidates who will be entered for each test.

**(c) Woodwork** (*Subject number 28*)

The examination will be in two parts of 3 hours each and candidates must satisfy the examiners in both parts.

1. *Drawing and Theory*

*Drawing* (1½ hours). A compulsory question will be set to test draughtsmanship, knowledge of construction and design.

(a) Ability to make and to read properly dimensioned working drawings to scale, in orthogonal projection, and according to British Standards on Engineering Drawing Practice, B.S. 308A : 1964 (pub. by British Standards Institution, 2 Park Street, W.1), using drawing board, tee square, and drawing instruments.

(b) Details of construction may be shown by means of freehand sketches, isometric or oblique projection, or other methods of pictorial representation.

(c) Sections shown to be parallel to vertical or horizontal planes only.

#### *Theory* (1½ hours)

An elementary knowledge of:

(a) Tools; common kinds and their uses, construction, sharpening and upkeep.

(b) Materials; timber; characteristics of soft and hard woods in common use; growth, conversion and seasoning; plywood and laminated boards.

(c) Other materials; glue, glass-paper, screws, nails, stains and polishes.

(d) Construction, processes and finishes; preparation of a cutting list from dimensioned drawings; various common joints and their application; glueing and assembling of small jobs; finishing processes.

(e) Development of construction in wood with reference to traditional crafts.

(f) An elementary knowledge of design as applied to woodwork construction.

#### *2. Practical Test* (3 hours)

This will test the use of the common hand-tools and methods of construction; types of joints and the correct use of one or more of these in given pieces of constructional work; correct use of nails, screws and glue as means of fastening; working from dimensioned sketches and completed scale drawings.

Exercises will be given to test the candidates' skill in the sizing and shaping of wood to specified dimensions and shapes, in making the simpler joints and in employing them in constructive work.

### ADVANCED LEVEL

Candidates may offer either Woodwork or Metalwork or both in the Summer examination only and the Certificates will record Handicraft (Woodwork), or Handicraft (Metalwork), or both, as the case may be. All materials for the tests must be provided by the school.

#### **27. Metalwork**

The examination will consist of two papers, each of 2 hours, and a 4-hour practical test.

##### *I. Theory*

(a) Metals; the natural sources of common metals, processes by which they are rendered suitable for use in the workshop, properties of metals and alloys commonly used in the school workshop.

(b) Tools; construction, operation and uses of common hand-tools and their upkeep; lathe and drill (manual or power).

(c) Construction and processes: the principles underlying the operations of fitting, turning, forging, decorative metalwork and sheet metalwork; hardening and tempering of carbon steel; hard and soft soldering, brazing, and riveting.

(d) Design; constructional design as applied to wrought iron work, sheet metalwork, and coppersmithing.

## II. Drawing

(a) Ability to make and read properly dimensioned working drawings drawn to scale, in orthogonal projection, and according to British Standards Engineering Drawing Practice, B.S. 308A : 1964 (pub. by British Standards Institution, 2 Park Street, W.1), using drawing board, tee square and drawing instruments.

(b) Details of construction may be shown by means of freehand sketching, isometric (without the use of isometric scale) or oblique projection, or other methods of pictorial representation.

(c) Sections, sectional plans and elevations.

(d) The geometry required for the preparation of working drawings, e.g., construction of polygons and the ellipse.

(e) Development and sections of prisms, pyramids, the right circular cylinder and cone. True lengths.

## III. Practical

The course should include work in the common metals and alloys, basic constructional processes, e.g., setting out, filing, fitting and riveting; soft and hard soldering; hardening, tempering and annealing; the use of stocks, dies and taps.

According to the equipment available, the course should also include some or all of the following; simple forge work; piercing, hollowing, raising and planishing, drawing-down, upsetting, bending and twisting; the decoration and finishes appropriate to articles made by these processes; simple modelling from one side only; the application of drawn, hammered, twisted and plaited wires; suitable finishes; colouring, waxing and lacquering; sheet metalwork in heavier material; elementary lathe work including plain turning and boring.

In the practical examination alternative tests will be set,

either (a) involving the use of hand tools only.

or (b) including the use of the lathe:

in both sections a more difficult test will be set and a higher standard of craftsmanship will be expected than that for the Ordinary level in Metalwork (Practical).

Schools will be required to notify the University at the time of entry of the number of candidates who will be presented for each test.

### *Submission of specimens of work*

The examiners may require the submission of one specimen of work carried out in the year of the examination together with the relevant working drawings which must have been made by the candidate himself.

In view of the alternative tests in the practical examination, the range of questions in the drawing and theory papers will provide adequate scope for candidates taking either test.

## 28. Woodwork

The examination will consist of two papers, each of 2 hours, and a 4-hour practical test.

### I. Theory

(a) Timbers: the growth of timber trees, geographical distribution, characteristics of soft and hard woods in common use; conversion, seasoning, and market forms. Chief characteristics and uses of plywood and laminated boards.

(b) Tools: common woodworking tools, reason for their selection and use for practical purposes, the mechanical principles underlying their construction and manipulation; upkeep of the workshop equipment.

(c) Other materials: common kinds of glues and their uses, glasspaper, screws, nails, stains and polishes.

(d) Construction and processes: a knowledge of construction including the use of the more difficult joints and the principles involved, e.g., secret dovetail, long and short shoulder mortise and tenon, glueing and assembling of small jobs; finishing processes.

(e) History and design: an elementary knowledge of the principal styles of English furniture from Tudor to the present time.

## II. *Drawing*

(a) Ability to make and read properly dimensioned working drawings drawn to scale, in orthogonal projection, and according to British Standards Engineering Drawing Practice, B.S. 308A : 1964 (pub. by British Standards Institution, 2 Park Street, W.1), using drawing board, tee square and drawing instruments.

(b) Details of construction may be shown by means of freehand sketching, isometric (without the use of isometric scale) or oblique projection, or other methods of pictorial representation.

(c) Sections, sectional plans and elevations.

(d) The geometry required for the preparation of a working drawing, e.g., construction of polygons and the ellipse.

(e) A compulsory question will be set to test draughtsmanship, knowledge of construction and design.

## III. *Practical*

The examination will be framed to test the candidates' skill in the range of work specified below and also their knowledge and understanding of the principles involved.

The course of woodwork should require the use of the common hand-tools and methods of construction. Types of joints and the correct use of one or more of these in given pieces of constructional work. Correct use of nails, screws and glue as means of fastening. Working from dimensioned sketches, written descriptions, and completed scale drawings.

Candidates should be familiar with the following constructional joints and their application; the halving, housing, and bridle joints, the through and stopped mortise (including long and short shoulder), the common and lapped dovetail joints, and the through and stopped dovetail housings.

Candidates should be familiar with the use of rebate plane and plough.

### *Submission of specimens of work*

The examiners may require the submission of one specimen of work carried out in the year of the examination together with the relevant working drawings which must have been made by the candidate himself.

## 29. HISTORY

### ORDINARY LEVEL

There will be one paper of 2½ hours.

Candidates must answer questions from any two of the twelve sections into which the paper is divided, but may not offer both section (6) and section (7)

in English History, or both section (11) and section (12) in European History. They must answer five questions, choosing at least two from each of the two sections chosen.

The questions will be framed to test general knowledge of history and historical development rather than technical detail. Candidates will be given an opportunity to show knowledge of general movements and of special topics. It is assumed that all candidates will have learnt the outlines of English History, and some questions in which a knowledge of such outlines is implied may be set in any of the sections relating to English History.

ENGLISH HISTORY, considered with reference to the contemporary history of Europe and to developments overseas:

- |                         |                 |
|-------------------------|-----------------|
| (1) 55 B.C. – A.D. 1216 | (5) 1763 – 1832 |
| (2) 1216 – 1485         | (6) 1832 – 1914 |
| (3) 1485 – 1649         | (7) 1902 – 1955 |
| (4) 1649 – 1763         |                 |

EUROPEAN HISTORY. The main lines of European development, including that of Great Britain and the British Empire:

- |                  |                  |
|------------------|------------------|
| (8) 1500 – 1648  | (11) 1830 – 1914 |
| (9) 1648 – 1763  | (12) 1904 – 1954 |
| (10) 1763 – 1830 |                  |

A school may submit for approval a special topic (e.g., local history) in substitution for one of the two sections required by the syllabus. Application to offer such a special topic must be made not less than two years before the date of the examination, when the school must state the period of history that candidates will offer in addition to the special topic, and forward a list of the books which the candidates will use in studying the special topic.

## ADVANCED LEVEL

There will be three papers of 3 hours each.

### *Paper I. English History*

*Either* Paper IA. One of the following periods of English History:

- |                 |                 |
|-----------------|-----------------|
| (1) 450 – 1270  | (5) 1714 – 1832 |
| (2) 1270 – 1529 | (6) 1815 – 1922 |
| (3) 1529 – 1642 | (7) 1865 – 1955 |
| (4) 1603 – 1714 |                 |

*Or* Paper IB. One of the following outline periods of English History:

- |                 |                 |
|-----------------|-----------------|
| (8) 1529 – 1815 | (9) 1714 – 1955 |
|-----------------|-----------------|

### *Paper II. European History*

*Either* Paper IIA. One of the following periods of European History:

- |                 |                 |
|-----------------|-----------------|
| (1) 395 – 1216  | (5) 1715 – 1830 |
| (2) 1216 – 1516 | (6) 1815 – 1923 |
| (3) 1516 – 1661 | (7) 1871 – 1954 |
| (4) 1610 – 1725 |                 |

*Or* Paper IIB. One of the following outline periods of European History:

- |                 |                 |
|-----------------|-----------------|
| (8) 1516 – 1789 | (9) 1715 – 1954 |
|-----------------|-----------------|

In all papers each section will contain twelve questions and candidates must answer five questions from any one section.

The limiting dates of the periods must not be taken too rigidly. Candidates will be expected to have some knowledge of the years before and after the period chosen.

*Paper III. Special Subject.*

Special knowledge will be required of one of the following subjects. Candidates must answer four questions on the subject chosen; a choice of questions will be given. The special subjects are revised from time to time; for Summer 1966 and January 1967 they will be:

- (1) Roman Britain
- (2) Twelfth-Century Monasticism in the West
- (3) The Age of Discovery, 1400-1550
- (4) The Renaissance in Britain in the Sixteenth Century
- (5) France in the age of Richelieu and Mazarin
- (6) Scientific and technological development in Britain 1660-1760. The main achievements of British scientists and technologists, with special reference to their application to industries (e.g., agriculture, metallurgy, textiles, transport and communications) and the economic and social results. Candidates will be expected to have some knowledge of developments in Europe in the same period
- (7) English social conditions in the second half of the Eighteenth Century
- (8) The causes and course of the French Revolution, 1774-1799
- (9) The History of the United States of America, 1783-1865
- (10) The History of the British Empire during the reign of Queen Victoria
- (11) English social conditions in the second half of the Nineteenth Century
- (12) The making of the Triple Alliance and the Triple Entente.

*A Special paper will be set in this subject: see Regulation III (page 4).*

## 30. ANCIENT HISTORY

This subject may not be taken at the Ordinary level by candidates taking English Economic History or Modern History at that level at the same examination.

### ORDINARY LEVEL

There will be one paper of 3 hours, on  
Greek History from 510 B.C. to 323 B.C. and  
Roman History from 218 B.C. to A.D. 14.

The questions will be framed to test knowledge of the general conceptions of history and historical development rather than technical detail, and will include a compulsory question involving the use of an outline map.

### ADVANCED LEVEL

The examination will consist of the following papers (3 hours each) of which any two must be taken.

*Paper I. Either* (1) Outlines of Greek History, 600 B.C. to 404 B.C.  
or (2) Outlines of Greek History, 491 B.C. to 323 B.C.

*Paper II. Either* (1) Outlines of Roman History, 280 B.C. to 31 B.C.  
or (2) Outlines of Roman History, 133 B.C. to A.D. 96.

- Paper III.* (1) Greek History, 500 B.C. to 404 B.C.  
or (2) Greek History, 431 B.C. to 336 B.C.  
or (3) Roman History, 133 B.C. to 44 B.C.  
or (4) Roman History, 31 B.C. to A.D. 54.

The papers will include some questions of the essay type, and also one compulsory question, involving the use of an outline map.

## 32. BRITISH ECONOMIC HISTORY

This subject may not be taken at the Ordinary level by candidates taking Modern History or Ancient History at that level at the same examination.

### ORDINARY LEVEL

There will be one paper of 2½ hours.

The paper will be divided into four sections, and candidates will be required to answer five questions in all, choosing not more than three from any one section.

- |                 |                 |
|-----------------|-----------------|
| (1) 1066 – 1500 | (3) 1700 – 1850 |
| (2) 1480 – 1750 | (4) since 1815. |

### ADVANCED LEVEL

There will be two papers, each of 3 hours.

*Paper I.* The paper will cover the forms of economic and social organisation which have existed in Britain since the eleventh century, and will be divided into two parts at approximately 1750. Candidates must answer two questions from each part. The questions will be designed to test the candidate's general understanding of the course and the consequences of economic growth and social change, and their ability to observe the relationships between the various factors involved.

*Paper II.* The paper will require more detailed study of the economic history of one or two periods to be chosen from the following:

- |                 |                 |
|-----------------|-----------------|
| (1) 1000 – 1550 | (3) 1700 – 1875 |
| (2) 1500 – 1750 | (4) since 1850. |

Candidates must answer four questions from not more than two sections.

*A Special paper will be set in this subject; see Regulation III (page 4).*

## 35. HUMAN ANATOMY, PHYSIOLOGY AND HYGIENE

### ORDINARY LEVEL ONLY

This subject may not be taken by candidates taking Additional General Science at the same examination.

There will be one paper of 3 hours.

The aim of the syllabus is to examine a general education in Human Biology that will enable the principles of health education to be understood. It is essential that candidates should have followed a course of elementary

science and that they should have acquired sufficient knowledge of Biology, Physics and Chemistry to be able to understand the Physiology and Hygiene included in the work. It is assumed that the functional anatomy of a small mammal will be known.

Demonstration dissections of mammals should be used to illustrate general anatomy, and candidates should have the opportunity of looking at histological preparations of the more important tissues (possibly by means of micro-projection). Stress should be laid on the relation of structure to function.

### *I. Man as an individual*

General structure of man as a primate. Man's distinctive anatomical features (large brain, erect posture, bipedal gait, etc.). Position of the principal organs of the body in relation to one another. An elementary knowledge of the main races and types of living man.

### *II. Anatomy and Physiology*

Anatomy should never be dissociated from any functional implications. The syllabus is outlined systematically to give an indication of the detail required, and not to suggest an order of presentation.

#### *(a) Nervous system*

General outline in man: central nervous system and peripheral nervous system. The neurone and its nerve fibre; conduction of nerve impulses. Main parts of the human brain and their functions in co-ordination, control and consciousness. The main functions of the autonomic nervous system. Structure and arrangement of a reflex arc; reflex responses inherent in daily life. Sense organs and their functions: skin, ear and eye, organs of taste and smell.

#### *(b) The skeleton; muscles; locomotion*

The main parts of the human skeleton; functions of the skeleton. Types of joints (detailed structure only of shoulder, hip and knee joints).

Muscle tissues, striated, smooth and cardiac. Origin and insertion of muscles in relation to movement. Group action of muscles. Details of the main muscles involved in walking, posture, respiration and grasping. Reciprocal innervation.

