The Universities of Bristol, Exeter, Reading and Southampton




Southern Universities' Joint Board for School Examinations

General Certificate of Education 1966

REGULATIONS

AND

SYLLABUSES

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Oxford University Press

Education Department, Oxford

The Universities of Bristol, Exeter, Reading and Southampton

Southern Universities' Joint Board for School Examinations

General Certificate of Education 1966

REGULATIONS

AND

SYLLABUSES

The Southern Universities' Joint Board for School Examinations was established in 1954 *by agreement between the Universities of Bristol, Reading and Southampton, by which the Joint Board shall conduct and supervise school examinations on behalf of the Universities so as to continue the examinations conducted by the University of Bristol for the General Certificate of Education. In* 1956 *the University of Exeter joined the Board.*

The Board's Examination for the General Certificate of Education is approved by the Department of Education and Science, and the Board's certificates are endorsed by the Department.

CALENDAR FOR 1966

Applications for special notice papers and sections for the Summer Examination to be sent by	Oct. 1	1965

SUMMER EXAMINATION

Schools' subject entry forms and private study candidates' entry forms may be obtained on and after	1966 Jan. 3
Applications from schools, which have not previously taken the Board's examination, for recognition as examination centres (see Regulations 2 and 5) to be sent by	Jan. 31
Subject entry forms (see Regulation 5) to be sent by	Jan. 31
Private study candidates' entries at:	
Advanced level to be sent by	Feb. 14
Ordinary level to be sent by	Feb. 28
Withdrawals must be received by	April 1
Entry forms from schools to be sent by	April 1
Late entries (on payment of an additional fee) will be accepted until	April 15
Advanced level examination begins	June 13
Ordinary level examination begins	June 17

Results Advanced Level will be issued in the second week in August.
„ Ordinary Level „ „ „ „ „ fourth „ „ „

ORDINARY LEVEL WINTER EXAMINATION

Schools' subject entry forms and private study candidates' entry forms may be obtained on and after	Sept. 5
Subject entry forms from schools to be sent by	Sept. 19
Entry forms from Schools and private study candidates	Oct. 8
Late entries (on payment of an additional fee) will be accepted until	Oct 28
Winter examination begins	Nov. 21

Correspondence should be addressed to:

The Secretary,
Southern Universities' Joint Board for School Examinations,
22 Berkeley Square,
Bristol, 8.

All enquiries should be made in writing to the Secretary, and not to the constituent universities.

EXAMINATION TIME TABLES

Advanced Level and Special papers pages 113–114
Ordinary Level papers pages 115–117

* Special notice is required for this subject on or before October 1st.
† Special notice is required for certain Section or papers in this subject.
w Set in Winter Examination at O Level.

SPECIAL NOTICE SUBJECTS

Notice before October 1st in the year preceding the examination must be given by Schools if papers are required in the following subjects, or sections of subjects. A notification fee may be payable (see Fees, paragraph 10). Special notice cannot be accepted from unrecognised schools and private study candidates; on application in December they will be informed which special notice subjects, papers and sections of papers are being set.

Ordinary Level Papers	*Advanced Level and Special Papers*
History, Paper D	History II, (*b*) U.S.A.
Geography, Paper II (Sections F, G, H and I)	Geography, Paper III (Sections F, G and H).
	Woodwork.
Metalwork (iii) Sheet and hammered metalwork	Metalwork.
Art Papers II and III	Art Papers II and III.

(Notice of the chosen sections of Paper II and the Crafts in Paper III at Ordinary and Advanced Levels.)

Other Papers (See Regulations, paragraph 8).

OTHER SUBJECTS

Papers may be set by special arrangement on approved syllabuses proposed by recognised schools.

Applications must be made on or before January 1st in the year preceding the examination (see Regulations, paragraph 9).

N.B. Special Notice subjects and sections are NOT set in the Winter Examination.

REGULATIONS GOVERNING EXAMINATIONS FOR THE GENERAL CERTIFICATE OF EDUCATION

N.B.—Changes in the Regulations and Syllabuses for 1966 are indicated thus: |

EXAMINATIONS

1. Examinations for the General Certificate of Education shall be held annually at Ordinary and Advanced Levels in the summer. The majority of subjects at Ordinary Level will also be examined in the winter. (See Regulation 14.)
The oral examinations in modern languages in the summer will normally be completed before the first day of the written examinations. Those for unrecognised schools and for private study candidates may be held after the written papers. The oral examinations for the winter examination will be held after the written papers.

Practical examinations in Advanced level Sciences will be held after the completion of the written papers.

EXAMINATION CENTRES

2. The Examinations may be held in the Universities of Bristol, ~~Exeter, Reading, Southampton~~, or such other places as the Board may appoint. Schools which are recognised as efficient by the Department of Education and Science will normally be accepted as centres. (See Regulation 5.)
Schools which are not recognised as efficient by the Department may be accepted as centres with independent invigilators appointed by the Board. There will be an invigilation charge, and the school will also be responsible for invigilators' subsistence and necessary travelling expenses.
The Board cannot undertake to make arrangements for candidates to take the examination at another school; any such arrangements must be made directly between the Heads of the Schools concerned, and then submitted to the Board for approval.

PRACTICAL EXAMINATIONS IN ADVANCED LEVEL SCIENCES

3. The Physics, Biology, Botany and Zoology practical examinations for candidates from recognised schools will be held in the laboratories of those schools.
Practical examinations will be held in the laboratories of the University of Bristol for private study candidates and for candidates from unrecognised schools.

CONDITIONS OF ENTRY

4. Candidates must normally be not less than sixteen years of age on September 1st of the year of examination. A candidate whose sixteenth birthday falls on September 2nd is deemed to have attained the age of sixteen on September 1st, and thus becomes eligible for entry for the examination.

Although the existing age limit is retained, the Head of a school may enter a pupil below the stated age if he certifies:

(*a*) that it is educationally desirable that he should take the Examination in the particular subject(s) offered at the time proposed; and

(*b*) that he has pursued a course of study with such a degree of competence as to make it very probable that he will pass in the subject(s) offered.