#### *(c) Cardiovascular system and blood*

Circulation in man; heart and great vessels, arteries and veins, arterioles and capillaries. Blood pressure, systolic and diastolic, its maintenance. Heart as a pump, heart rate and output, the pulse. Vasomotor mechanisms; re-distribution of blood. Tissue fluid, lymph, circulation of lymph and its functions.

Composition and functions of blood, red and white cells, plasma. Blood as a transport system. Sites of formation of cellular components. Haemoglobin, iron, anaemia.

Outline of blood clotting. Part played by circulation in temperature regulation.

#### *(d) Respiratory system*

Purpose of respiration. Respiratory organs and their mechanism. Respiratory movements, normal and increased, effects of exercise. Response of breathing to metabolic needs. Atmospheric composition, changes in air breathed. Transfer of oxygen from inspired air to tissues and cells and removal of carbon dioxide. Respiratory failure and resuscitation.

(e) *Food and alimentary system*

Food nutrients; protein, fat, carbohydrate, vitamins, mineral salts, water. Food needs for different activities. Requirements for infants, adolescents and in pregnancy. A balanced diet; value of milk as a food.

General arrangement of alimentary tract. Peristalsis, sphincters. Liver and pancreas. Digestion, absorption and fate of absorbed nutrients.

(f) *Urogenital system*

General anatomy of urinary tract. Functions of kidneys; formation of urine and control of body water.

Male and female reproductive organs. Functions of gonads. Outline of female reproductive cycle, menstruation. Outline of human development; fertilisation, implantation, brief outline of growth of embryo and foetus (no details of organogenesis). Functions of the placenta.

(g) *Endocrine system*

Outline of location and physiology of thyroid, adrenals, islets of Langerhans, pituitary. Hormones in communication and effector mechanisms.

(h) *Integumentary system*

Structure and functions of skin. Regulation of body temperature.

III. *Heredity*

Outline of Mendelian inheritance as applied to one pair of contrasting characters; the significance of the pairing and subsequent separation of homologous chromosomes (a detailed study of meiosis is not required).

IV. *Man in the community*

(a) *Living conditions*. Housing, heating, ventilation. Open spaces. Water supply, sanitation, methods of sewage disposal. Personal hygiene, health in the home. Health in industrial work, with reference to one particular hazard to health in any local or national industry.

(b) *Food*. Standards of nutrition, hygienic conditions of processing, preparation, storage and distribution. Illustration of above by reference to regulations governing quality of milk and freedom from contamination or adulteration. Outline of important diseases or toxic agents that can be spread by contaminated food.

(c) *Prevention of disease*. Micro-organisms, useful and harmful. Bacteria and viruses; protozoan and other parasites. Antibodies and immunity. Methods of spread of disease. Study of one disease spread in each case by air, water, food, vermin and insects. Means of control of these agencies to restrict disease (signs, symptoms and pathology of any disease are not required).

**ITALIAN** See page 49.

## 37. LATIN

ORDINARY LEVEL

SYLLABUS A

There will be two papers, one of 2½ hours and one of 2 hours.

*Paper I* (2½ hours). The paper will consist of three sections of which candidates may offer one:

- (a) Prepared books, one in prose and one in verse, including questions on the language and subject matter.
- (b) A verse prepared book, including questions on the language and the subject matter, and prose unprepared translation.
- (c) Unprepared translation.

Candidates will be expected to be able to scan hexameter, elegiac and hendecasyllabic verses where these occur in the texts offered.

Except where a particular edition is prescribed, the examiners will use the Oxford Classical Texts (Clarendon Press, Oxford) or, if a text is not published in this series, the Teubner edition.

The following books are prescribed for Summer 1966 and January 1967.

Caesar: Gallic War, Book I, 1-12 and 38-54 or Livy IX, 1-15.

Virgil: Aeneid II, 268-725 or Two Centuries of Roman Poetry, E. C. Kennedy and A. R. Davis (Macmillan), Part I.

*Part II* (2 hours). A paper on easy unprepared translation, grammar, simple and easy sentences of English for translation into Latin, and, as an alternative to such sentences, an easy continuous piece of English prose.

Candidates must satisfy the examiners in translation at sight from English into Latin and from Latin into English, and in grammar.

#### SYLLABUS B (*Subject number 38*)

There will be two papers, one of 2½ hours and one of 2 hours.

*Paper I* (2½ hours).

##### *A. Set Books*

The paper will consist of passages from set portions of prose and verse authors, to be explained and discussed in relation to the context, by means of answers to questions which will test a comprehension of the Latin. A passage of about five lines from each author will be set for translation, as well as the passage not for translation.

Candidates will be expected to be able to scan hexameter, elegiac and hendecasyllabic verses where these occur in the texts offered.

The following authors are prescribed for Summer 1966 and January 1967, and from them candidates must offer one verse and two prose authors, or one prose and two verse authors.

##### *Prose*

Caesar: Gallic War, Book III, 1-21

An Easy Selection from Cicero's Correspondence, ed. J. D. Duff, *2nd Edition Revised* by W. K. Lacey, Nos. 1-16 (C.U.P.)

Pliny: Selections by C. E. Robinson (Allen and Unwin) I-VIII, XVI-XXV, XXXIII.

##### *Verse*

Ovid: Anthology of the Metamorphoses, J. E. Dunlop (Bell), III and V-VIII

Virgil: Aeneid II, 250-558

Martial: Selections from Martial and Pliny, E. C. Kennedy, I-XXI, XXIV-XXVI, XXXIII (C.U.P.).

##### *B. General Questions*

Six questions will be set, each based on the subject-matter of one of the six portions prescribed as set books. Candidates must answer two questions, one

on a verse author and one on a prose author. The questions will give candidates an opportunity to show some knowledge of Roman life, history or literature in relation to the set books.

*Paper II* (2 hours).

*A. Unprepared Translation*

Candidates must attempt two pieces, a prose passage and either a verse passage or a second prose passage.

*B. Composition*

A choice of *either* (1) straightforward sentences,  
or (2) a passage of simple narrative,

Candidates must satisfy the examiners in unprepared translation and in composition.

**ADVANCED LEVEL** (*Subject number 37*)

There will be three papers, two of 2½ hours and one of 3 hours.

*Paper I* (2½ hours). Prose composition.

*Paper II* (2½ hours). Unprepared translation, consisting of two prose passages and one verse passage.

Candidates must satisfy the examiners in Papers I and II taken together.

*Paper III* (3 hours). Translation from prescribed texts, and questions thereon.

The following books are prescribed for Summer 1966 and January 1967.

Candidates may offer:

*Either* (i) One prose and one verse book selected from the following:

(a) Cicero: *Pro Milone*

Livy: Book XXII, Chaps. 1-50, § 3, omitting Chaps. 19-22 and 31-37

Tacitus: *Annals*, Book XIV

(b) Virgil: *Aeneid*, Book I, 1-656

Horaces: *Odes*, Book I

Plautus: *Captivi*

No grammatical questions will be set except on the books prescribed.

*Or* (ii) All four of the following:

Cicero: *Pro Milone*

Livy: Book XXII, Chaps. 1-50, § 3, omitting Chaps. 19-22 and 31-37

Virgil: *Aeneid*, Book I, 1-656

Horace: *Odes*, Book I.

For candidates offering alternative (ii) the test will consist of translation and questions on the subject-matter.

Except when a particular edition is prescribed, the examiners will use the Oxford Classical Texts (Clarendon Press, Oxford), or, if a text is not published in this series, the Teubner edition.

*A prize in memory of Margaret Winifred Matthew will be awarded annually to the girl candidate who enters for the examination while at school and accomplishes the best performance in Latin at Advanced level in the Summer examination.*

*A Special paper will be set in this subject; see Regulation III (page 4).*

## 39. LOGIC

This subject may only be taken at the Summer examination.

### ORDINARY LEVEL

There will be one paper of 3 hours.

The term; classification of terms, denotation and connotation. Division and definition. The proposition: classification of propositions, reduction of sentences to logical form. Laws of thought, opposition of propositions, immediate inference. The syllogism: moods and figures, the expression of arguments in syllogistic form. Syllogistic fallacies, hypothetical and disjunctive propositions and arguments.

Inductive reasoning in its various forms.

Observation and experiment: canons of scientific induction.

Combination of induction and deduction; hypothesis and explanation.

} *These three subjects will be treated in a specially elementary manner.*

### ADVANCED LEVEL

There will be two papers, each of 3 hours.

The following subjects should be treated in an elementary way, but, where they overlap with those prescribed at Ordinary level, they should be dealt with in a more detailed way.

#### *Paper I: Deductive Logic*

The nature of logic. Form and symbols. Statements and arguments. Truth and validity. Entailment.

Types of statement. Relations between statements. The square of opposition. Truth-functions.

Immediate inferences. Compound arguments. Fallacies.

Classes. Class-inclusion and class-membership. Relations and their logical properties.

General statements. Their interpretation in terms of classes.

System. The Aristotelian system. The syllogism: figures and moods.

Reduction.

Definition. Connotation and denotation. Classification and division. The predicables.

#### *Paper II: Induction and Scientific Method*

Induction versus deduction. Types of inductive reasoning. Analogy.

Generalisation and law. Causal laws.

Principles of causal determination. Mill's canons. Experiment and observation.

Hypothesis. System and theory. The hypothetico-deductive method.

Scientific explanation. Probability and chance.

Measurement. Quantitative and qualitative laws.

## 40. PURE MATHEMATICS

### ORDINARY LEVEL

*Four-figure logarithmic tables will be provided by the University for use at the examination.† The use of slide rules is prohibited.*

To pass in Pure Mathematics at the Ordinary level a candidate must not only reach the necessary standard in the subject as a whole, but must also reach a standard satisfactory to the examiners in each of the papers offered.

### SYLLABUS A

There will be four papers, three of 2 hours and one of  $2\frac{1}{2}$  hours, of which candidates must offer three.

#### *Paper I. Arithmetic and Trigonometry (2 hours)*

Great importance will be attached to correct working. Logarithms may be used except in questions where they are expressly forbidden.

Elementary principles and processes of arithmetic.

The principles of vulgar and decimal fractions (excluding recurring decimals).

Knowledge and use of the tables required, both in the English and metric system, for the measurement of length, area, volume, capacity, weight and time.

Mensuration of the rectangle, parallelogram, triangle, trapezium and circle.

Averages, ratio, proportion, percentages.

Practical applications of arithmetic.

Simple numerical trigonometry.

In this paper, in which a choice of questions will be allowed, some questions will be set which involve a knowledge of the subject matter of papers II and III.

#### *Paper II. Algebra (2 hours)*

The fundamental processes of algebra.

Symbolic expression of general results in arithmetic.

Interpretation and evaluation of formulae. Changing the subject of a formula.

Factors of expressions of simple types.

Equations of the first and second degree containing one unknown quantity.

Simultaneous equations of the first degree, and two simultaneous equations of which one is of the first degree and the other of the second degree.

Easy examples in fractions.

Graphs of simple algebraic functions with easy applications.

Simple questions on fractional and negative indices (formal proofs not being required).

Use of logarithms to the base 10.

Arithmetic and geometric series.

Applications of algebra to the solution of problems.

#### *Paper III. Geometry ( $2\frac{1}{2}$ hours)*

The paper will contain questions on Practical and Theoretical Geometry.

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† Four-Figure Tables, by C. Godfrey and A. W. Siddons, published by the Cambridge University Press, at 2s. The published edition contains two pages (45-46) of Weights and Measures, Constants and Formulae which are deleted from the edition issued to candidates at examinations.

The questions on Practical Geometry will involve the constructions specifically mentioned in Part A, but may also contain other easy applications of the theorems listed in Part B. Constructions need not be described unless the question specifically states that a description is required. All figures must be drawn accurately and distinctly, and construction-lines should not be erased. Proofs need not be given unless the question states that they are required. Questions may be set in which only certain instruments may be used.

The questions on Theoretical Geometry will consist of theorems contained in Part B, together with applications of these theorems. Any proof of a theorem will be accepted which appears to the examiners to form part of a systematic treatment of the subject. The order in which the theorems are stated in Part B is not imposed as a sequence of their treatment. The use of algebraic and trigonometric symbols and of the properties of similar figures will be allowed. Proofs of the items in *italics* may be required.

The use of hypothetical constructions will be allowed.

#### PART A (PRACTICAL)

Bisection of angles and of straight lines.

Construction of perpendiculars to straight lines.

Construction of an angle equal to a given angle.

Construction of angles of  $60^\circ$ ,  $45^\circ$ , and  $30^\circ$ .

Division of straight lines into a given number of equal parts or into two or more parts in a given proportion.

Construction of a triangle equal in area to a given quadrilateral.

Construction of tangents to a circle and of common tangents to two circles.

Construction of circumscribed, inscribed and escribed circles of a triangle.

Construction of a square equal in area to a given quadrilateral.

#### PART B (THEORETICAL)

General properties of angles at a point and angles made with parallel lines.

The sum of the angles of a triangle is equal to two right angles.

In a polygon of  $n$  sides, the sum of the interior angles is equal to  $2n-4$  right angles.

If the sides of a convex polygon are produced in order, the sum of the angles so formed is equal to four right angles.

If two triangles have two sides of the one equal to two sides of the other, each to each, and also the angles contained by those sides equal, the triangles are congruent.

If two triangles have two angles of the one equal to two angles of the other, each to each, and also one side of the one equal to the corresponding side of the other, the triangles are congruent.

If two sides of a triangle are equal, the angles opposite to these sides are equal; and the converse.

If two triangles have the three sides of the one equal to the three sides of the other, each to each, the triangles are congruent.

If two right-angled triangles have their hypotenuses equal, and one side of the one equal to one side of the other, the triangles are congruent.

If two sides of a triangle are unequal, the greater side has the greater angle opposite to it, and the converse.

Of all the straight lines that can be drawn to a given straight line from a given point outside it, the perpendicular is the shortest.

*Defining a parallelogram as a quadrilateral with both pairs of opposite sides parallel, then in any parallelogram*

(i) *the opposite sides are equal*

(ii) *the opposite angles are equal*

(iii) *the diagonals bisect each other.*

*If in a quadrilateral*

(i) *both pairs of opposite sides are equal*

or (ii) *one pair of opposite sides are equal and parallel*

or (iii) *the opposite angles are equal*

or (iv) *the diagonals bisect each other*

*then the quadrilateral is a parallelogram.*

*If there are three or more parallel straight lines, and the intercepts made by them on any straight line that cuts them are equal, then the corresponding intercepts on any other straight line that cuts them are also equal.*

*Parallelograms on the same base or with equal bases and of the same altitude are equal in area.*

*The area of a parallelogram is equal to the area of a rectangle on the same base and of the same altitude.*

*Triangles on the same base or with equal bases and of the same altitude are equal in area. The area of a triangle is half that of a parallelogram on the same base and of the same altitude.*

*Triangles of equal area on the same base or with equal bases are of the same altitude.*

*In a right-angled triangle, the square described on the hypotenuse is equal to the sum of the squares described on the sides containing the right angle; and the converse.*

*The square on a side of a triangle is greater or less than the sum of the squares on the other two sides, according as the angle contained by those sides is obtuse or acute. The difference is twice the rectangle contained by one of the two sides and the projection on it by the other.*

*In any triangle, the sum of the squares on any two sides is equal to twice the square on half the third side together with twice the square on the median which bisects the third side.*

*The locus of a point which is equidistant from two fixed points is the perpendicular bisector of the straight line joining the two fixed points.*

*The locus of a point which is equidistant from two intersecting straight lines consists of the pair of straight lines which bisect the angles between the two given lines.*

*A straight line drawn from the centre of a circle to bisect a chord, which is not a diameter, is at right angles to the chord; conversely, the perpendicular to a chord from the centre bisects the chord.*

*Equal chords of a circle are equidistant from the centre; and the converse.*

*The tangent at any point of a circle and the radius through the point are perpendicular to each other.*

*Tangents to a circle from an external point are equal and equally inclined to the line joining the point to the centre of the circle.*

*If two circles touch, the point of contact lies on the straight line through the centres.*

*The angle which an arc of a circle subtends at the centre is double that which it subtends at any point on the remaining part of the circumference.*

Angles in the same segment of a circle are equal; and if the line joining two points subtends equal angles at two other points on the same side of it, the four points lie on a circle.

*The opposite angles of any quadrilateral inscribed in a circle are supplementary; and the converse.*

In equal circles (or, in the same circle) (i) if two arcs subtend equal angles at the centres, they are equal; (ii) conversely, if two arcs are equal, they subtend equal angles at the centre.

In equal circles (or, in the same circle) (i) if two chords are equal, they cut off equal arcs; (ii) conversely, if two arcs are equal, the chords of the arcs are equal.

*If a straight line touch a circle, and from the point of contact a chord be drawn, the angles which this chord makes with the tangent are equal to the angles in the alternate segments, and the converse.*

*If two chords of a circle intersect either inside or outside the circle, the rectangle contained by the parts of the one is equal to the rectangle contained by the parts of the other, and the converse.*

*If, from any point outside a circle, a secant and a tangent are drawn, the rectangle contained by the whole secant and the part of it outside the circle is equal to the square on the tangent, and the converse.*

*If a straight line is drawn parallel to one side of a triangle, the other two sides are divided proportionally; and the converse.*

If two triangles are equiangular their corresponding sides are proportional; and the converse.

If two triangles have one angle of the one equal to one angle of the other and the sides about these equal angles proportional, the triangles are similar.

*If a perpendicular is drawn from the right angle of a right-angled triangle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to one another.*

*The internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the sides containing the angle, and likewise the external bisector externally; and the converses.*

*The ratio of the areas of similar triangles is equal to the ratio of the squares on corresponding sides.*

#### *Paper IV Statistics (2 hours)*

The following syllabus, in which the order of the topics is not necessarily a suitable teaching order, aims at a treatment of statistics which shall be broad rather than deep, indicating the fundamental elementary concepts and including some simple calculation. It is assumed that illustrative material will be drawn from such fields as economics, biology and psychology and that some statistical data will be collected by candidates themselves. The University will supply squared paper but schools may supply their own.

The scope of statistics.

The collection and interpretation (numerical and descriptive) of data.

Design of questionnaires and of samples: bias.

Tabulation. Pictorial representation, bar charts.

Graphs of statistical data, time-series, use of moving averages for removing seasonal fluctuations, secular trend, parallel movement.

Frequency distributions, histograms, cumulative frequency diagrams.

Measures of central tendency: the arithmetic mean (calculated from a set

of numbers and from a frequency distribution). Weighted means in economic and vital statistics (e.g., index numbers, standardised death rates). The median (determined graphically) and the mode.

Measures of dispersion, quartiles, percentiles (determined graphically).

Calculation of the standard deviation from a set of numbers and from a frequency distribution.

Probability, permutations and combinations, the binomial distribution.

Meaning of correlation and of regression. Scatter diagrams. Graphical treatment of regression. Correlation by ranks with calculation of the coefficient of rank correlation by using a small number of items. Elementary ideas on interpretation and reliability of this coefficient.

### *SYLLABUS B (Subject number 41)*

This syllabus is alternative to Syllabus A in Pure Mathematics.

There will be two papers, each of 2 hours. Each paper may contain questions on any part of the syllabus, and the solution of any question may require knowledge of more than one branch of the syllabus.

Each paper will consist of two sections. The first section will contain questions of an elementary type which may consist of two or three short parts. The second will offer a choice of questions.

Unless the terms of the questions impose specific limitations,

(a) a candidate may use any appropriate method,

(b) tables of logarithms, trigonometrical functions, squares and square roots may be used wherever they give the required degree of accuracy,

(c) T-squares, set squares, graduated rulers, diagonal scales, protractors and compasses may be used.

#### *1. Numbers*

The ordinary processes of arithmetic.

The commoner systems of weights, measures, and money, including metric units.

Fractions, decimals, ratio, percentage.

Use of common logarithmic and square root tables.

Significant figures.

Questions may be set on the applications of these processes to problems of everyday life in the home and community but such questions will not involve complicated operations or the knowledge of uncommon technical terms. It is not intended that the 'long rules' for the extraction of square roots, the determination of H.C.F., etc., should be included.

#### *2. Mensuration*

The rectangle, triangle and figures derived from them, including easy extensions to three dimensions.

The circle, cylinder, cone and sphere (but formulae for the last two need not be memorised).

Questions may involve knowledge of the altitude and centre of an equilateral triangle and the ratio of the sides of the right-angled isosceles triangle and the  $30^\circ$ ,  $60^\circ$ ,  $90^\circ$  triangle.

#### *3. Formulae and Equations*

Construction of a formula through symbolical expression of a functional relation (e.g.,  $V$  is proportional to  $x^2$ ), or through generalisation of an

arithmetical result. Interpretation, evaluation, and very easy manipulation of a formula.

The use of indices.

[Only simple examples of fractional and negative indices will be set; candidates may be expected to understand the use of indices to express such numbers as  $3.74 \times 10^3$  or  $1.35 \times 10^{-6}$ . Questions involving the manipulation of surds will not be set.]

The use of suffixes.

Common factors: factors of  $(a^2 - b^2)$  and of such extensions as occur in mensuration. Easy trinomial factors.

Fractions whose denominators are single terms or linear expressions.

[Simple manipulations should not include more than two such fractions.]

Simple equations, quadratic equations, and linear simultaneous equations in two variables.

#### 4. *Graphs, Variation, Functionality*

Graphs from statistical data.

The idea of a function of a variable.

Translation into symbols of relations such as 'y is inversely proportional to x', 'V varies as x<sup>3</sup>', and their illustration by sketch-graphs.

Simple cases of the function

$$y = Ax^3 + Bx^2 + Cx + D + \frac{E}{x} + \frac{F}{x^2},$$

where the constants are numerical and at least three of them are zero.

Graphical treatment of these functions.

The gradients of these graphs, by drawing or by calculation.

[Questions will not involve theoretical treatment of limits.]

Application of gradients to (a) rates of increase, (b) easy linear kinematics including the distance-time and speed-time curves, (c) maxima and minima. The determination of a function from its gradient. The area 'under' a graph. Applications to areas, volumes of revolution, linear kinematics.

[Questions on Calculus will not be set in the compulsory part of the paper.

Candidates will be expected to understand the use of the standard notations for differentiation and integration. Questions involving the use of the formula

$$\frac{dy}{dt} = \frac{dy}{dx} \cdot \frac{dx}{dt} \text{ will not be set.}]$$

#### 5. *Two-dimensional Figures*

A sound understanding of the properties set out below will be expected.

Proofs of the items in *italics* may be required. Proofs of the other properties will not be required. Riders may be set which can be solved by the use of these properties, but they themselves will not be set as riders. In solving riders candidates may use any knowledge they possess. Candidates will be expected to understand the relation between a theorem and its converse.

Properties of angles at a point and angles made with parallel lines.

*The exterior angle property and angle-sum of a triangle.*

Angle-sum properties of polygons.

Congruency of triangles: similarity of triangles.

Symmetry about a point or line.

The isosceles triangle: the parallelogram, rectangle square.

*Parallelograms on the same base and between the same parallels are equal in area.*

*The straight line joining the mid-points of two sides of a triangle is parallel to the third side and equal to half the length of the third side. (By congruence or areas or similarity.)*

Other area properties of rectangles, parallelograms, triangles and trapezia, including the formulae  $\frac{1}{2}bc \sin A$ .

Connexions between algebra and geometry, e.g.  $(a+b)^2$ , use of coordinates, including negative coordinates.

The sine, and cosine, and tangent of an angle, acute or obtuse.

[Trigonometry of obtuse angles will not occur in the first section of the paper.]

The sine-rule for a triangle, with numerical applications involving the use of four-figure tables but not including the ambiguous case.

*The theorem of Pythagoras. (By proving that the perpendicular drawn to the hypotenuse divides the triangle into similar triangles: or otherwise.)*

$$\sin^2 A + \cos^2 A = 1.$$

$$a^2 = b^2 + c^2 - 2bc \cos A.$$

[This replaces the 'extension of Pythagoras': easy numerical applications using four-figure tables will be set.]

The symmetrical properties of chords of a circle.

*An angle at the centre of a circle is twice any angle at the circumference standing on the same arc.*

The other 'angle properties' of the circle.

The perpendicularity of tangent and radius: the distance between centres of circles in contact; the equality of tangents from an external point.

The 'alternate segment' theorem.

*The 'intersecting chord' theorem for an external point ( $OP.OQ = OR.OS = OT^2$ )*

The analogous property for an internal point.

*The relationship between the areas of similar triangles.*

Corresponding results for similar figures and extension to volumes of similar solids.

*The bisector of any angle of a triangle divides the opposite side in the ratio of the sides containing the angle.*

The analogous property for an exterior angle.

Knowledge of simple loci, with easy extensions to three dimensions. The method of intersecting loci. Plotting of simple loci other than the circle, e.g., parabola or ellipse.

Knowledge of the following 'ruler and compasses' constructions will be assumed: set squares will be allowed for the construction of parallel lines.

Bisection of angles and straight lines.

Construction of perpendiculars to a given line and of angles equal to a given angle.

Construction of angles of  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ .

Construction of triangles, quadrilaterals, and circles from simple data, including the inscribed and circumscribed circles of a triangle.

Division of a straight line into a given number of parts or in a given ratio.

Construction of a triangle equal in area to a quadrilateral or pentagon and of a square equal in area to a given rectangle.

Construction of tangents from an external point.

Construction of a segment containing a given angle.

#### 6. Three-Dimensional Figures

The forms of the cube, rectangular block, pyramid, tetrahedron, prism, circular cylinder, circular cone and sphere, including calculations of lengths and of angles between two planes and between a plane and a straight line.

#### 7. Practical Applications

In addition to ordinary riders, questions involving drawing, trigonometry or geometrical reasoning may be set on the following topics:

(a) Simple map problems, e.g., scales, contour lines, slopes

(b) Determination of positions by two bearings: the nautical mile and knot: the composition of two velocities

(c) Heights and distances

(d) Simple plan and elevation problems

(e) Latitude and longitude: great and small circles on a sphere

(f) The length of an arc in terms of the radius and the measure (in degrees) of the angle at the centre

(g) Three-dimensional problems which can be solved by analysis into plane figures.

## 42. ADDITIONAL MATHEMATICS

### ORDINARY LEVEL ONLY

*Four-figure logarithmic tables will be provided by the University for use at the examination.† The use of slide rules is prohibited.*

There will be four papers, each of 2 hours. Candidates must take Paper I and one other paper.

Paper I Pure Mathematics I

Paper II Pure Mathematics II

Paper III Theoretical Mechanics

Paper IV Statistics

Each paper will contain eight questions of which candidates must answer six.

#### *Paper I Pure Mathematics I*

The use and properties of logarithms. The theory of quadratic equations. The use of the binomial series for a positive integral index. Graphs of polynomials and of simple rational functions.

Solution of triangles (proofs of sine and cosine formulae only will be required). Graphs (and their applications) of sine, cosine and tangent and of functions of the form  $a \cos x + b \sin x$ .

Cartesian rectangular coordinates of a point in a plane, distance between two points, mid-point of a line joining two points. The straight lines  $y = mx + c$ ,  $x = a$ ,  $y - y_1 = m(x - x_1)$ , conditions for two lines to be parallel or perpendicular, equation of a line joining two points.

Gradients, the gradient at any point of  $y = x^n$  and  $y = f(x)$  where  $f(x)$  is a polynomial. Differentiation of a sum, a product and a quotient. Integration

† Four-Figure Tables by Godfrey and Siddons, C.U.P. See footnote, p. 77.

of  $x^n$ , excluding  $n=-1$ . Applications of the calculus to maxima and minima, tangents, normals and areas.

#### *Paper II Pure Mathematics II*

The theory of the quadratic function  $ax^2+bx+c$ . The use of the binomial series for a rational index.

The use of the formulae for  $\sin(A\pm B)$ ,  $\cos(A\pm B)$ ,  $\tan(A\pm B)$ ,  $\sin A\pm\sin B$ ,  $\cos A\pm\cos B$ . Trigonometric functions of angles of any magnitude. Circular measure. Three dimensional problems including applications to simple solids. The idea of a locus, the equation of a circle, determination of the centre and the radius of a circle.

Differentiation of a function of a function. Differentiation and integration of  $\sin x$ ,  $\cos x$  (no proofs required). Applications of the calculus to velocities, accelerations, rates of change and volumes of revolution.

#### *Paper III Theoretical Mechanics*

The composition and resolution of coplanar forces acting on a particle. The triangle, parallelogram and polygon of forces. Lami's Theorem. Moments of forces. Parallel forces. Centre of gravity. The equilibrium of a rigid body under the action of coplanar forces. Friction.

Velocity, acceleration, relative velocity, uniformly accelerated rectilinear motion. Projectiles.

Newton's laws of motion; gravitational, absolute and technical systems of units. Work, energy and power. Conservation of energy. Motion of connected particles. Motion in a circle with uniform speed.

Impulse. Conservation of momentum. Impact between inelastic bodies.

#### *Paper IV Statistics*

The following syllabus, in which the order of the topics is not necessarily a suitable teaching order, aims at a treatment of statistics which shall be broad rather than deep, indicating the fundamental elementary concepts and including some simple calculation. It is assumed that illustrative material will be drawn from such fields as economics, biology and psychology and that some statistical data will be collected by candidates themselves. The University will supply squared paper but schools may supply their own.

The scope of statistics.

The collection and interpretation (numerical and descriptive) of data.

Design of questionnaires and of samples: bias.

Tabulation. Pictorial representation, bar charts.

Graphs of statistical data, time-series, use of moving averages for removing seasonal fluctuations, secular trend, parallel movement.

Frequency distributions, histograms, cumulative frequency diagrams.

Measures of central tendency: the arithmetic mean (calculated from a set of numbers and from a frequency distribution). Weighted means in economic and vital statistics (e.g., index numbers, standardised death rates). The median (determined graphically) and the mode.

Measures of dispersion, quartiles, percentiles (determined graphically).

Calculation of the standard deviation from a set of numbers and from a frequency distribution.

Probability, permutations and combinations, the binomial distribution.

Meaning of correlation and of regression. Scatter diagrams. Graphical treatment of regression. Correlation by ranks with calculation of the coefficient of rank correlation by using a small number of items. Elementary ideas on interpretation and reliability of this coefficient.

# MATHEMATICS

## ADVANCED LEVEL

The subjects that may be offered are:

- 40 Pure Mathematics** Papers I and II and a Special Paper  
**43 Applied Mathematics** Papers III and IV and a Special Paper  
**44 Mathematics (Pure and Applied)** Papers I and III and a Special Paper  
**42 Further Mathematics** Papers V and VI

Each paper will be of 3 hours, and will contain a choice of questions.

Mathematics (Pure and Applied) may not be taken by candidates taking either Pure Mathematics or Applied Mathematics; Further Mathematics may not be taken with Additional Mathematics.