In exceptional cases, applications from private study candidates who are below the age limit may be considered, if they are able to satisfy the conditions stated for school candidates. Since it may be necessary to submit such applications to the Department of Education and Science they should be sent in early.

N.B. *Candidates entered in certain subjects by schools will not be accepted as private study candidates in other subjects in the same examination, whether at Ordinary or Advanced Level.*

EXAMINATIONS IN THE SCHOOLS

5. Any School wishing to present candidates shall give notice not later than the end of January, stating, on a subject entry form to be obtained from the Secretary, the approximate number of candidates in each subject at each level.

The authorities of the school must undertake:

(*a*) to provide, to the satisfaction of the Board, for adequate supervision and invigilation of candidates during the examination;

(*b*) to provide, to the satisfaction of the Board, furniture and materials for the conduct of the examination.

Immediately before and during the course of the examination, each school may be visited by a representative of the Board in order to ensure that the above requirements are satisfactorily met.

ENTRY FORMS

6. To schools which are accepted as centres broadsheet Entry forms will be sent on which Heads will be asked to give the names and dates of birth of their candidates and indicate

every subject in which each candidate is to be examined. The last date for receipt of these forms will be April 1st.

SUBMISSION OF ESTIMATE OF MERITS OF CANDIDATES

7. The Head of every school which presents candidates for the examinations may submit an estimate of the merits of the candidates in each of the subjects offered by them for examination and such estimate shall be taken into account by the Board.

Heads of Schools will be asked to submit estimates of their candidates on forms which will be forwarded to them, after their Entry forms have been received.

SYLLABUSES AND EXAMINATION PAPERS

8. There shall be issued annually a syllabus for each of the subjects included in the above examination, such syllabus to be issued two years before the examination to which it applies. The papers shall in general be set for all candidates alike in accordance with the syllabuses. If any recognised school wishes to have a paper or papers especially set to meet its own curriculum such paper or papers may be set for its pupils, the school paying an extra fee for every paper. Application, from the Head of a recognised school, for such papers should reach the Secretary on or before October 1st and should be renewed each year. A detailed syllabus must be submitted each year with the application; it must in general be comparable with the Board's syllabus(es) in the same subject.

OTHER SUBJECTS

9. On request, from the Head of a recognised school, subjects other than those contained in the Regulations may be included in the examination, an extra fee being chargeable for every special subject examined. Eighteen months' notice is required for examination in such subjects. Applications should reach the Secretary on or before January 1st in the year preceding the examination. A detailed syllabus may be required.

Applications for other papers or subjects cannot be accepted from unrecognised schools or from private study candidates.

FEES

10. Entry fee for each candidate £1
„ „ „ „ subject at Ordinary Level . 10s.
„ „ „ „ subject at Advanced Level . £1 10s.
„ „ „ „ Special Paper (see §16) . . 15s.
(in addition to the Advanced Level fee)

Entry fee for the General Paper . . . . 15s.
„ „ „ the Use of English Paper . . 15s.
„ „ „ the Arithmetic Paper . . . 10s.

Modern Languages Oral examinations: an examiner's fee will be charged to schools presenting small numbers of candidates and who wish to have the examination in the school.

Cookery Practical Examinations: There will be an examiner's fee of £4 for each practical examination (half day). In addition, a charge, ranging from 10s. to £3, will be made for Cookery to schools presenting fewer than seven candidates.

Advanced Level Science practical examinations at the University of Bristol 10s

There will be an Examination Centre fee for all private study candidates and for any candidate presented by a school, but who does not take the Examination at that school.

Ordinary Level, each subject . . . . 5s.
Advanced Level, each subject . . . . 7/6d.
Invigilation charge for unrecognised schools . . £1 10
(i.e. £3 a day). a session.

This invigilation charge is payable by the unrecognised school to the Board and not to the Invigilator directly. In addition there may be a charge for the Invigilator's travelling and subsistence.

Late entry fee up to:	two weeks	four weeks	eight weeks
Schools . . .	£5	—	—
Private study candidates . .	10/–	£1	£2

Centre transfer fee; each subject . . . . 10s.
Change of subject entry, each . . . . 10s.

Centre fee: every school accepted as a centre will be charged a fee of £7 10s. This fee will be deducted from the candidates' entry fees, so that schools entering ten or more candidates will, in effect, pay no centre fee.

Notification fee for Special Notice Papers—Special Notice Papers listed on Page 5. Notification fee: Ordinary Level £2 each subject; Advanced Level £5 each subject.

These fees will be credited against the school's account for entries in these special notice subjects.

A candidate taking subjects at Ordinary and Advanced Levels in the same examination will pay one entrance fee only.

Cheques, postal orders and money orders should be drawn to the order of the Southern Universities' Joint Board for School Examinations and crossed " National Provincial Bank Ltd."

Withdrawal

Entry fees and centre fees will not be refunded.

Subject fees will be refunded:

(i) if notice of withdrawal from the examination is received in writing by the Secretary before the closing date;

(ii) if an entry is cancelled because of illness between that date and the date of the examination; a medical certificate must be sent with the written cancellation;

(iii) on production of satisfactory evidence of changes in the private circumstances of a candidate which necessitate withdrawal.

SPECIAL SERVICES

11. After receiving their examination results Heads of schools may apply for special reports on their candidates' work in any subject. The charges for such reports will be, for each paper, as follows:

10 candidates or fewer	£3 0 0
11–20 candidates	£5 0 0
For every 10 (or fraction of 10) additional candidates	£1 10 0

The charge for a two paper subject report will be twice, and for a three paper subject, three times these sums.

Details of candidates' marks at Ordinary Level required by schools or candidates may be provided by the Board if requested in writing, with a fee of 2/6d. for each candidate in each subject where there is more than one paper in the subject examination.

SPECIAL VISITS OF EXAMINERS TO SCHOOLS

12. The necessary travelling and hotel expenses and fees of any examiner who may be requested to conduct an oral or practical examination of a small number of candidates in any school shall be defrayed by the school.

CHOICE OF SUBJECTS

13. Candidates may not offer the same subject at both Ordinary and Advanced levels in the same examination.

At Ordinary Level:

Greek Civilisation may not be offered with Greek at Advanced Level.

Science and General Science are alternatives and may not be offered with Biology, Chemistry, Physics, or Physics-with-Chemistry.

Physics-with-Chemistry may not be offered with Physics or Chemistry.

Human Biology may not be offered with Biology or Housecraft.

Mathematics and Statistics for Commerce may not be offered with any other Mathematics papers or with the Arithmetic paper.

At Advanced Level:

Biology may not be offered with Botany or Zoology.

Pure and Applied Mathematics may not be offered with Pure Mathematics or Applied Mathematics.

WINTER EXAMINATION: ORDINARY LEVEL

14. Papers at Ordinary level will be set in Latin, Greek, Greek Civilisation, Religious Knowledge, English Language, English Literature A and B, History A, B and C, Geography (Paper II, Sections A, B, C, D and E). French, German, Spanish, Science, General Science, Physics-with-Chemistry, Biology, Human Biology, Geology, Chemistry, Physics, Mathematics, Additional Mathematics and Music on the same syllabuses as for the preceding Summer Examination.

Special Notice Subjects and Sections are NOT set in the Winter Examination.

STANDARD OF ENGLISH

15. Candidates must in all subjects present scripts in which the language is clear and the writing legible. Examiners are directed to deduct marks for bad English. Badly written scripts will be referred to the Standard of English Panel of the Board which has power to fail the candidate.

SPECIAL PAPERS

16. Questions in the Special papers will be more searching than those in Advanced level papers but will be set on the same syllabuses except in Pure Mathematics and Applied Mathematics.

Only candidates who pass in their Advanced level papers

will be eligible for a grade on their Special papers. The grades for the Special papers will be "Distinction" or "Merit", and these will be recorded on the certificates. No lower grade will be recorded on the certificate, but schools, universities and professional bodies will be informed where candidates have attempted the Special papers and have failed to reach Distinction or Merit. This latter provision is made in order to discourage unsuitable candidates from attempting the Special papers which are intended only for candidates of considerable ability.

Candidates may attempt Special papers in not more than two subjects which they are taking at Advanced level in the same examination.

RESULTS

17. At Ordinary level the Heads of schools which enter candidates, and every private study candidate, will be given the total mark for each subject expressed as a percentage.

At Advanced level, the results will be issued in the form of five grades of pass, A, B, C, D and E. Marks will not be given. Examiners have discretion to grant a pass at Ordinary level on performance in a subject taken at Advanced level. For the Special papers, candidates who pass the same subject(s) at Advanced level may be given a grade of "Distinction" or "Merit". No result lower than "Merit" for the Special paper will be given.

CERTIFICATE

18. A General Certificate of Education will be issued to every candidate who passes in one or more subjects.

At Ordinary level, the Certificate will simply show that the candidate has passed in the subjects indicated.

At Advanced Level, a grade A, B, C, D or E will be shown for each subject in which a pass is obtained. Performance in Special papers will be recorded on the Certificate of candidates who reach the grade of "Distinction" or "Merit" and who pass at the Advanced level in the same subject.

The certificate should be carefully preserved; no duplicate will be issued, unless the applicant can prove, to the satisfaction of the Board, that the original has been destroyed. The charge for a duplicate certificate will be 5/–.

REQUIREMENTS OF PROFESSIONAL BODIES

19. The requirements of certain professional bodies in terms of the General Certificate of Education are set out by the Department of Education and Science in a pamphlet "The General Certificate of Education", published by Her Majesty's Stationery Office, 1964. In particular cases further information may be obtained from the secretary of the professional body concerned. The Board cannot answer queries concerning these requirements.

UNIVERSITY ENTRANCE

20. Copies of the results of all candidates at Advanced level are sent to the Registrars of all universities in the United Kingdom. Candidates should not therefore ask for their results in the Advanced level Examination to be sent to the Registrars of any universities in the United Kingdom; they will already have had them.

CERTIFICATION

21. Letters of certification of Ordinary or Advanced level results in the Board's Examinations and those of the former University of Bristol School Examinations Committee may be sent to universities or professional bodies on payment of a search fee to the Board by the applicant. The fee for certification of Southern Board results is 5/– and for the University of Bristol results 7/6 for each examination.
Applicants for certification must give full particulars of the examination(s) in which they passed: date, centre, level, subjects and their full name and date of birth.

22. The Board has prepared lists of recommended books in the following subjects: A.L. Latin and Greek, Paper III, Greek Civilisation, Religious Knowledge, Economics, Science, A.L. Chemistry, Art, Handicraft, Principles and Practice of Commerce. Copies may be obtained on application enclosing a stamped and addressed foolscap envelope to the Secretary.

USE OF ENGLISH PAPER

A paper of three hours which has been approved, as meeting one of their matriculation requirements, by the Universities of Oxford and Cambridge, and by the Northern Universities' Joint Matriculation Board.

It may be taken only by candidates who have entered for two or more subjects in the Advanced Level examination of the Southern Board, or of any of the other recognised G.C.E. examining bodies, or who have already passed in two subjects at Advanced Level.

This paper will test the ability of candidates to understand and write English prose, whether composed for the purpose of narrative, description or argument. No special study of any subject-matter will be required, and the paper will not test factual knowledge. The best preparation for this paper will be wide reading and regular practice in writing clear prose. Formal essays will not be required; but the paper will test the candidate's power of understanding and his ability to express concisely, in his own words, the meaning of a given passage of prose or a set of data, and to comment significantly upon it.

CERTIFICATE IN ARITHMETIC

The Board issues a Certificate in Arithmetic on the result of a two and a half hour Examination in Arithmetic which is held at the same time as Paper I in the G.C.E. Ordinary Level Mathematics Examination. It is intended for candidates in the General Certificate of Education Examination whose Mathematics is not strong enough for them to sit the Ordinary Level papers in that subject. It is available only to candidates who are taking the Board's G.C.E. Examination in the summer in subjects other than Mathematics.