Candidates who offer Pure Mathematics and Applied Mathematics and who fail in both subjects may be awarded a pass in Mathematics (Pure and Applied) if they pass in Papers I and III.

The use of logarithms and slide rules will be permitted unless otherwise stated.

### *Paper I*

The theory of the quadratic function and of quadratic equations. Simple algebraic functions. The theory of indices and logarithms.

Permutations and combinations. The Binomial Theorem for a positive integral index. The use of the expansion  $(1+x)^n$ , where  $n$  is fractional or negative, simple approximations. Determination of a linear law from experimental data.

Rectangular Cartesian coordinates, including parameters, applied to the straight line, circle and parabola. Easy problems on loci.

Circular measure. Small angles, including the use of limits such as  $\sin \theta/\theta$  as  $\theta$  tends to zero.

Trigonometric functions of compound angles and simple transformations of sums and products. Solution of triangles. Easy three-dimensional problems.

The differentiation of simple algebraic, trigonometric (excluding inverse functions), exponential and logarithmic functions. Differentiation of a sum, product, quotient and simple cases of a function of a function and of implicit functions. Application to gradients, maxima and minima.

Definite and indefinite integration of simple functions. Applications to area and volume.

### *Paper II*

The convergence of geometric series. Summation of simple finite algebraic series. The relations between the roots of an algebraic equation and its coefficients. The exponential and logarithmic series.

Identities, including Partial Fractions, the remainder theorem, simple inequalities.

Rectangular Cartesian coordinates, including parameters, applied to the ellipse and the hyperbola.

General solutions of trigonometrical equations (including  $a \cos x + b \sin x = c$ ). Application of trigonometry to properties of triangles and harder three-dimensional problems.

The determination of the angles made by planes and straight lines with one another. The mensuration and simpler properties of common solids, including the tetrahedron, cone and sphere; any appropriate methods may be used.

Differentiation of  $\sin^{-1}x$  and  $\tan^{-1}x$ . Simple examples of integration by substitution and integration by parts.

Applications of the calculus to rates of change, tangents and normals and centroids. Sketching of graphs such as  $(ax^2+bx+c)/(px^2+qx+r)$ .

### *Paper III*

The addition and subtraction of vectors. Moments and couples. Equilibrium of a particle and of rigid body under the action of a system of coplanar forces. Mass centre.

Friction. Hooke's Law

Kinematics of a particle moving with uniform acceleration

Concept of relative velocity

Mass, momentum, force, impulse, work, energy and power

The principles of energy and momentum

Direct impact of elastic bodies

Elementary treatment of projectiles

Uniform circular motion; simple harmonic motion; the small oscillations of a simple pendulum

Motion in a vertical circle under gravity.

### *Paper IV*

Equilibrium of one or more bodies under the action of coplanar forces or of parallel forces, smoothly jointed frameworks of light rods, including graphical solutions.

Properties and determination of mass centres and of second moments in simple cases.

Relative velocity and acceleration, resolution and composition, graphical representation of the relations between displacement, velocity, acceleration and time.

Direct and oblique impact, rectilinear motion under the action of a variable force, motion of connected particles, projectiles.

Moments of inertia. Motion of a rigid body about a fixed axis, the compound pendulum.

### *Papers V and VI*

Each paper will consist of 12 questions, 6 of which are to be answered. (It is not expected that every candidate will cover the whole subject.)

Simple determinants and matrices (not greater than  $3 \times 3$ ). Consistency of linear equations. Newton's method of approximate solution of  $f(x)=0$  and other iterative methods.

Complex numbers, Argand diagram. De Moivre's theorem for a positive or negative integral index. Cube roots of unity.

Sequences and series, limits, convergence of simple series. Hyperbolic functions and their inverses.

Elementary properties of the triangle and its associated points and circles.

Concurrence and collinearity. Radical axis; coaxial circles. Similitude. Inversion.

Curvature of a plane curve using Cartesian or parametric coordinates.

Polar coordinates; polar equations of simple plane curves. Area =  $\frac{1}{2} \int r^2 d\theta$ .  
 Length of arc of a curve; surface of revolution; theorems of Pappus. Use of  $\tan \phi = r \frac{d\theta}{dr}$ . Curve tracing. Simple properties of well-known curves e.g. semi-cubical parabola, cardioid and cycloid.  
 Approximate integration e.g. Simpson's rule.  
 Leibnitz theorem;  $n$ th derivative of a product.  
 Easy cases of reduction formulae for integrals.  
 Elementary differential equations; variables separable;  $\frac{dy}{dx} + Py = Q$ , where  $P$  and  $Q$  are functions of  $x$ ;  $a \frac{d^2y}{dx^2} + b \frac{dy}{dx} + cy = 0$ , where  $a$ ,  $b$  and  $c$  are constants.  
 Shearing stress and bending moment.  
 The use of the principle of virtual work.  
 The uniform catenary.  
 Linear motion in a resisting medium.  
 Radial and transverse components of velocity and acceleration. Tangential and normal components of acceleration of a body moving under constraint.  
 Two dimensional motion of a rigid body. Impulse, momentum and energy applied to rods, cylinders and spheres. Instantaneous centre of rotation.  
 The examples on the above syllabus will be designed to test the understanding of principles rather than the ability to carry out intricate calculations.

## 45. MUSIC

### ORDINARY LEVEL

The examination will consist of: Aural Tests ( $\frac{3}{4}$  hour); Rudiments, Melody and Harmony (3 hours); Musical History and Set Works (2 hours).

#### *Paper I. Aural Tests*

The examination will be conducted by the music teacher (or the examiner at a University centre) and will consist of the following tests.

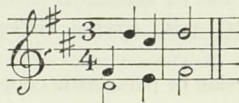
Candidates must write from dictation:

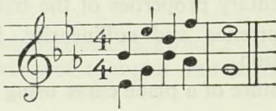
(a) Two simple rhythms in any of the following times: 3/4, 4/4 or 6/8. The passages will be played as melodies to the candidates, who will be required to write the rhythms on a monotone. Each test will be played five times.

The time signature must not be stated.

(b) Two simple melodies (one major and one minor) of not more than four bars, in 3/4, 4/4 or 6/8 time, with no syncopation in the first two bars. The key and time signature will be stated; each passage will be played five times and the tonic chord sounded before each time.

(c) Two simple passages of: (i) 4 intervals (no passing notes) making up two bars of 3/4 time in any simple major key; (ii) 5 intervals forming two bars of 4/4 time with the same limitations. In each case the passage will be played four times. The key and time will be stated and the tonic chord played before each time.

e.g. (i) 

(ii) 

(d) The names of perfect, imperfect, interrupted or plagal cadences in major or minor keys. Each cadence will be preceded by the tonic chord, and played twice. The tonic chord will be sounded before each playing of the test. Candidates will be required only to name the cadences, not to write them in musical notation.

(e) The names of the chords in root position or inversion (as tonic, dominant, etc.) in a short passage of not more than five chords. Each passage will be preceded by the tonic chord, and played five times. The tonic chord will be sounded before each repetition of the test. Only the diatonic triads of the scale and their inversions and the chord of the dominant seventh in root position will be included. Candidates will be required to give only the names of the chords and their inversions, and not to write them in musical notation.

### *Paper II. Rudiments, Melody and Harmony*

1. *Rudiments.* Candidates will be required to have a general knowledge of the rudiments of music, including:

(a) The addition of rests to incomplete bars

(b) The formation of major and minor scales; key signature and technical names of degrees of the scale

(c) Diatonic and chromatic intervals and their inversions

(d) Simple ornaments in common use; the appoggiatura, acciaccatura, mordent, turn and trill

(e) Simple and compound times, with time signatures

(f) Barring an unbarred passage

(g) Musical terms in common use

(h) Transposition of a melody with no key signature up or down a specified interval, stating the key of the original and the key of the transposed version

(j) Transcription of a short passage written in the G and/or F clef for voices (alto and tenor) or for strings (viola or violoncello) into the appropriate C clef or clefs – and vice versa.

2. *Melody.* Simple phrase formation, modulation to the dominant or to the relative major or minor key. Candidates will be required to complete either a melody in specified key to a given stanza of poetry, or a melody of which the opening is given. Phrasing and directions for performance must be shown. The complete melody or setting should be approximately 8 to 10 bars in length.

### 3. *Harmony.*

Candidates will be required:

(a) To write a melody above or below a given one in any key containing not more than 2 sharps or 2 flats: the part added must keep within the compass of the voice named, and may be mainly note against note with an occasional passing note.

(b) To show a knowledge of the following chords in any key containing not more than 2 sharps or 2 flats: *Chords in Root Position*, Major I, II, IV, V, VI, Minor I, IV, V, VI; *Chords (or Triads) in their First Inversions*, Major and Minor, I, II, IV, V, VI, VII; Dominant 7th in root position, and the second inversion of the tonic chord at a cadence point (i.e., cadential six four).

Questions in harmony may include:

(a) The harmonisation of a simple melody in four parts in a major key only

(b) The addition of three parts above a short unfigured bass; harmonisation

in a minor key will be limited to approaches to cadences, such fragments to consist of four chords each.

(c) The writing of specified chord progressions, or of cadences in four parts-

*Paper III. Musical History and Set Works*

Candidates must have a knowledge of the works and of the historical position and importance of the following composers, with special reference to the branch of music indicated. They will also be required to show a detailed knowledge of the set parts of the work or works named and must be prepared both to quote and to identify important themes (of which a choice will be given) from the chosen portions of the particular works given below.

One item must be prepared from each of the following three sections:

*Vocal* Purcell: Dido and Aeneas, Acts I and II, Vocal score ed. Dent (O.U.P.)

*Instrumental*: Beethoven: String Quartet in C Minor Op. 18 No. 4—1st movement only.  
Domenico Scarlatti: Sonatas in D major and G minor (Nos. 5 and 6 from Augener Edition\* No. 5900A)

*Orchestral*: Haydn: Symphony No. 101 in D (The Clock)—1st and 3rd movements only  
Elgar: Concerto for violoncello and orchestra, Op. 85—3rd and 4th movements only

A general knowledge of the form of these particular works will be expected but no detailed bar-by-bar analysis.

## ADVANCED LEVEL

The examination will consist of two papers, each of 3 hours, an aural test of fifty minutes and a practical test.

*Paper I. Harmony and Free Counterpoint*

Candidates will be required to show a competent knowledge of all diatonic triads, the dominant seventh and supertonic secondary seventh (with the available inversions of those chords), suspensions, passing notes, and auxiliary notes (accented and unaccented, diatonic and chromatic), and simple modulation to the closely related keys.

The tests under this heading may include:

- (i) The continuing of a melody of not less than eight, and not more than sixteen, bars in all, the opening of which will be given. The melody must modulate at least once, and return finally to the original key
- (ii) The addition of a melodious part to a given treble or bass
- (iii) Three-part free counterpoint in imitative style, for voices or instruments, one of the extreme parts being given, and an opening suggested
- (iv) The harmonisation of a melody or a bass in four parts, vocal or instrumental, modulation to be included.

Open score with C clefs will be required for at least one question.

*Paper II. Musical History, Repertory and Form*

1. *Musical History*. There will be three set periods:

- (a) 1550 – 1750
- (b) 1750 – 1830
- (c) 1830 – 1930

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\*The edition of the Scarlatti Sonatas is given so that they may be identified, and is not compulsory. Any good edition may be used.

Three questions will be set on composers and their works in each period. Candidates must answer three questions chosen from the nine set, but not more than two may be taken from any one period.

The limiting dates of the periods must not be taken too rigidly; candidates will be expected to have some knowledge of the years before and after the periods chosen and to show by brief musical quotations their detailed knowledge of relevant works.

2. *Repertory*. Detailed study of both the following prescribed works:

Brahms: Symphony No. 4 in E Minor, Op. 98

Vaughan Williams: Sea Symphony.

3. *Form*. Elementary questions based on the prescribed works.

#### *Aural Test*

The examination will be conducted by the music teacher (or the examiner at a University centre).

Candidates will be required to write from dictation:

(a) a rhythm without pitch

(b) a short melody of moderate difficulty

(c) a short and simple passage in two simultaneous melodic parts

(d) on treble and bass staves a short passage of four-part harmony which may include the use of:

common chords and their inversions

diminished triads (first inversion only)

cadential second inversions

the chord of the dominant seventh and its inversions and modulations.

The outer parts only need be written if the chords are described or if the bass is figured.

*Practical Test*. Candidates must have passed the Grade VI Examination (or higher Grade), in singing or on any keyboard or orchestral instrument, of the Associated Board of the Royal Schools of Music, the Trinity College of Music, the London College of Music or the Guildhall School of Music. Candidates for the Summer examination must have passed the Grade VI Examination not later than the preceding May, and those for the January examination not later than the preceding August.

Entries for the practical test must be made and fees paid direct to the individual Music examining bodies in accordance with their current Regulations. In addition, the entry must be indicated on the entry form submitted to the University. Details of the practical test passed must be given on a special form to be obtained from the University and returned not later than the last day for entry to the examination.

## 58. NAVIGATION

### ORDINARY LEVEL ONLY

There will be one paper of 2½ hours.

Terrestrial Sphere: Great circles, small circles, equator, poles, meridians, parallels of latitude. Latitude; difference of latitude. Longitude; longitude and time, departure and difference of longitude. Rhumb line. Nautical mile, geographical mile, cable; knot.

Earth's Magnetism: Magnetic poles and meridians; H, Z; Dip; Variation.

Magnetism of Ships: Magnetic effects of hard and soft iron. Deviation; effect of change of course and latitude on deviation (treated in a general way).

Magnetic Compass: Construction (brief description). Compass courses and bearings; conversion to true courses and bearings by application of variation and deviation; Deviation card.

Gyro Compass: (brief description).

Sailings: Plane sailing; parallel sailing. Rhumb line, Mid-latitude sailing, explanation of formulae. Meridional parts, difference of Meridional parts (D.M.P.); Mercator's sailing.

Chart Work: Mercator projection, brief description and advantages. Admiralty chart; how to read; standard chart abbreviations. Plotting and taking off positions. Laying off, and measuring bearing and distance from one point to another. Plotting ship's track, knowing times of alteration of courses and speeds. Bearings; transit, 4-point, angles on bow or quarter. Terrestrial position lines; method of transferring for ship's run. Sextant angles, vertical and horizontal, for fixing ship's position. Currents and tidal streams; set and rate; effect on course steered; drift; finding course to counteract effect. Use of a single astronomical position line.

Traverse Table: Working up ship's position. Finding course and distance from one point to another. Day's Work problems including correction of courses for current and tidal stream (but not for leeway).

Celestial Sphere: Poles, meridians, equator, ecliptic, equinox, Aries, Libra, Cancer, Capricorn, zenith. The solar system; Kepler's Laws; Earth's movement in space; aphelion; perihelion; Sun's apparent motion. Fixing positions of celestial bodies: declination, right ascension, sidereal hour angle; altitude and azimuth; observed, apparent and true altitudes; visible, sensible and rational horizons; corrections to be applied to sextant altitudes. Time: sidereal and solar time; mean Sun, equation of time; local time, apparent, mean and sidereal; zone time, G.H.A., S.H.A., L.H.A. The astronomical (PZX) triangle; zenith distance, polar distance, co-latitude, hour angle, azimuth. Navigational figure drawing. Position line navigation: theory; geographical position; circle of equal altitudes; finding position lines by observations of Sun or star; finding true azimuth by calculation or tables; fixing ship's position from two Sun position lines or position lines of two stars by calculation or by drawing on chart or graph paper. Amplitudes.