No syllabus in Arithmetic is issued, but the examination paper covers the elements of the subject, and an indication of the standard will be gained from past papers which may be purchased from the offices of the Board.

The Cambridge Four Figure Mathematical Tables should be supplied by schools for their candidates. Private study candidates sitting at University centres will be provided with tables by the Board. Candidates will not be permitted to use slide rules.

SYLLABUSES FOR THE EXAMINATIONS FOR THE GENERAL CERTIFICATE OF EDUCATION TO BE HELD IN 1966

S.N. *indicates a special notice subject, paper or section*

General Paper ORDINARY LEVEL

This paper, which has the status of an Ordinary level subject, is intended for candidates of some maturity who have spent two years in the Sixth form, or on some other advanced course. It is designed to encourage reading and thinking outside the candidates' specialist studies, and to assess their powers to present a logical argument and to express themselves in clear English.

The paper, which will be of three hours' duration, will contain questions requiring answers of an essay type. It will normally include: a compulsory question based on a passage of general interest, of which candidates will be asked to express the thought in their own words as concisely as possible; a choice of questions relating to moral, political and general problems and to current topics about which it would be reasonable to expect all Sixth form pupils, irrespective of specialist interests, to know something; other questions requiring some knowledge of a specialised kind but testing intelligent application rather than detailed knowledge.

Latin ORDINARY LEVEL

The examination will consist of two papers. Candidates must satisfy the examiners in both of them.

Paper I (Two and a half hours):

Tests in accidence, the translation of sentences from English into Latin and of unprepared prose passages from Latin into English.

Paper II (Two hours): Set books and/or unseen translation.

The translation of passages from the set books together with questions on the subject matter of the set books and on the scansion of the verse.

and/or

The translation of more difficult unprepared passages, one prose and one verse, from Latin into English.

Candidates will be free to answer questions on one or other of the two prose set books or the prose unseen translation, together with questions on one or other of the verse set books or the unseen verse translation.

Set Books:
Caesar: *De Bello Gallico* III.
or Pliny: *Prose* (Martial and Pliny. Selections. Ed. E. C. Kennedy. C.U.P.).
with Virgil: *Aeneid* II (lines 1–401).
or Martial: *Verse* (Martial and Pliny. Selections. Ed. E. C. Kennedy. C.U.P.).

Latin ADVANCED LEVEL

The examination will consist of three papers. They will be set from the latest Oxford Classical Texts unless otherwise prescribed.

Paper I (Three hours): Prose composition and unprepared translation.

The paper will be in two parts, Part I, prose composition, carrying 40 per cent of the marks; Part II, unprepared translation, verse and prose passages, each carrying 30 per cent of the marks.

Candidates must reach a reasonable standard both in Part I and in Part II, and must pass in this paper as a whole in order to pass in the subject at Advanced Level.

Paper II: (Two hours): Set Books.
Candidates will be asked to answer questions on one prose author and one poet, chosen from:

Cicero: *Pro Caelio.*
or Tacitus: *Germania.*
with Virgil: *Aeneid* XII.
or Lucretius: *De Rerum Natura* V (lines 771 to end).

The paper will contain three passages, each of about eight lines, from each author. Candidates will be asked to translate all of the passages from the chosen author, and to comment on the syntax and/or context of each passage.

NOTE: Set books will be chosen from:

Prose—Cicero, Livy, Tacitus, Sallust, Pliny's letters;

Verse—Lucretius, Virgil, Horace, Ovid, Juvenal.
In any year two prose authors and two poets only will be set.

Paper III (Two and a half hours): Roman History, Life and Literature.

Section I: Roman History from 90 B.C. to A.D. 69.

Section II: Roman life and literature from Cicero to Tacitus.
There will be eight questions in Section I and ten in Section II; candidates will *oe* asked to answer any four questions chosen from Section I and/or Section II.

Section II will contain one question on set books which will include four alternatives, one on each author.

Reading List. The Board has prepared a list of recommended books. A copy may be obtained on application, enclosing a stamped addressed foolscap envelope to the Secretary.

Special Paper I (Two hours): Prose composition.

Special Paper II (Two hours): Unprepared translation of prose and verse.

Greek ORDINARY LEVEL

The examination will consist of two papers. Candidates must satisfy the examiners in both of them.

Paper I (Two and a half hours):

Tests in accidence, the translation of sentences from English into Greek and of unprepared prose passages from Greek into English.

Paper II (Two hours): Set books and/or unseen translation.

The translation of passages from the set books together with questions on the subject matter of the set books and on the scansion of the verse.

and/or

The translation of more difficult unprepared passages, one prose and one verse, from Greek into English.

Candidates will be free to answer questions on one or other of the two prose set books or the prose unseen translation, together with questions on one or other of the verse set books or the unseen verse translation.

Set Books:

Xenophon: *The Fall of Athens.* Selections from Hellenica Books I and II ed. T. Horn (Macmillan).
or Thucydides: *Athenian Disaster in Sicily* ed. E. C. Marchant (Macmillan) *with* Euripides: *Alcestis* (lines 280 to 960, omitting the lyrics).
or Homer: *Odyssey* IX.

Greek ADVANCED LEVEL

The examination will consist of three papers. They will be set from the latest Oxford Classical Texts unless otherwise prescribed.

Paper I (Three hours): Prose composition and unprepared translation.
The paper will be in two parts, Part I, prose composition, carrying 40 per cent of the marks; Part II, unprepared translation, verse and prose passages, each carrying 30 per cent of the marks.

Candidates must reach a reasonable standard both in Part I and in Part II, and must pass in this paper as a whole in order to pass in the subject at Advanced Level.

Paper II (Two hours): Set books.

Candidates will be asked to answer questions on one prose author and one poet, chosen from:

Thucydides: Book I (chapter 89 to the end).

or Plato: *Republic* X.

with Homer: *Iliad* XXIV.

or Sophocles: *Antigone* (omitting lines 100–222, 332–375, 582–625, 781–805, 904–987 and 1115–1154).