## 46. PHYSICS

### ORDINARY LEVEL

There will be one paper of 3 hours.

The treatment will be based on such experimental work as is usually done in schools, and will include simple examples from everyday life. Any calculations required will be direct and simple. Candidates may use a stencil for drawing apparatus.

#### *Mechanics*

Rectilinear motion: velocity and acceleration, uniformly accelerated motion, motion under gravity. Determination of  $g$  by any one simple method. The relation between force, mass and acceleration. Mass and weight.

Parallelogram and triangle of forces. Resolution of a force into two components. Conditions of equilibrium of forces in simple cases.

Moments. Centre of gravity: its experimental determination and its relation to stability. Work, energy and power. The conservation of energy. Machines. Principle of work. Mechanical advantage, velocity ratio and efficiency. Levers, wheel and axle, inclined plane, screw, single string pulley systems. Friction; coefficient of friction.

Fluid pressure and its transmission. Hydraulic press. Principle of Archimedes and applications. Flotation. The common hydrometer. Pressure of the atmosphere. Simple mercury and aneroid barometers. Boyle's law. The siphon, lift pump, force pump, bicycle pump and valve. Density and specific gravity and their experimental determination by simple methods.

### *Heat*

Temperature. Liquid-in-glass thermometers; structure and graduation. Scales of temperature. Maximum and minimum thermometers including the clinical thermometer.

Expansion of solids, liquids and gases. Effects and applications. Abnormal expansion of water. Coefficient of linear expansion and its measurement. Real and apparent expansion of a liquid and the measurement of the apparent coefficient. Pressure-volume-temperature relationship for an ideal gas. Determination of pressure and volume coefficients.

Quantity of heat. Determination of the specific heats of solids and liquids by the method of mixtures. Change of state. Determination of latent heats of fusion and evaporation. Melting, evaporation, boiling; the factors which affect them, Vapour pressure, unsaturated and saturated vapours. Water vapour in the atmosphere. Dew point and its determination.

Qualitative ideas of conduction, convection and radiation, including examples and applications.

Heat as a form of energy. Determination of the relation between the thermal and mechanical units of energy by a simple method.

### *Light*

Rectilinear propagation. Photometry and simple photometers. Laws of reflection. Formation of images by plane, concave and convex mirrors, including graphical construction and use of formulae. Determination of the focal length of a concave mirror.

Laws of refraction. Refractive index. Apparent depth. Total internal reflection and critical angle. Refraction by prisms (excluding the minimum deviation formula). Formation of images by converging and diverging lenses. Graphical construction and use of formulae for lenses. Determination of the focal length of converging lens. (Proofs of formulae for lenses and mirrors not required.)

Simple optical instruments: the eye, its simple defects and their correction (calculations are excluded), magnifying glass, simple camera, projection lantern, compound microscope, astronomical telescope.

Dispersion of white light by prism. Production of pure spectrum. Colour by absorption.

### *Sound*

The production and transmission of sound (no detailed consideration of wave motion). Reflection of sound, echoes. Characteristics of sound. Resonance. Experimental determination of velocity of sound in air. Experiments on the vibration of strings and columns of air.

### *Magnetism and Electricity*

Simple phenomena of magnetism. Methods of magnetising and demagnetising. Magnetic fields and neutral points (treated qualitatively). Magnetic properties of iron and steel. The magnetic field of the earth.

Simple phenomena of electrostatics. The gold leaf electroscope. The electro-phorus. Distribution of charge and potential. Action of points. Potential and capacitance. Condensers.

Magnetic effect of a current. Moving coil galvanometer, ammeter and voltmeter. Moving iron instruments. Potential difference. Ohm's law. Resistance and its measurement including metre bridge. Electromotive force; comparison by potentiometer.

Chemical effect of a current. Faraday's laws. Determination of electro-chemical equivalent. Primary cells and their defects.

Heating effect of a current. The kilowatt-hour. The hot wire ammeter.

Simple experiments to illustrate the phenomena and laws of electro-magnetic induction. Elementary treatment of the motor, dynamo, transformer, loud-speaker, telephone receiver, carbon microphone and diode.

### ADVANCED LEVEL

The examination will consist of two papers, each of 3 hours, and a practical examination of 3 hours. Candidates must satisfy the examiners in the practical as well as in the written part of the examination.

The syllabus is divided into two parts. Candidates are expected to cover the whole of Part I but not more than half of Part II. Each paper will contain two Sections with six questions in each Section. Paper I: the first Section will contain questions on Heat, Light and Sound from Part I of the syllabus. The second Section will contain one question on each of the paragraphs A, C, D, E, F and G in Part II in that order. Paper II: the first Section will contain questions on the rest of Part I syllabus. The second Section will contain one question on each of paragraphs B, H, I, J, K and L in that order. Questions set on the Part II syllabus may assume a knowledge of any part of the Part I syllabus. Candidates may answer six questions on each paper, but not more than five, or less than three, questions from the first Section.

Candidates will be expected to possess a knowledge of the topics dealt with in the Ordinary level syllabus in Physics.

Candidates will be expected to show an acquaintance with the relevant parts of Syllabus B of Pure Mathematics at Ordinary level, together with the formulae for the surface area and volume of a sphere; circular measure; trigonometrical functions of angles up to 360 degrees; graphs of  $\sin x$ ,  $\cos x$  and  $\tan x$ ; the limiting values of  $(\sin x)/x$  and  $(\tan x)/x$  when  $x \rightarrow 0$ ; expansion of  $\sin(A \pm B)$ ; the expansion of  $(1+x)^n$  where  $x$  is small; the straight line  $y=mx+c$ . Problems in which the use of the calculus is essential will not be set in the Advanced level Papers I and II.

Candidates will be expected to know something of the evidence on which laws and theories are based and wherever possible to have examined this in the laboratory. When the proof of a formula is not required the candidate should, in general, have followed through some form of the proof or an experimental check and be satisfied that the formula is a reasonable conclusion.

Electrical quantities will be quoted, where appropriate, in both C.G.S. and M.K.S. (rationalised) units.

## PART I

### *General Physics*

Momentum, conservation of momentum. Uniform motion in a circle. Meaning of moment of inertia. Angular motion, moment of momentum, kinetic energy. Simple harmonic motion. Simple pendulum. Law of gravitation (measurement of  $G$  not required). Determination of the acceleration due to gravity.

Elasticity: stretching of wires and helical springs, Hooke's law. Stress, strain, elastic limit. Experimental determination of Young's modulus. Work done in stretching a spring or wire.

Solid friction: laws, measurement of coefficients of static and dynamic friction.

Surface tension: definition in terms of force and work; pressure difference across a spherical interface; measurement using a balance and by the capillary rise method.

Fortin barometer. Structure of the beam balance.

Qualitative account of the kinetic theory of matter.

Units and dimensions of physical quantities (limited to  $M$ ,  $L$  and  $T$ ); use for checking equations.

### *Heat*

Temperature: definition of centigrade temperature on the scale of a specified property. Liquid-in-glass thermometers, gas thermometers. Other methods of measuring temperature, e.g., resistance thermometer, thermocouple (experimental details not required).

Quantity of heat: units, relation between joule and calorie, methods of measurement. Specific heats of solids, liquids and gases. Change of state and accompanying phenomena.

Expansion of solids, liquids and gases. The ideal gas. Isothermal and reversible adiabatic expansion of gases. Vapours. Dalton's laws of partial pressures.

Hygrometry. General principles of refrigeration.

Transfer of heat: conduction in solids, liquids and gases; convection, radiation. Measurement of conductivity of solids by Searle's bar and a disc method.

Newton's law of cooling.

### *Sound*

Production, propagation and characteristics of sound. Nature of wave motion. Progressive and stationary wave motion. Principle of superposition. Standing waves, interference, beats. Free and forced vibrations, resonance.

Velocity of waves in gases and along strings and rods, without proof of formulæ. Reflexion and refraction of sound. Echoes. Vibration of air column, strings. Measurement of velocity, wavelength and frequency. Doppler effect (qualitative treatment only).

### *Geometrical Optics*

Photometry, measurement of luminous intensity, cosine law. Reflection at plane and spherical surfaces, formation of images. Refraction at plane and spherical interfaces. Prisms and thin lenses (full formula required). Determination of refractive index of solids and liquids. Thin lenses in contact.

Chromatic dispersion. Emission and absorption spectra.

Simple optical instruments. Camera (including  $f$ -number), telescope, microscope, projector, spectrometer.

### *Physical Optics*

Simple treatment of wave theory of light; reflection and refraction at plane surfaces treated by Huygens' secondary wavelets. Interference; conditions for interference, Young's two-slit experiment.

Polarisation; production and detection of plane polarised light, uses of polarised light.

Properties of electromagnetic waves, the electromagnetic spectrum.

### *Magnetism and Electricity*

Simple phenomena of magnetism. Theory of magnetisation. Inverse square law; unit magnetic pole, strength of magnetic field, magnetic moment, representation of fields by lines of force. Comparison of magnetic fields and of magnetic moments. The earth's magnetic field, measurement of the horizontal component of the earth's magnetic field.

Simple phenomena of static electricity. Inverse square law; unit charge, electric field. Distribution of charge on a conductor. Potential. Capacitance. Condensers; condensers in series and parallel, energy of a charged condenser. Electroscopes; the use of electrometers. Van de Graaff machine.

Current electricity: magnetic field of a current; measurement of current by its magnetic effect, force on current-carrying conductors in a magnetic field.

Galvanometers. Work done by an electric current, heating effect of current; electromotive force, resistance, variation of resistance with temperature. Ohm's law. Wheatstone bridge. Potentiometer. Voltmeters, ammeters.

Electromagnetic induction; laws; self induction and mutual induction, unit of inductance. Alternating current, r.m.s. and peak values (proofs not required). Transformer. Simple treatment of electric motors and of a.c. and d.c. generators.

Electrolysis; Faraday's laws. Primary and secondary cells. Conduction of electricity through solids, liquids and gases.

Production and properties of cathode rays and X-rays, the electron, electron volt. The cathode ray oscillograph (excluding details of the time base). Simple descriptive account of the structure and action of the diode valve. Elementary descriptive account of the structure of the atom.

## PART II

### *General Physics*

A. Moment of inertia of a uniform rod about an axis at right angles to its length and of a disc about an axis through its centre at right angles to its plane. Rotation about a fixed axis. Compound pendulum.

(Proofs of formulae are not required in Papers I and II.)

B. Viscosity: definition, orderly and turbulent motion. Poiseuille's equation (proof not required), comparison of viscosities of liquids. Stokes' law, terminal velocity.

Surface tension: angle of contact. Jaeger's method. Measurement of pressure inside a soap bubble.

### *Heat*

C. Elementary account of temperature measurements by resistance thermometer, thermocouple and optical pyrometer.

First law of thermodynamics in the form  $\Delta Q = \Delta U + \Delta W$ . Difference between the principal specific heats of an ideal gas.

Radiation; Prévost's theory. The black body; Stefan's law. Distribution of energy in the spectrum of black body (or temperature) radiation and its variation with temperature.

D. Kinetic theory of gases: calculation of pressure exerted by an ideal gas; temperature and molecular kinetic energy. Ratio of, and difference between, the principal specific heats of an ideal gas, variation of  $\gamma$  with atomicity. Use of the equation  $pV^\gamma = \text{constant}$ . Definition of bulk modulus, elasticity of gas. Behaviour of real gases, ideas underlying van der Waals' equation. Liquefaction of gases.

#### *Sound*

E. Elementary mathematical treatment of simple harmonic progressive and stationary waves. Doppler effect in sound and optics.

Determination of frequency by stroboscopic method. Intensity, intensity level and loudness, bel and phon. Simple acoustics of halls. Principles of recording and reproduction of sound.

#### *Optics*

F. Measurement of velocity of light by one terrestrial method. Measurement of illumination; the photo-cell. Doppler effect in sound and optics.

Achromatic combination of two thin lenses in contact. Telescopes; effects of size and object glass, eye-ring. Microscopes: significance of numerical aperture, oil immersion. *Meaning* of resolving power.

G. Interference: air wedge and Newton's rings. Colours of thin films (proof of formula not required in Papers I and II). Nature of diffraction; simple illustrative experiments, transmission grating, measurement of wavelength. Nature of light, photoelectric effect, photons.

#### *Electricity and Magnetism*

H. The properties and uses of ferromagnetic materials. Intensity of magnetisation, magnetic induction, susceptibility, permeability. One method of finding the relation between magnetising field and intensity of magnetisation (or magnetic induction), hysteresis. Magnetic behaviour of para- and diamagnetic substances.

I. Characteristics of ballistic galvanometer and its use (i) with search coil, (ii) for comparison of capacitances. Use of Weston cell. Measurement of a small (e.g., thermoelectric) e.m.f. with potentiometer. Instruments for measuring alternating currents and potential differences.

J. Calculation of self and mutual inductance in simple cases. Simple quantitative treatment of a.c. circuits; reactance, impedance, power factor; series circuit containing resistance, inductance and capacitance. Choking coil.

K. Experimental determination of  $e$  and  $e/m$ . Thermionic emission; use of diode as rectifier and of triode as detector, amplifier and oscillator.

#### *Atomic and Nuclear Physics*

L. Simple treatment of radioactivity. Geiger counter. The structure of the atom: electron orbits and shells. Constituents of the nucleus: proton and neutron. Atomic number and mass number, isotopes. Mass and energy, nuclear reactions. Nuclear fission and fusion.

#### *Practical Examination*

Exercises will be set involving the use of apparatus commonly found in physical laboratories in schools working at the Advanced level. They will

be restricted to such of the topics in Part I of the syllabus as may reasonably be made the subject of experimental work in school laboratories. The following are excluded: platinum resistance thermometer, photo-cell, polarimeter, dip circle, electroscopes and electrometers, use of Kohlrausch bridge, measurement of inductance, electrical experiments with motors, generators, a.c. ammeters and voltmeters.

*A Special paper will be set in this subject; see Regulation III (page 4).*

## 47. PHYSICS WITH CHEMISTRY

### ORDINARY LEVEL ONLY

This subject may not be taken by candidates taking Physics, Chemistry or General Science.

There will be two papers, each of 1½ hours. Paper I, on Physics, will contain nine questions and Paper II, on Chemistry, will contain seven: candidates must answer four questions from each paper. The questions will be of a direct and elementary character, and, for the most part, descriptive. Calculations, except those of the simplest kind, will be avoided.

#### Paper I: PHYSICS

*Mechanics:* Rectilinear motion: velocity and acceleration, uniformly accelerated motion, motion under gravity. The relation between force, mass and acceleration. Mass and weight.

Work, energy and power. The conservation of energy. Levers.

Moments. Centre of gravity and its experimental determination in simple cases. Its relation to stability.

Fluid pressure and its transmission. Principle of Archimedes and applications.

Flotation. The common hydrometer. Pressure of the atmosphere. Simple mercury barometer, Boyle's law. The bicycle pump and valve, lift pump, force pump, siphon.

Density and specific gravity; their experimental determination by simple methods.

*Heat:* Temperature. Liquid-in-glass thermometers. Centigrade and Fahrenheit scales. Determination of fixed points. Maximum and minimum thermometers. The clinical thermometer.

Expansion of solids, liquids and gases. Effects and applications. Peculiarity of water. Coefficient of linear expansion and its measurement. Pressure-volume-temperature relation for an ideal gas (experimental determination of pressure and volume coefficients not expected).