The paper will contain three passages, each of about eight lines, from each author. Candidates will be asked to translate all of the passages from the chosen author, and to comment on the syntax and/or context of each passage.

NOTE: Set books will be chosen from:

Prose: Herodotus, Thucydides, Plato, Demosthenes, Lysias;

Verse: Homer, Aeschylus, Euripides, Sophocles, Aristophanes.

In any year two prose authors and two poets only will be set.

Paper III (Two and a half hours): Greek History, Life and Literature.

Section I: Greek history from 510 B.C. to 323 B.C.

Section II: Greek life and literature from 510 B.C. to 323 B.C.

There will be eight questions in Section I and ten in Section II; candidates will be asked to answer any four questions chosen from Section I and/or Section II.

Section II will contain one question on (Homer and) set books which will include four (or five) alternatives, one on each author.

Reading List: The Board has prepared a list of recommended books. A copy may be obtained on application enclosing a stamped and addressed foolscap envelope to the Secretary.

Special Paper I (Two hours): Prose composition.

Special Paper II (Two hours): Unprepared translation of prose and verse.

Greek Civilisation ORDINARY LEVEL

The examination will consist of one paper of two and a half hours.

The subject will comprise Greek Civilisation in relation to its historical background, with special reference to the following topics: (1) Politics; (2) Literature; (3) Philosophy; (4) Art and Architecture; (5) Science.

Candidates will be expected to show some knowledge of at least two of these topics.

1. *Politics* will consist of the development of Greek government from the earliest times to the death of Alexander.

2. *Literature* will be confined to a study of the Homeric Epic and of Drama.

3. *Philosophy* will comprise an acquaintance with the early Greek philosophers and with Plato and Aristotle.

4. *Art and Architecture* will comprise a knowledge of the principal orders of Greek Architecture and of some typical examples thereof; also a general knowledge of the development of Sculpture and Pottery during the sixth, fifth and fourth centuries B.C.

5. *Science* will comprise the principal scientific achievements of the Greeks.

The Board has prepared a list of recommended books. A copy may be obtained on application, enclosing a stamped and addressed foolscap envelope, to the Secretary.

Greek Civilisation may not be offered with Greek at Advanced level.

Religious Knowledge

NOTE: *Candidates must bring to the examination a copy of the Revised Version, the Revised Standard Version or the Douai Version of the Bible, as printed, without added notes. The New English Bible may also be used.*

Biblical quotations in the examination papers will be taken from the Revised Version, but any significant variant in the text of the Revised Standard and Douai Versions will be indicated.

ORDINARY LEVEL

The examination will comprise one paper of two hours and forty-five minutes. For the first part of the paper, of forty-five minutes, candidates will use Bibles. These will then be collected by the invigilator and the second part of the paper, of two hours, will be written without Bibles.

Candidates will be expected to attempt a maximum of six questions; not more than three from Part I (Old Testament), and not more than three from Part II (New Testament).

PART I: Candidates must choose their questions from *one only* of the following sections.

Section I: From Moses to the Division of the Kingdom: Book of Exodus, chapters 1–24; Book of Judges, chapters 1–9, 11, 12; First Book of Samuel, chapters 1–31; Second Book of Samuel, chapters 1–12, 15–20, 24; First Book of Kings, chapters 1–12.

Or *Section II:* The Divided Monarchy; The Southern Kingdom from the fall of Samaria to the Captivity:

The Books of Amos and Hosea; Book of Isaiah, chapters 1–12, 28–31; Book of Jeremiah, chapters 1, 5, 7, 8, 18, 19, 20, 26–29, 31, 36–39; Book of Deuteronomy, chapters 12, 13, 15, 16, 18; with appropriate historical background.

Or *Section III:* The captivity to the end of the Persian period:

Book of Ezekiel, chapters 1–3, 8, 18, 34, 36, 37;

Book of Isaiah, chapters 40–55, 56 (verses 1–8), 60, 61, 65;

The Books of Haggai, Jonah, Ezra and Nehemiah.

PART II: Candidates must choose their questions from *one only* of the following sections.

Section I: The Gospel according to St. Mark.

Or *Section II*: The Book of Acts, chapters 1–15.

Or *Section III:* The Book of Acts, chapters 9, 13–28.

Some knowledge of the geography of Bible lands will be expected for both parts.

The Board has prepared a list of recommended books. A copy may be obtained on application, enclosing a stamped and addressed foolscap envelope, to the Secretary.

ADVANCED LEVEL

The examination will comprise two papers of three hours each.

PAPER I: THE HISTORY AND RELIGION OF ISRAEL

To be studied (in main outlines only) for the period from Moses to the New Testament, with detailed attention to one of the following:

1. Exodus chapters 1–23; and Isaiah chapters 1–12 and 28–39.

Or 2. First Book of Samuel; Isaiah, chapters 40–55; and Joel and Malachi.

Or 3. Second Book of Kings, chapters 18–25; the Book of Daniel; and First Book of Maccabees, chapters 1–9 (verse 22).

PAPER II: THE NEW TESTAMENT

1. The Gospel according to St. John.

2. *Either* (*a*) The growth of the Church in the period of the Acts of the Apostles, illustrated by the First Epistle to the Corinthians;

Or (*b*) The life of St. Paul, and a study of his thought as illustrated by the Epistles to the Galatians and to the Philippians.

SPECIAL PAPER

This will be a paper of three hours, consisting of essay questions on the same syllabus.

Note.—The Bible will be used for both Advanced level papers and for the Special paper.

The Board has prepared a list of recommended books. A copy may be obtained on application, enclosing a stamped and addressed foolscap envelope, to the Secretary.

English Language ORDINARY LEVEL

The examination will consist of one paper of two and a half hours, comprising:

(*a*) A test of comprehension, including a compulsory exercise in summarising and questions on the vocabulary, structure, imagery, style or logic of a given passage or passages. Questions on grammar may be included.

(*b*) An essay or composition. The subjects set will give a wide choice, including such exercises as the presentation of an argument or statement based on common knowledge or information supplied.

English Literature ORDINARY LEVEL

The examination will consist of one of two alternative papers, A or B, each of two and a half hours.

ENGLISH LITERATURE A. SET BOOKS

TEXTS FOR STUDY

(*a*) Shakespeare: *Richard II* or *Merchant of Venice*.

(*b*) Conrad: *The Mirror of the Sea* (Methuen).

or Shaw: *Arms and the Man*.

(*c*) Hardy: *The Mayor of Casterbridge*.

or H. G. Wells: *Mr. Polly*.

(*d*) *The Poets' World*, ed. James Reeves (Heinemann)

or Wollmann: *Ten Twentieth-Century Poets* (*Harrap*).

The paper will include a compulsory " context " question on Shakespeare. Candidates will be required to answer five questions in all:

(*a*) One " context " question on Shakespeare.

(*b*) One other question on Shakespeare—a choice between a question based entirely on the text, and a question on the text in relation to " background " (*e.g.* the Elizabethan theatre).

(*c*) One question on each of the other three set texts.

ENGLISH LITERATURE B. GENERAL READING

This paper is intended for candidates of some maturity. A wide choice of questions will be given and candidates will be expected to answer one question from each of four sections.

1. Shakespeare:

   At least one tragedy, one comedy and one history play.

2. Verse:

   A reasonable selection of different kinds of verse (narrative, lyric, etc.). A passage for critical appreciation may be set in this section.

3. Drama:

   One or more of the plays of each of three standard playwrights other than Shakespeare. Opportunity will be given for candidates to show their knowledge of foreign drama in translation.

4. Prose:

   At least two works of prose literature other than novels (The Bible, biography, travel, essays, natural history, etc.).

5. Novels:

   One or more of the novels of each of three standard English novelists (*e.g.* Jane Austen, Scott, Dickens, Thackeray, the Brontës, George Eliot, Hardy, Conrad).

Note.—Quotations from Shakespeare in examination papers at both Ordinary and Advanced levels will be based on The Tudor Edition of William Shakespeare, ed. Peter Alexander (Collins).

English Literature ADVANCED LEVEL

The examination will comprise three papers:

I. SET BOOKS AND GENERAL READING. (Three hours.)

The examination paper will include questions on each of the set books and also questions designed to test ability to compare books within a group. Candidates will be required to answer any four questions from any two, three or four groups. Section D counts as one group only and therefore candidates who answer questions on this section must also answer questions on at least one other group in sections A or B or C.

SECTION A. POETRY (*three groups*)

Group 1. *England's Helicon* ed. Macdonald. (The Muses' Library, Routledge and Kegan Paul Ltd.)
Metaphysical Poetry, Donne to Butler (ed. Grierson: Clarendon Press). Selections: Poems by Carew, Crashaw, Lovelace, Marvell, Herbert, Donne and Vaughan.

Group 2. Dryden: *Absalom and Achitophel* (ed. Kinsley, O.U.P.).
Byron: *Satirical and Critical Poems* (ed. J. Bennett, C.U.P.)

Group 3. Wordsworth: *Poetry and Prose* (ed. D. Nichol Smith, O.U.P.).
Michael Roberts: (ed.): *The Faber Book of Modern Verse* (1960 edition) (Poems by Auden, Graves, Hopkins, Muir, Owen and Yeats; and the following poems by Eliot: *Sweeney among the Nightingales, The Waste Land, Journey of the Magi, Marina*).

SECTION B. DRAMA (*two groups*)

Group 4. J. Webster: *The Duchess of Malfi.*
Ben Jonson: *Volpone.*

Group 5. Sophocles: *Antigone*
Ibsen: *The Wild Duck*

SECTION C. THE NOVEL (*two groups*)

Group 6. Jane Austen: *Persuasion.*
H. James: *Portrait of a Lady* (O.U.P.).

Group 7. D. H. Lawrence: *Sons and Lovers.*
E. M. Forster: *Howard's End.*

SECTION D. GENERAL READING (*one group*)

Group 8. Candidates offering this section are not required to study set books. Questions will be so framed that candidates have opportunities to use their reading in such fields as, for example, biography, diaries, letters and journals, history, criticism, natural history, travel, essays, the Bible. Questions will not normally be tied to particular books or authors.

II. SPECIAL AUTHORS. (Three hours.)

The special authors will be Shakespeare: *Hamlet* and *The Winter's Tale.*

with (1) Chaucer: *The General Prologue*; *The Pardoner's Tale, Prologue and Link;*

or (2) Milton: *Paradise Lost*, Books I and II.

or (3) Wordsworth: *The Prelude*, Books I and II (1850 text).

Candidates will be required to answer a compulsory question requiring detailed knowledge of texts. Passages for translation, detailed explanation and description of context from Chaucer will be taken only from the *General Prologue.*

NOTE.—For both Papers I and II candidates will be well advised to read other works by the authors chosen for study, and to interest themselves in their relevant literary and historical background.

III. COMPREHENSION. (One hour.)

This paper will test comprehension of a passage of verse or prose.

SPECIAL PAPER (Three hours)

This paper will test the candidates' powers of criticism and appreciation and will give them opportunities for showing that they have made more searching literary studies, particularly of Shakespeare.

History

Note.—In all history papers, illustrations by sketch maps, where appropriate, will count in the candidate's favour.

ORDINARY LEVEL

The examination will consist of one paper of two and a half hours on *one* of the following alternative four syllabuses, A to D.

A general knowledge of History and historical development, rather than technical detail, will be examined, and the questions will be framed to test the power to select and use appropriate facts.

PAPER A.—Early and Medieval History

Part 1. British History 55 B.C. to 1485.
Part 2. European History 476 to 1494.

PAPER B.—Modern History

British History	Part 1.	1485 to 1783.
	Part 2.	1783 to 1939.
European History	Part 3.	1494 to 1789.
	Part 4.	1789 to 1939.

NOTE: *on Papers A and B:*

Candidates may choose all of their questions from any one part of either of these two papers or they may choose questions from all or several parts of either paper.