Quantity of heat. Determination of the specific heats of solids and liquids by the method of mixtures. Change of state. Melting, evaporation, boiling. Determination of latent heats of fusion and evaporation. Water vapour in the atmosphere. Humidity, Dew point. The wet and dry bulb hygrometer.

Qualitative ideas of conduction, convection and radiation, including examples and applications, e.g., the vacuum flask.

Heat as a form of energy. Simple ideas on the transformation of energy. The relation between the thermal and mechanical units of energy.

*Light:* Rectilinear propagation: shadows, pin-hole images. Laws of reflection. Formation of images by plane and concave mirrors, including graphical constructions and use of formulæ. Determination of the focal length of a concave mirror.

Laws of refraction, refractive index. Simple graphical constructions. Determination of refractive index by ray plotting and 'apparent depth'. Total internal reflection. Uses of right-angled prisms. Converging and diverging lenses. Formation of images by converging lenses, including graphical constructions and use of formulæ. Determination of the focal length of a converging lens.

The simple magnifying glass. The eye; simple defects and their correction treated qualitatively.

Dispersion of white light by a prism. Production of a pure spectrum.

*Sound:* Production of sound by vibrating bodies. Transmission of sound. Necessity for a material medium. Propagation and characteristics of sound. Determination of velocity of sound in free air.

*Magnetism and Electricity:* Simple phenomena of magnetism. Methods of magnetising and demagnetising. Magnetic properties of iron and steel. Mapping magnetic fields. The magnetic field of the earth. The meaning of declination and dip. Simple phenomena of electrostatics. Charging by contact and induction. Conductors and insulators. The gold leaf electroscope. Distribution of charge. Elementary ideas of potential and capacity. Condensers. Magnetic effect of a current. Moving coil galvanometer. Potential difference and resistance. Ohm's law; ampere, volt, ohm. Use of ammeter and voltmeter. Measurement of resistance by ammeter and voltmeter, and by substitution. Chemical effect of a current. Primary cells. Local action, polarisation. Daniell, Leclanché and dry cells.

Heating effect of a current. The hot wire ammeter. The kilowatt-hour. Calculation of cost of electrical supply.

Simple experiments to illustrate the phenomena of electro magnetic induction.

## Paper II: CHEMISTRY

Classification of matter. Solubility and its determination. Methods of separation and purification by solution, filtration, crystallisation, distillation and sublimation. Physical and chemical change. Types of chemical change.

Conservation of matter. Elements, compounds and mixtures. Law of constant composition. Atoms and molecules. Symbols, formulæ and equations. Simple numerical exercises based on gravimetric relations expressed in formulæ and equations.

Experimental study of air. Simple methods for determining the percentage of oxygen in air. Isolation of nitrogen and oxygen. Preparation and reactions of oxygen. Oxides: preparation and classification.

Experimental study of water. Gravimetric composition. Action of water on sodium and calcium, and of steam on heated iron and carbon. Water of crystallisation. Deliquescence and efflorescence. Preparation, reactions and uses of hydrogen.

Metals and non-metals. Acids, bases and salts. Simple examples of oxidation and reduction.

Experimental study of the chalk-lime-carbon dioxide relationship. Hard

waters, and their reactions with soap, soda, slaked lime and permutite, and when heated.

Carbon. Allotropy. Oxides. Carbon and carbon monoxide as fuels and reducing agents. Carbonates and bi-carbonates.

Chlorine. Common salt and chlorides of calcium and iron. Preparation, reactions and uses of hydrochloric acid and chlorine.

Sulphur. Allotropy. Oxides. Sulphurous and sulphuric acids. Sulphates of calcium, barium, zinc, copper, sodium and ferrous iron. Preparation and reactions of hydrogen sulphide.

Nitrogen. Preparation from air, ammonia, or oxides of nitrogen. Preparation and reactions of nitric acid, and nitrates (of sodium, potassium, lead and copper); of the three common oxides of nitrogen; and of ammonia, and ammonium compounds (hydroxide, chloride, nitrate and sulphate).

The properties of, and simple tests for oxygen, hydrogen, chlorine, hydrogen chloride, hydrogen sulphide, water, carbon dioxide, sulphur dioxide, ammonia and ammonium salts.

Simple chemical tests for carbonate, chloride, sulphate, sulphite, sulphide and nitrate.

The general characteristics of metals illustrated by:

Calcium. Oxide and hydroxide. Carbonate and bicarbonate. Chloride, nitrate and sulphate.

Sodium. Combustion in air and in chlorine. Preparation and reactions of hydroxide, carbonate and bicarbonate. Sulphate and bisulphate.

Copper. Cupric oxide and sulphate: preparation, reactions and uses.

Iron. Rusting. Ferrous sulphate. Oxides and chlorides of iron.

Simple chemical tests for iron (ferric) and copper. Flame tests for sodium, potassium and calcium.

Electrolysis of acidulated water with platinum electrodes, of copper sulphate solution with copper electrodes and of sodium chloride solution with carbon electrodes. Simple explanation in terms of ions.

The simple chemistry of the production of hydrogen, oxygen, nitrogen, ammonia and nitric acid, baking soda, caustic soda, pig iron and steel, lime and sulphuric acid (by the Contact Process).

## 48. RELIGIOUS KNOWLEDGE

### ORDINARY LEVEL

There will be one paper of 2½ hours.

Candidates must answer questions from two of the sections (1) to (8), of which one must be (1), (2), (3) or (4). Six questions will be set in each section. Candidates must answer five in all choosing two from each of two sections, and the fifth from either of the two selected.

The paper on Biblical Books will contain questions to test the candidates' knowledge of introductions, contents and interpretations of the books. The Revised Version of the Old Testament, of the Apocrypha, and of the New Testament will be used: the Authorised and Knox Versions will be quoted where necessary.

(1) Old Testament History and Religion. Questions will be set on the following three periods: (i) The early historical and religious traditions of the

Hebrew people (Genesis 1-4 v. 15; 6-9 v. 17; 11 v. 1-9; 11 v. 27-12 v. 5; 15; 18 v. 1-15; 21 v. 1-8; 22 v. 1-19; 25 v. 19-34; 27; 28 v. 10-22; 29 v. 1-30; 32 v. 24-32; 37; 40-47 v. 27. Exodus 1-3; 6 v. 1-13; 12; 14; 17 v. 1-7; 19-20 v. 21; 34 v. 1-28. Deuteronomy 34); (ii) History of the Northern and Southern Kingdoms from the death of Solomon to the captivity of Judah (I Kings, 12-end, II Kings), with reference to Amos 1-8, Isaiah 1-7, 28, 30, 31, Jeremiah 1-3, 5-7, 19-23, 26, 28, 31, 34-39; (iii) The Captivity and Return, with reference to Ezra, Nehemiah, Jeremiah 29, Ezekiel 2, 3, 33, 34, 36, 37, Isaiah 40-42, 45, 49-55, Haggai. Attention should be given to the chief features in the teaching of the prophets, and to social and religious conditions. Candidates may select questions from any one period or from two consecutive periods.

(2) New Testament: the life and teaching of Jesus according to the Synoptic Gospels.

(3) New Testament: prescribed books in Greek.\* Candidates will be required to answer a question on the subject-matter of the prescribed book.

(4) The history of the early church as recorded in the Acts of the Apostles.

(5) The religious and ethical teaching of the Apocrypha with reference to the following passages: questions on purely historical matters will not be set in this section.

I Esdras, 3 and 4.

Tobit, 1-3 v. 6; 4-5 v. 16; 6 v. 1-8; 12-14 v. 2.

Wisdom, 1-6; 9-12 v. 2.

Ecclesiasticus, Prologue, 1; 2; 4; 6; 8; 10 v. 1-5; 14; 17; 24; 25 v. 1-12; 27; 28 v. 1-12; 32; 35; 36 v. 1-17; 38; 41 v. 1-4; 42 v. 15-44 v. 15; 51.

Baruch.

Song of the Three Children.

Bel and the Dragon.

Prayer of Manasseh.

I Maccabees, 1 v. 11-15, 41-50, 51-64; 2 v. 1-28; 3 v. 16-22; 4 v. 52-59; 14 v. 4-15.

(6) Prayer Book. Questions will be set to test the candidates' knowledge of the Church Catechism (full text and explanations), with Morning and Evening Prayer, Confirmation Service and the Service of Holy Communion.

(7) Church History from A.D. 70 to A.D. 325.

(8) Jewish History from 200 B.C. to A.D. 70.

*The Westminster Abbey Service Committee has provided a fund for the annual award of a book prize, to be known as the 'Westminster Abbey Service Prize', to the candidate who submits the best work in Religious Knowledge at the Ordinary level in the Summer examination, and who is taking the examination at a school within thirty miles of the Senate House. The Frederic David Matthew Prize of books (chosen by the candidate and approved by the University) is awarded to the candidate at school who submits the best paper in sections (1), (2), (4) or (5) at the Summer examination.*

## ADVANCED LEVEL

There will be two papers, each of 3 hours.

The Revised Version will be used and the Authorised and Knox Versions quoted where necessary.

Jewish candidates may offer a second section from Paper I instead of Paper II provided that notice of their intention to do so is given at the time of entry for the examination.

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\* Summer 1966 and January 1967, New Testament in Greek. Luke XVIII-XXIV. For the purpose of setting questions the examiners will use the edition of the Greek New Testament by A. Souter published by the Oxford University Press.

*Paper I. Old Testament.* One of the following sections:

- (a) An outline of the history and religion of the Hebrews from the earliest times to the close of the period of the Judges, with special attention to the books of Joshua and Judges.†
  - (b) An outline of the history and religion of Israel from the rise of the monarchy to the exile (586 B.C.), with special attention to the books of Hosea and Jeremiah.†
  - (c) An outline of the history and religion of Israel from the exile (597 B.C.) to the close of the historical and prophetic writings of the Old Testament, with special attention to the books of Malachi, Isaiah Chs. 56-66, Jonah and Daniel.†
  - (d) Selections from Wisdom literature; Proverbs, Job, Ecclesiasticus, Wisdom.
- Questions set on prescribed books will deal with matters of Introduction as well as the contents of the books.

*Paper II. New Testament.* One of the following sections:

- (a) The Synoptic Gospels
- (b) The Gospel and Epistles of John
- (c) Greek Testament. Text and Introduction to the Gospel of St. Mark
- (d) The life and work of St. Paul in the Acts of the Apostles together with 1 and 2 Corinthians and Galatians.

Questions set on Sections (a), (b) and (d) will deal with matters of Introduction as well as the contents of the books.

*A Special paper will be set in this subject; see Regulation III (page 4).*

## 49. RUSSIAN

### ORDINARY LEVEL

Syllabus as for French and Italian (*See page 49*).

### ADVANCED LEVEL

The examination will consist of three written papers and an oral test, and may be taken at the Summer examination only.

*Paper I* (1½ hours). Unprepared translation into English from Russian.

*Paper II* (2½ hours). (a) Translation into Russian of two continuous prose passages, one of which will be designed to test more particularly the candidates' command of accidence and syntax.

(b) Essay in the language on a general subject, six topics to be set.

Candidates must satisfy the examiners in Papers I and II taken together.

*Paper III* (3 hours). Prescribed books. Questions on the text and subject-matter of the literature studied. The following books are prescribed for Summer 1966.

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† These books will alternate annually with others which will be prescribed for the Summer 1967 and January 1968 examinations.

*For detailed study. Any two of the following:*

1. Pushkin: Tales of Belkin (Blackwell), Metel', Vystrel, Baryshnyakrest'yanka.
2. Turgenev: Asya.
3. Russian Poetry Reader I (ed. Lavrin, Blackwell), the poems of Pushkin.
4. Kuprin: How I became an Actor.
5. Chekhov: Dyadya Vanya (Bradda Books).
6. Tolstoy: Detstvo, Chapters 1-3, 13-16, and 21-28 (Bradda Books).
7. Lermontov: Demon (Bradda Books).

*For general study. Any two of the following:*

8. Gogol': The Inspector General (Pitman).
9. Pushkin: Evgeniy Onegin, Chapter I (Bradda Books).
10. Russian short stories of the 19th century (ed. Coulson and Duddington) (Oxford Univ. Press).
11. Griboyedov: Gore ot uma (ed. Costello) (Oxford Univ. Press).
12. Pushkin: Boris Godunov (ed. Segal) (Pitman).
13. Turgenev: Fathers and Sons (ed. Sands) (Cambridge Univ. Press).
14. Yevtushenko: Selected Poetry, Nos. 2, 7, 11, 22, 25, 26, 31, 35, 37, 39, 41, 42, 50, 55, 57, 59, (Pergamon Press).

*Oral Test comprising:*

- (1) Dictation given by the examiner.
- (2) Reading at sight a passage of some twenty lines supplied by the examiner.
- (3) Conversation with some reference to the books studied.

*A Special paper will be set in this subject; see Regulation III (page 4).*

## 59. SEAMANSHIP

### ORDINARY LEVEL ONLY

There will be one written paper of 2½ hours and a practical examination.

#### *Written Paper*

The written paper will comprise four sections, and candidates must answer six questions, two from Section A, two from Section B, and one from each of Sections C and D.

#### *Section A—Instruments and navigational aids.*

The Sextant. Light; the laws of reflection at plane surfaces; the deviation of a ray of light by a rotated mirror. The vernier; theory and construction; reading a vernier on and off the arc. The adjustments of a sextant. Taking vertical and horizontal angles.

The Standard Marine Barometer. Atmospheric pressure. Units of pressure, the bar and millibar. Errors of capillarity and capacity. Corrections for latitude, temperature and height. Principle and use of barometer.

The hydrometer. Density, specific gravity. Archimedes' principle, buoyancy and displacement. Principle and use of hydrometer. The load line markings, fresh water allowance. Draught markings.

The hygrometer. Water vapour, saturation, relative humidity, dew point. The principle and use of hygrometer in forecasting weather, and in ships' holds.

Sounding machines. Water pressure. Principle and use of Kelvin patent sounding machine. Boyle's Law. Speed of sound in air and water. The principle of echo sounding, the supersonic echo sounder; magnetostriction, transmitter, receiver; the electrolytic recorder. Errors caused by changes in sea temperature and salinity. Hand lead and line: markings.

The Compass. Boxing compass in points. Quadrantal and 360° notations. Relative bearings and compass bearings. Dry card and liquid compasses.

Logs. The rotator log, principle, streaming, housing, care and maintenance. The log ship; Dutchman's log.

### *Section B*

Stresses and tensions in cargo gear. Composition and resolution of forces. Simple applications of parallelogram and triangle of forces for finding stresses and tensions in spans, topping lifts, derricks, masts, stays and guys. Mechanical advantage in pulleys and purchases used to advantage and disadvantage. Approximate formula to allow for friction when lifting. Breaking, proof, and safe working loads for manilla and wire rope, and chain. The names of different types of purchases. Rigging of masts and derricks.

The Ship. Names of parts of ship; beams, frames, floors, bulkheads, shell plating, etc. The rolled sections used in ship construction. The stresses acting on a ship at sea; hogging, sagging, racking, panting, pounding and the parts of the ship counteracting these stresses. Methods of joining plates and frames: the merits of welding and riveting.

Simple sketches to illustrate the above.

Gross, nett, and deadweight tonnage.

Battening down of hatchways.

Windlass, anchors, chain cables, and fittings used in anchor work.

### *Section C—Boats and life saving appliances.*

Different types of boats. Boat construction. Hoisting, lowering, and stowage of boats, types of davits. Parts of a sail. Management of boats under oars, sail and power.

Lifejackets, lifebuoys, fire-fighting equipment, line-throwing apparatus.

### *Section D—The International Regulations for Preventing Collisions at Sea; knowledge of the Regulations and their application using models.*

Notices to Mariners relating to buoyage, caution approaching certain ports, single ships approaching squadrons, submarine warning signals, mine-sweepers, wreck dispersal vessels, wreck-marking vessels.

*Practical Examination*—Candidates will be tested, either individually or in small groups, in:

Boat work—management of boats under oars.

Rope work—knots, splices, and whippings in manilla rope; splices, seizings, worming, parcelling, and serving of wire rope.

Signals—International Code of Flags; meaning of single flag hoists, use of code book for coding and decoding.

Morse code; sending and receiving at four words per minute.

Semaphore; sending and receiving at six words per minute.

Instruments—Sextant; adjusting and observing.

Compass; observing and plotting a bearing.

Barometer; reading and applying corrections.

In addition, questions will be asked on 'Rule of the Road' and on any of the above (written) syllabus.

## 50. SPANISH

In writing Spanish, candidates may follow either the old rules for accentuation or the new rules published by the Royal Spanish Academy of Languages in 1953.

### ORDINARY LEVEL

Syllabus as for French and Italian (*See page 49*).

### ADVANCED LEVEL

The examination will consist of three written papers and an oral test.

*Paper I* (1½ hours). Unprepared translation into English from Spanish.

*Paper II* (2½ hours). (a) Translation into Spanish of two continuous prose passages, one of which will be designed to test more particularly the candidates' command of accidence and syntax.

(b) Essay in the language on a general subject, six topics to be set. The following books may be consulted by candidates who are interested in the cultural, social, historical or geographical aspects of Spanish life and an opportunity to show knowledge of this kind will be given in the essay subjects set.

J. B. Trend: *The Civilisation of Spain* (O.U.P.)

M. Romera Navarro: *Historia de España* (Harrap)

G. T. Northup: *Introduction to Spanish Literature* (Univ. of Chicago Press)

W. B. Fisher and H. Bowen Jones: *Spain* (Chatto & Windus)

W. C. Atkinson: *A History of Spain and Portugal* (Penguin)

G. Brenan: *The Literature of the Spanish People*.

Candidates must satisfy the examiners in Papers I and II taken together.

*Paper III* (3 hours). Questions on the text and subject-matter of the literature studied (Sections A, B and C) and on the period studied (Section D). Candidates must answer five questions including at least one question from Section A. One question only may be attempted from Section C, and one question from Section D.

#### *Section A: Golden Age Literature*

1. Spanish Lyric Poetry of the Golden Age (Bell)

2. *La vida de Lazarillo de Tormes* (Clásicos Castellanos or Manchester University Press)

3. Cervantes: *Novelas ejemplares*, Clásicos Castellanos II (Vol. 36): *El casamiento engañoso and Coloquio de Cipión y Berganza*

4. Lope de Vega: *Fuenteovejuna* (Austral).

#### *Section B: Modern Literature*

5. Miguel Delibes, *El camino* (Harrap)

6. Pedro de Alarcón: *El sombrero de tres picos* (Austral, Sopena or Harrap)

7. Gustavo Adolfo Bécquer: *Rimas y leyendas* (Austral)

8. García Lorca: *La zapatera prodigiosa* (Losada or Harrap)

9. Ortega y Gasset: *España invertebrada* (Austral)

10. J. Benavente: *Los intereses creados* (Austral)

11. Antonio Machado: *Poesías completas* pp. 76-166 ('Campos de Castilla'), (Austral)

12. Unamuno: *Abel Sánchez* (Austral or Crisol)

*Section C: Spanish American Literature.*

13. Rubén Darío: *Canots de vida y esperanza* (Austral)
14. Horacio Quiroga: *Cuentos de amor, de locura y de muerte* (Losada)
15. Rómulo Gallegos: *Cantaclaro* (Austral, or Losada)
16. Jorge Isaacs; María (Austral or Aguilar).

*Section D:*

Either (i) *Spain under Philip II* (1557-1598)

or (ii) *The Movement of South American Independence* (1792-1824).

The following books are recommended reading for Section D but are not prescribed:

- (i) R. Trevor Davies: *The Golden Century of Spain*  
J. H. Elliott: *Imperial Spain*  
W. H. Prescott: *A History of the Reign of Philip II*  
G. Marañón: *Antonio Pèrez*  
Garrett Mattingly: *The Defeat of the Spanish Armada*  
P. C. A. Geyl: *The Revolt of the Netherlands (1550-1609)*  
J. Lynch: *Spain under the Habsburgs Vol. I, Chapters 6-10*  
R. B. Merriman: *The Rise of the Spanish Empire, Vol. IV.*
- (ii) J. B. Trend: *Bolívar and the Independence of Spanish America*  
F. A. Kirkpatrick: *Latin America, a Brief History*  
W. S. Robertson: *History of the Latin-American Nations*  
W. S. Robertson: *The Rise of the Spanish American Nations as told in Lives of their Liberators*  
J. F. Rippy: *Historic Evolution of Hispanic America.*

*Oral test comprising:*

- (1) Dictation given by the examiner.
- (2) Reading at sight a passage of some twenty lines supplied by the examiner.
- (3) Conversation with some reference to the books studied.

*A Special paper will be set in this subject; see Regulation III (page 4).*

## 51. TECHNICAL DRAWING

### ORDINARY LEVEL

There will be two papers, each of 2 hours, and candidates must satisfy the examiners in both.

#### *Paper I*

##### *Plane and Solid Geometry*

Construction of scales, triangles, quadrilaterals and polygons: problems on circles, arcs and tangents, areas of plain figures: simple problems on loci, including paths of points in elementary linkwork.

Planes of projection: plans, elevations and simple sections; application to the prism, pyramid, cone and cylinder.

Isometric projection applied to common solids of elementary form.

#### *Paper II*

##### *Machine Drawing*

The making of scale drawings of machine or engine parts, including sections and new views: knowledge of parts such as nuts, bolts, studs and screws, simple castings, shaft bearings and couplings.

The drawings are to be prepared from given details of their component parts, or from drawings of the assembled machine or engine parts.

Freehand sketching of hand or machine tool or engine parts: sketches are to be made in good proportion using plans and elevations or isometric projection.

The recommendations of the British Standards' Institution on Engineering Drawing Practice B.S. 308A: 1964 must be followed for the preparation and dimensioning of drawings.

## ADVANCED LEVEL

There will be two papers, each of 3 hours, and candidates must satisfy the examiners in both.

### *Paper I*

#### *Plane Geometry*

Construction and properties of conic sections; special curves—cycloid, involute, evolute, envelope, spirals; problems on loci, including points on moving link-work.

#### *Graphical Statics*

Concurrent coplanar forces, non-concurrent coplanar forces. Bow's notation. Force diagrams. Simple frame structures. Centroids.

#### *Solid Geometry*

True length and slope of a line; point view of a line. Principal planes, auxiliary and oblique planes. True shape and slope of a plane. Projection of solids, including sections. Interpenetration of surfaces as applied to the cylinder, right cone, oblique cone, prisms and sphere. Development of surfaces. Isometric projection. Isometric scale.

#### *Freehand Sketching*

Production of sketches in good proportion without the use of mechanical aids. These should show orthogonal views of details such as fastenings, locking devices, keys, couplings, pipe joints, bearings, and simple machine elements, or views taken from a given drawing.

### *Paper II*

Preparation of scale drawings of machine and engine components in accordance with the Recommendations of B.S. 308A: 1964 Engineering Drawing Practice. Assembly drawings from details of given component parts. Drawings showing new views of a given component or assembly.

## 52. ZOOLOGY

### ADVANCED LEVEL ONLY

There will be two papers, each of 3 hours, and a practical examination of 3 hours.

Candidates must satisfy the examiners in the practical as well as in the written examination.

1. A study of the structure and of the elementary physiology of the rabbit.
2. The structure, mode of life and life-history of the following animals, to illustrate the general characteristics of animal organisation:

*Amoeba, Euglena, Paramecium, Hydra, Obelia*, the earthworm, the crayfish, amphioxus, the dogfish, frog and rabbit.

3. Elementary physiology; metabolism; nutrition (digestion, assimilation and food storage); respiration, excretion, movement, response to stimuli and reflex action; growth and reproduction. The differences between plants and animals.

4. The modifications of structure, habit, and life-history associated with parasitism (including the mode of transmission from host to host) as exemplified by *Monocystis, Trypanosoma*, the malarial parasite, the liver-fluke and the tape-worm.  
Symbiosis.

5. The principles of classification and nomenclature. A discussion of the systematic position of the animals mentioned in paras. 2 and 4 and of their place in their respective phyla, and of these phyla in the animal kingdom.

6. The structure of a cell. Cell division. The multi-cellular organism illustrating morphological differentiation and the division of labour. The essential characteristics of the following: epithelial tissues, connective and supporting tissues (including the process of ossification), blood and lymph, muscular tissues, nervous tissues.

7. Sexual and asexual reproduction. The chief types of ova. Gametogenesis. Fertilisation and cleavage. The germ layers and their formation in amphioxus, frog and chick. The development and metamorphosis of the frog. The development of the chick up to the end of the third day of incubation. The development and functions of the embryonic membranes of the chick and mammal.

8. Variation and heredity, including a simple treatment of the facts of genetics and nuclear cytology.

9. The evidence bearing on the occurrence of organic evolution. The theories of Lamarck and Darwin as to the method of evolution.

### *Practical Work*

*Observations on living animals should be made wherever possible. Candidates are expected to make adequate labelled drawings of all the preparations they examine and of all the dissections they make.*

(a) The dissection, or microscopical examination of whole mounts and sections, of the animals mentioned in paras. 2 and 4 (except the malarial parasite and *Trypanosoma*).

(b) The examination of the skeleton of the vertebrate types mentioned in para. 2, together with the skull of the dog.

(c) The examination of preparations representing the chief varieties of the tissues mentioned in para. 6.

(d) The examination of prepared sections of the following vertebrate organs: skin, stomach, intestine, liver, kidney, ovary, testis and spinal cord.

(e) The preparation of stained permanent mounts of suitable whole animals, parts of animals and tissues.

(f) A study of the external changes during the development of the frog from fertilisation to the end of metamorphosis.

(g) The examination of whole mounts of and representative sections through:

(i) The early stages of frog development to the time of the first appearance of the external gills.

(ii) Stages illustrating the development of the chick during the first, second and third days.

### Practical Examination

Candidates must be prepared to examine microscopically, to dissect and to describe specimens or parts of the animals† mentioned in paras. 2 and 4 in the foregoing syllabus and to determine the zoological position of specimens in accordance with para. 5.

Candidates must bring their original notebooks, certified by their teachers as being the record of the work carried out by the candidate in the laboratory, for inspection at the practical examination. These notebooks must be taken away by the candidates at the end of the examination.

Candidates may bring their own stains for use at the practical examination.

*A Special paper will be set in this subject; see Regulation III (page 4).*

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† The list of animals may be changed from time to time, but two years notice of any change will be given.

## MODERN EUROPEAN LANGUAGES

Other than French, German, Italian, Russian and Spanish (*q.v.*).

The attention of candidates is invited to Regulation IV (pp. 4-8).

### ORDINARY LEVEL

The examination will consist of one paper of 3 hours containing passages for translation from the language, a passage for translation into the language, and four subjects for free composition of which the candidate must treat one.

### ADVANCED LEVEL

In 101 Afrikaans, 109 Bulgarian, 113 Czech, 114 Danish, 115 Dutch, 121 Modern Greek, 127 Hungarian, 130 Irish, 138 Norwegian, 142 Polish, 143 Portuguese, 144 Rumanian, 147 Scottish Gaelic, 148 Serbo-Croat, 153 Swedish and 159 Welsh, the examination will consist of two written papers, each of 3 hours.

*Paper I.* (a) Unprepared translation into English from the language (1 hour).

(b) Translation of two continuous prose passages, one of which will be designed to test more particularly the candidates' command of accidence and syntax (1 hour). (c) Essay in the language on a general subject, six topics to be set (1 hour).

In order to pass at the Advanced level, candidates must pass in Paper I.

*Paper II.* Questions on the text and subject-matter of the literature studied.

*The list of prescribed books in these subjects may be obtained from the Secretary.*

In Serbo-Croat candidates may use either the Cyrillic script (for Serbian) or the Latin script (for Croat) provided that they are consistent.

In 102 Albanian, 150 Slovak and 151 Slovene the syllabus will be as follows:

Two papers, each of 3 hours, on the following syllabus:

Grammar. Translation into English. Composition: (a) translation from English and (b) some form of free composition.

Books will not be prescribed.

## ORIENTAL AND AFRICAN LANGUAGES

The attention of candidates is invited to Regulation IV (pp. 4-8).

### ORDINARY LEVEL

#### 104 Classical Arabic

There will be one 3-hour paper containing:

(a) Translation into English

(b) Pointing an unpointed passage

(c) Translation into the language (pointed)

(d) Translation into the language of sentences chosen to test grammatical knowledge.

### **124 Classical Hebrew**

There will be two papers, each of 2 hours.

*Paper I.* A paper on easy unprepared translation, grammar, and simple and easy sentences of English for translation into Classical Hebrew, and, as an optional alternative to such sentences, an easy continuous piece of English prose.

*Paper II.* A paper on prepared books, including questions on the language and subject-matter, and unspecified passages from the Hebrew Old Testament for translation.

For Summer 1966 and January 1967 the following books are prescribed: I Kings 16-22; Ruth.

### **125 Modern Hebrew**

There will be one 3-hour paper, containing:

- (a) Translation into English
- (b) Pointing an unpointed passage
- (c) Translation into the language (pointed)
- (d) Translation into the language of sentences chosen to test grammatical knowledge
- (e) Free composition (unpointed) on one of three subjects.

Candidates may use the modern cursive script, and may use Hebrew grammatical terminology where the English terminology is difficult of application.

Classical Hebrew and Modern Hebrew may not be taken at the same examination.

### **139 Pali and 146 Sanskrit**

There will be one 3-hour paper.

The paper will be drawn up as nearly as possible in conformity with the following syllabus:

- (a) an easy passage or passages for translation from the language; (b) an easy piece of translation into the language; (c) questions on grammar, limited to accidence and elementary syntax. Candidates must satisfy the examiners in each of the three sections of the syllabus.

### **Other Oriental and African Languages**

There will be one 3-hour paper, containing:

- (a) Translation into English
- (b) Translation into the language
- (c) Translation into the language of sentences chosen to test grammatical knowledge
- (d) Free composition on one of three subjects.

Candidates in Igbo are warned that they may be penalised if they do not use the official orthography, which is compulsory in the Summer examination.

## **ADVANCED LEVEL**

Except in the case of volumes of selections or anthologies, the editions of set texts given below are indicated only for the convenience of candidates. Any good edition may be used.

### 104 Classical Arabic

There will be two papers, each of 3 hours.

#### *Paper I: Arabic Language and Civilisation*

(a) Composition in Arabic, with a choice of themes, to test the candidate's ability to write good Arabic. The essay subject will be based on the candidate's reading in Islamic Civilisation.

Recommended books:

P. K. Hitti, *History of the Arabs*, and *The Arabs*.

(b) Grammar and Syntax. Three questions. A choice of questions will be given.