In British History, some acquaintance with Foreign History will be expected, but only *in so far as is needed for an adequate understanding of Great Britain and the Empire.*

European History should be understood to *exclude* matters solely or mainly concerning the British Isles, but to *include* international affairs which involve Great Britain.

PAPER C.—Social and Economic History, 1760–1939, with special reference to the following:

1. *Social Change.*

Changes in size and distribution of the population. Religious and humanitarian movements. Changes in the condition of the people: relief of poverty, education, health, position of women, housing, public utilities, insurances and old age pensions. The part played in these changes by central and local governments and voluntary associations. The effects of the first World War; redistribution of wealth.

2. *Agriculture and the Rural Population.*

Enclosures; changes in agricultural methods; effects of the war, 1793–1815; Corn Laws, the depression to *circa* 1850, high farming and prosperity; effects of increasing overseas competition. The influence of the first World War; Government subsidies, mechanisation and scientific methods in agriculture.

3. *Industry and the Urban Population.*

Changes in methods of production in leading industries; changes in industrial organisation, including factory legislation; joint stock enterprise and industrial legislation; development of Trade Unions and regulation of wages. Unemployment and the General Strike, foreign competition.

4. *Communications and their relation to agricultural and industrial changes.*

Roads; waterways; railways; steam navigation; postal, telegraph and telephone services; development of motor traffic; air transport; radio.

5. *Commercial and Financial Policy.*

Expansion in British overseas trade, migration, investment; Adam Smith and the theory of Free Trade; changes in fiscal policy; the development of banks; tariff reform; the great depression. The economic importance of the British Empire and Commonwealth.

S.N. PAPER D.—History of the United States of America, 1783–1940.

History ADVANCED LEVEL

The examination will comprise two papers of three hours each. They will be divided into periods simply as a guide to the candidates, who may answer questions from any period. Some questions may overlap two periods.

PAPER I—British History. Period I 55 B.C.–1485
„ II 1485–1688
„ III 1688–1815
„ IV 1815–1939

PAPER II

(*a*) European History. Period I A.D. 476–1453
,, II 1453–1689
,, III 1689–1815
,, IV 1815–1939

S.N. *Or* (*b*) History of the United States of America 1783–1940

SPECIAL PAPER

This will be a paper of three hours in which candidates will be required to answer *three* questions only. It will give a wide choice of questions of a more general type on British and Foreign History.

Geography

NOTE: *Candidates should bring to the examination a standard Atlas, as printed, without added notes, for Paper I at Ordinary level and for Papers I, II and III at Advanced level, and the Special Paper.*

ORDINARY LEVEL

The examination will comprise two papers, each of two and a quarter hours.

PAPER I. *Principles of Geography*

Map Reading: the use and interpretation of topographical maps of $2\frac{1}{2}$ inch and 1 inch scales O.S. Series. There will be a compulsory question on this section. Simple photographs may be used in the examination paper.

The size, shape, and movements of the earth and their consequences; land forms and the agencies by which they have been produced; factors determining climate and the distribution of the principal climatic types of the world; the distribution of natural vegetation and animal life; the distribution of man and of his major economic activities in relation to his environment.

Candidates should be encouraged to make observations in the field.

PAPER II. *Regional Geography*

Candidates will be required to answer four questions, two on Section A, The British Isles, and two on any *one* other section only. Questions will not be set on Sections F, G, H and I unless asked for before October 1st in the year preceding the examination.

Section A. The British Isles.

Section B. Western Europe (France, Belgium, The Netherlands, Denmark, Norway, Sweden, West Germany, Switzerland, Luxembourg).

Section C. Canada and the United States of America.

Section D. Africa.

Section E. South America.

S.N. Section F. Southern Europe (Spain, Portugal, Italy, Greece, Yugoslavia, Bulgaria, Switzerland, Austria, Albania).

S.N. Section G. The U.S.S.R., China and Japan.

S.N. Section H. Australia, New Zealand and New Guinea.

S.N. Section I. India, Pakistan, Ceylon, Burma and Malaysia.

Geography ADVANCED LEVEL

The examination will consist of three papers.

PAPER I. *Practical Geography* (Two hours.)

The use and interpretation of topographical maps of 2½ inch. and 1 inch scales O.S. Series; distributional maps; graphs and diagrams and their compilation from simple statistical matter; weather charts. Questions may be set involving the interpretation of simple photographs, including oblique, but not vertical, aerial photographs.

The Cambridge Four Figure Logarithmic Tables may be used in answering questions in this paper, and should be provided by schools for their candidates. Candidates may bring and use their own slide rules.

PAPER II. *Physical and Human Geography.* (2½ hours.)

Candidates will be required to answer four questions, two from section (*a*) and two from section (*b*).

(*a*) Physical Geography:

The characteristics and distribution of land forms and the processes in their development.

The principles of climatology; the influence of climate and relief upon natural vegetation; the characteristics of soils and the distribution of the major soil types.

The sea; temperatures and salinity; the continental shelf; ocean currents, their characteristics and effects.

(*b*) Human Geography:

The geographical background of settlements, agriculture, communications, industries and trade, with some reference to their contemporary world settings and relationships.

PAPER III. *Regional Geography* (2½ hours.)

Candidates will be required to answer four questions selected from two only of the Sections A to H. Not more than two questions are to be selected from any one section.
Questions will not be set on Sections F, G and H unless asked for before October 1st in the year preceding the examination.

Section A. The British Isles.

Section B. Norway, Sweden, Denmark, France, the Netherlands, Belgium, Luxembourg, West Germany, Switzerland and Italy.

Section C. The lands around the Mediterranean Sea, its islands and Portugal.

Section D. Canada and the U.S.A.

Section E. India, Pakistan, Ceylon, Burma and Malaysia.

S.N. Section F. China, Korea, Japan and The Philippines.

S.N. Section G. Africa.

S.N. Section H. Latin America: Central and South America and the Caribbean region.

Candidates are advised to use topographical maps in their field work and in their studies of the principles of physical and human geography. Field work questions may appear in Papers I and II and in the Special Paper.

SPECIAL PAPER

This will be a paper of three hours on the same syllabus as Papers I, II and III.