(c) A passage from a classical text for vocalisation comprehension and comment on grammatical phenomena.

Section (b) may be answered in English or in Arabic.

#### *Paper II: Arabic Literature*

(a) Pre-Islamic and Umayyad Literature. Choice of three questions.

(b) 'Abbasid Literature. Choice of five questions.

(c) Set Book: Tāhā Husain, *Hadīth al-Arbi'ā'*, vol 2, or 'A.M. al-'Aqqād: *Ibn al-Rūmī*.

(d) Unseen passage for translation into English and commentary.

Candidates must answer six questions in all, (d) being compulsory. At least one question must be answered from each section.

All questions in Paper II must be answered in English, but quotations in Arabic will be allowed.

### 106 Classical Armenian

There will be two papers, each of 3 hours.

*Paper I.* Translation from specified texts, with questions on their language and subject matter. Armenian history, 5th century A.D.

For Summer 1966 the text will be

Eliseus: History, chaps. I-III, pp. 5-165 (Venice, 1893).

*Paper II.* Translation from unspecified texts. Translation into Armenian. Grammar.

### 112 Classical Chinese

There will be two papers, each of 3 hours.

*Paper I.* (a) Translation from specified texts with questions on their language and subject matter: for the purpose of transcription Cantonese will be accepted as an alternative to National Language.

For Summer 1966 the texts will be

Y. C. Liu and W. Simon: *Fifty Chinese Stories*, London 1960, lessons 1-30 including parallel modern texts but not the parallel Kambun Japanese versions.

(b) Translation from unspecified texts.

*Paper II.* Translation into Chinese (National Language (Kuo Yü) will be accepted as an alternative to Literary Style.) Chinese history, A.D. 1837-1949.

### 123 Hausa

There will be two papers, each of 3 hours.

*Paper I.* Translation from specified texts, with questions on their language and subject matter.

For January 1967 the texts will be

Abubakar Imam: *Ruwan Bagaja* (Gaskiya Corporation, Zaria).

Abubakar Imam: *Magana Jari Ce*, Book 1, pp. 1-102 (Gaskiya Corporation).

*Paper II.* Translation from unspecified texts. Translation into Hausa. Questions on grammar.

#### 124 Classical Hebrew

There will be three papers, two of 3 hours and one of 2 hours.

*Paper I* (3 hours). (a) Prose composition; (b) Unprepared translation – two passages, one prose and one verse.

*Paper II* (3 hours). Translation from prescribed texts and questions thereon.

The following books are prescribed for Summer 1966: I Samuel 1-12, Isaiah 1-12, Psalms 40-60, Proverbs 1-9. The test will consist of translation, and questions on the subject matter and on grammar. Candidates may be asked to point a selected passage from one or other of the prescribed books.

*Paper III* (2 hours). Special period of Jewish History to be prescribed from time to time. For Summer 1966 the special period will be from Alexander the Great to the Fall of the Temple (A.D. 70). (The book recommended is Oesterley & Robinson, *A History of Israel*, O.U.P. 1932, Vol. II, chaps. 14-28.)

The use of square character with full pointing in writing Hebrew is compulsory.

*A Special paper will be set in this subject if requested by 1 October 1965. See Regulations III and IV (pp. 4-5).*

#### 132 Classical Japanese

There will be two papers, each of 3 hours.

*Paper I.* (a) Translation from specified texts, with questions on their language.

For Summer 1966 the text will be

Rose-Innes: *Japanese Reading for Beginners*, Vol. IV (Literary Style), pp. 1-100.

(b) Translation from unspecified texts.

(c) Questions on the Japanese language.

*Paper II.* (a) Translation into Japanese (Japanese script or Romanization).

(b) Questions on Japanese history, A.D. 1600-1868.

#### 139 Pali

There will be two papers, each of 3 hours.

*Paper I.* Translation from specified texts with questions on their language and subject matter. Grammar.

For Summer 1966 the texts will be

*Mahāvamsa*, chaps. 19-24 inclusive.

*Samyutta-Nikāya*, Kosala-samyutta and Māra-samyutta (P.T.S. ed., Vol. I, pp. 68-127).

*Paper II.* Translation from unspecified texts. Translation into Pali.

Candidates must use Roman script in writing Pali.

#### 141 Classical Persian

There will be two papers, each of 3 hours.

*Paper I.* Translation from specified and unspecified texts with questions on their language and subject matter.

For Summer 1966 the texts will be

Sa'di: *Gulistān*, chaps. I and II (without *Muqaddima*).

Ibn al-Balkhī: *Fārs-Nāma* (ed. G. Le Strange and R. A. Nicholson, Luzac, Great Russell Street, London, W.C.1, 1921), pp. 60-119.

*Paper II.* Translation into Persian. Grammar. Outlines of Persian history A.D. 813-1258.

(A. K. S. Lambton: *Persian Grammar* (C.U.P.) is recommended for the study of this paper.)

#### 146 Sanskrit

There will be two papers, each of 3 hours.

*Paper I.* Translation from specified texts with questions on their language and subject matter. Grammar.

For Summer 1966 the text will be

Lanman: *Sanskrit Reader* (O.U.P.), I-XXXIV (Selections from Nala, Hitopadeśa, Kathāsaritsāgara, Manu, Ṛgveda).

*Paper II.* Translations from unspecified texts. Translation into Sanskrit.

A satisfactory standard must be reached in each section of both papers. Importance is attached to Sandhi, and to the correct spelling of Sanskrit words, whether in Nagari script or in transliteration. Candidates may use either Nagari or Roman script when answering grammar questions or translating short sentences into Sanskrit, but in translating connected passages the Nagari script must be used.

#### 152 Swahili

There will be two papers, each of 3 hours.

*Paper I.* Translation from specified texts, with questions on their language and subject matter.

For Summer 1966 the texts will be

Harries L: *Swahili Prose Texts* (O.U.P. 1964).

Muhammed Saleh Farsy: *Kurwa na Doto* (Eagle Press).

*Paper II.* Translation from unspecified texts. Translation into Swahili, Questions on grammar.

#### 154 Turkish

There will be two papers, each of 3 hours.

*Paper I.* Translation from specified modern texts, with questions on their language and subject matter.

For Summer 1966 the texts will be

Reşat Nuri Güntekin: *Anadolu notlari* (Istanbul, n.d.).

*Paper II.* Translations from unspecified modern texts. Translation into modern Turkish. Grammar.

# EXAMINATION TIMETABLES

**Appendix A** shows the timetable for the Summer examination 1966 and **Appendix B** that for the January examination 1967.

In both examinations, morning papers are normally to begin at 9.30 and afternoon papers at 2, but schools may vary these times up to half an hour. The time allowed for each paper is three hours unless otherwise stated in the syllabus.

Regulation I (3) on page 3 provides for certain other adjustments.

Candidates may be allowed a break of not more than half an hour between the two papers in English Language.

The names of the mathematical subjects at the Advanced level do not appear on the timetables, but the times and dates of papers I to VI are shown and the subjects to which these relate are given in the syllabus.

## Notes to Appendix A

Papers in Art at the Advanced and Ordinary levels not included in the Timetable are to be taken at any time between 6 and 24 June when candidates are free. Tests in Art for some private candidates in London may be held after 24 June.

The arrangements for the oral and practical examinations will be made known later.

Special papers will be set on the morning of Wednesday, 25 May 1966.

## Notes to Appendix B

Papers in Art at the Advanced and Ordinary levels not included in the Timetable are to be taken at any time between 9 and 20 January. Tests in Art for some private candidates in London may begin in December 1966.

The arrangements for the oral and practical examinations will be made known later.

GENERAL CERTIFICATE OF EDUCATION EXAMINATION TIMETABLE, SUMMER 1966 APPENDIX A

	Morning		Afternoon		
	ORDINARY LEVEL	ADVANCED LEVEL	ORDINARY LEVEL	ADVANCED LEVEL	
Monday, 6 June		French I Classical Arabic I Classical Chinese I Norwegian I Polish I Portuguese I Scottish Gaelic I Serbo-Croat I Slovene I Swahili I		English Literature I Physics I Ancient History I Handicraft - Woodwork - Theory Domestic Subjects - Dressmaking - Practical Classical Arabic II Classical Chinese II Norwegian II Polish II Portuguese II Scottish Gaelic II Serbo-Croat II Slovene II Swahili II	
Tuesday, 7 June		French II Physics II Art (6), (7), (8) Logic I		Greek I Geography I Music (Dictation) Classical Hebrew I Handicraft - Metalwork - Theory	
Wednesday, 8 June		English Literature II Afrikaans I Albanian I Classical Armenian I Bulgarian I Czech I Danish I Dutch I Modern Greek I Hungarian I Irish I	Classical Japanese I Pali I Classical Persian I Rumanian I Sanskrit I Slovak I Swedish I Turkish I Welsh I	British Economic History I Botany I Biology I Classical Hebrew II Greek II Italian I Russian I	
Thursday, 9 June		Chemistry I Ancient History II German I British Constitution I		Geography II Art (4) Italian II Classical Hebrew III Russian II Afrikaans II Albanian II Classical Armenian II Bulgarian II Czech II Danish II Dutch II Modern Greek II Hungarian II Irish II	Classical Japanese II Pali II Classical Persian II Rumanian II Sanskrit II Slovak II Swedish II Turkish II Welsh II

Special papers will be set on the morning of Wednesday, 25 May

Friday, 10 June	Afrikaans Amharic Armenian Bahasa Indonesia Chinese Czech Danish Dutch Estonian Ewe Fante Finnish Ga	Gujarati Hindi Icelandic Igbo Japanese Norwegian Persian Siamese Swedish Turkish Twi Ukrainian Urdu Yoruba	English Literature III Art (5) Botany II Logic II	Albanian Bengali Burmese Hausa Hungarian Irish Latvian Lithuanian Malay Maldivian Maltese Marathi Navigation Nyanja	Pali Polish Portuguese Rumanian Sanskrit Scottish Gaelic Serbo-Croat Slovak Slovene Swahili Vietnamese Welsh White Russian	British Economic History II Italian III Russian III
Monday, 13 June	Commerce Greek Literature in Translation Seamanship – Theory		Mathematics I	Logic Art (4)		Geography III Ancient History III
Tuesday, 14 June	Music II Principles of Accounts		French III Biology II Zoology I British Constitution II	Additional Mathematics I Art (5) Modern Greek Classical Arabic		Greek III Mathematics II Handicraft – Metalwork – Practical
Wednesday, 15 June	Additional Mathematics II, III, IV Pure Mathematics A (4)		Chemistry II History I	Music I Music III		Mathematics III Handicraft – Woodwork – Practical
Thursday, 16 June	English Language I English Language II			Religious Knowledge Astronomy		History II
Friday, 17 June	History Ancient History British Economic History		History III Zoology II	Art (6) Geology		German II
Monday, 20 June	General Science Biology		German III Mathematics IV	Pure Mathematics A (1) Pure Mathematics – Syllabus B I		Religious Knowledge I Handicraft – Metalwork – Drawing Mathematics V
Tuesday, 21 June	French			Pure Mathematics A (2) Pure Mathematics – Syllabus B II		Latin I Mathematics VI
Wednesday, 22 June	Pure Mathematics A (3)		Latin II Handicraft – Woodwork – Drawing Domestic Subjects I – Theory	English Literature		Spanish I Religious Knowledge II Geology I
Thursday, 23 June	General Science II Physics Physics with Chemistry I		Music I Economics I	Geography I		Spanish II

*Special papers will be set on the morning of Wednesday, 25 May*

**GENERAL CERTIFICATE OF EDUCATION EXAMINATION TIMETABLE, SUMMER 1966** *(continued)*

	Morning		Afternoon	
	ORDINARY LEVEL	ADVANCED LEVEL	ORDINARY LEVEL	ADVANCED LEVEL
Friday, 24 June	Chemistry Physics with Chemistry II	Spanish III Economics II Music II	Geography II	Latin III
Monday, 27 June	Economics Classical Hebrew I Modern Hebrew Technical Drawing I	Technical Drawing I	Latin I Domestic Subjects – Needlework – Theory	Geology II Domestic Subjects II – Theory
Tuesday, 28 June	German Technical Drawing II	Technical Drawing II	Latin II Handicraft – Metalwork – Practical Handicraft – Embroidery – Practical	Domestic Subjects III – Theory
Wednesday, 29 June	Handicraft – Metalwork – Drawing Theory Handicraft – Embroidery – Design		Domestic Subjects – Cookery – Theory Russian	
Thursday, 30 June	Spanish Elementary Surveying – Theory Classical Hebrew II		Additional General Science Human Anatomy, Physiology and Hygiene Botany Rural Biology Handicraft – Woodwork – Practical	
Friday, 1 July	British Constitution Domestic Subjects – Needlework – Practical Elementary Surveying – Practical Greek I		Greek II Handicraft – Woodwork – Drawing Theory Handicraft – Embroidery – Theory Italian	

*Special papers will be set on the morning of Wednesday, 25 May*



**GENERAL CERTIFICATE OF EDUCATION EXAMINATION TIMETABLE, JANUARY 1967 APPENDIX B**

	Morning		Afternoon	
	ORDINARY LEVEL	ADVANCED LEVEL	ORDINARY LEVEL	ADVANCED LEVEL
Monday, 9 January	Approved Languages other than West African Classical Hebrew I	Latin I Classical Arabic I	Classical Hebrew II, Italian, Spanish, Russian	British Economic History I
Tuesday, 10 January	Latin I German	Latin II British Economic History II Music (dictation)	Music I and III Greek I Navigation	Geography III Art (4) Music I
Wednesday, 11 January	Latin II	Classical Arabic II Latin III Geology I	English Language I and II	History I Geology II
Thursday, 12 January	Ancient History British Economic History History Music II	Ancient History I History II Music II Physics I	French Greek II	Geography I Zoology I Technical Drawing I
Friday, 13 January	English Literature Seamanship	English Literature I Physics II Technical Drawing II	Art (4) Geology	History III Ancient History II Chemistry I
Monday, 16 January	Geography I	Hausa I English Literature II Mathematics I	Technical Drawing I Art (5)	Hausa II Chemistry II Greek I
Tuesday, 17 January	Pure Mathematics A (1) Pure Mathematics B (1)	Greek II Mathematics II Spanish I	Geography II	English Literature III Mathematics III Ancient History III
Wednesday, 18 January	Religious Knowledge Technical Drawing II	Religious Knowledge I Spanish II	Physics General Science I Physics with Chemistry I	Geography II Mathematics V German I                      Zoology II
Thursday, 19 January	Botany Biology General Science II	Botany I Art (5) Religious Knowledge II Spanish III	Physics with Chemistry II Chemistry Additional General Science	Biology I Greek III
Friday, 20 January	Pure Mathematics A (2) Pure Mathematics B (2) Human Anatomy, etc. Art (6)	Mathematics IV French I	Additional Mathematics I British Constitution	Mathematics VI Botany II German II

Monday, 23 January	Economics Woodwork - Practical	French II Biology II Economics I	Pure Mathematics A (3)	British Constitution I
Tuesday, 24 January	Additional Mathematics II, III, IV Pure Mathematics A (4) Domestic Subjects - Cookery and Needlework Theory Handicraft - Woodwork and Metalwork - Drawing and Theory	German III British Constitution II Art (6), (7), (8)	Astronomy	French III Economics II
Wednesday, 25 January	Metalwork - Practical Domestic Subjects - Needlework, Practical			

Papers in specially approved West African languages at Ordinary Level will be set on the afternoon of Monday, 2 January.



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