ATLASES

The Board has prepared a list of those which may be brought into the examination. Copies may be obtained on application to the Secretary, enclosing a stamped, addressed, foolscap envelope.

Economics ADVANCED LEVEL

The examination will consist of two papers of three hours each on the following syllabus:

The economic problem and the functions of the economic system.

The productive process under a price system. The organisation and financing of modern industry. Trade Unions.

The nature and importance of the National Income. Influences determining the standard of living. The conditions of economic growth.

Theory of consumer demand. Conditions of cost and supply for a commodity. Determination of price and output under perfect competition, monopolistic competition and monopoly.

Distribution of the National Income between persons and factors: wages, rent, interest and profits.

Elementary theory of the general level of employment. Significance of Saving and Investment. Nature of Inflation. Nature and functions of money. The working of the British banking system. Significance of the quantity of money.

International trade: reasons why goods are imported and exported. The balance of payments and the foreign exchanges.

Economic activities of the state. Taxation and public expenditure.

Some knowledge of the economic structure, national income and general economic position of the United Kingdom will be expected.

A reading list may be obtained on application, enclosing a stamped and addressed foolscap envelope, to the Secretary.

SPECIAL PAPER

This will be a paper of three hours on the same syllabus.

French ORDINARY LEVEL

The examination will comprise the translation of unprepared passages from French into English; a comprehension test, comprising questions, to be set and to be answered in English, testing the candidate's understanding of the salient points contained in a standard passage of French; the translation of prose passages from English into French; free composition in French; dictation, and an oral test.

Candidates will be expected to have read an original French text, for instance a novel or a collection of short stories or a set of extracts, on which questions may be asked in the oral examination.

The written examination will consist of two papers, each of two hours:

PAPER I:

Unseen translation into English of two prose passages. Comprehension test.

PAPER II:

Translation into French and free composition.

ORAL EXAMINATION. (i) Dictation;
(ii) Reading aloud, conversation.

French ADVANCED LEVEL

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

ORAL EXAMINATION. (i) Dictation;
(ii) Reading aloud, conversation and discussion.

PAPER I (1½ hours):

Unseen translation into English of not less than two passages, the first of them to be in prose; for the second the candidate will have the choice between a somewhat more difficult piece of prose and a passage in verse.

PAPER II (2½ hours):

Unprepared translation into French; and an essay in French on a general subject. There will be a choice of four subjects, and an essay of about 280–320 words will be expected. Credit will be given for the form of the essay.

N.B.—Candidates must obtain a pass mark on Papers I and II combined in order to gain an Advanced level pass in the subject.

PAPER III (3 hours):

Set books and general historical and literary background of modern France. This paper will consist of questions on the sections A and B below, to be answered in English.

It is not intended that this paper should be a test mainly of translation nor an exercise in the mechanical, even if accurate, reproduction of second-hand description and criticism. It is designed to bring out the candidates' accurate knowledge of the text and personal appreciation of the literary qualities of the work studied. It will therefore consist of short passages of special difficulty or interest chosen from texts in Section A for translation and comment, of others for explanation with reference to the context and of questions on the subject-matter, language (e.g., syntactical difficulties, vocabulary, style), prosody, allusions and general import.

While no periods are prescribed and the syllabus is designed to preclude exclusive specialisation in one period, it will be possible for teachers to lay particular emphasis in choice of texts and reading upon either the Classical period or the period since the French Revolution; some questions will be included to give an opportunity to candidates to show their general familiarity with the historical and literary background of the texts studied.

A. For detailed study:

Section I_1 and one text from Section I_2; one text from any two of the Sections $II_{1, 2 \text{ or } 3}$; i.e. *four* texts in all.

Section I:

1. La Fontaine; the following fables: La Cigale et la Fourmi; Le Corbeau et le Renard; Le Rat de Ville et le Rat des Champs; Le Loup et l'Agneau; La Grenouille qui veut se faire aussi grosse que le Boeuf; La Mort et le Bûcheron; Le Lion et le Rat; Le Lièvre et les Grenouilles; Le Bûcheron et Mercure; Le Rat qui s'est retiré du monde; Le Coche et la Mouche; Le Couré et le Mort; Le Chat, la Belette et le petit Lapin; L'Ours et l'Amateur des jardins; Les deux Pigeons; Le Singe et le Léopard.

2. *Either* Molière: *Le Misanthrope.*

   Or Racine: *Andromaque.*

Section II:

1. The poems of Vigny and Leconte de Lisle in Berthon: *Nine French Poets* (1820–1880) (Macmillan).

2. *Either* Mérimée: *Nouvelles*, pp. 23–98 (Hachette).
   Or Maupassant: *Quinze Contes* (C.U.P.).

3. *Either* Anouilh: *Antigone*
   Or Camus: *L'Etranger*.

B. For less detailed study:

At least two of the texts in this section:

Corneille: *Polyeucte*.
Molière: *Le Malade Imaginaire*.
Mme de Sévigné: *Selected Letters* (ed. Baker, M.U.P.), or any similar selection of her letters.
Balzac: *Le Curé de Tours*.
The poems of Gautier, Baudelaire and Verlaine in Berthon.
Henri Troyat: *La Neige en Deuil*.
Saint-Exupéry: *Terre des Hommes*.
Jacques de Lacretelle: *Silbermann* (Heinemann).

Candidates will be advised to read at least two further works, one dealing with the history of France and the other with French literature, to provide a literary and historical background to the chosen texts.

A list of books recommended for this purpose is available on application, enclosing a stamped addressed envelope, to the Secretary.

SPECIAL PAPER

This will be a paper of three hours, comprising:

(*a*) An essay in French on a subject connected with the set books or on the literary, cultural and political background of the books selected (a choice of not less than seven subjects will be offered).

(*b*) The critical appreciation in English of a passage of modern French not taken from a set book.

German ORDINARY LEVEL

The examination will comprise the translation of unprepared prose passages from German into English, a comprehension test consisting of short questions in English on a prose passage, the translation of prose passages from English into German, free composition in German; dictation, and an oral test. Candidates may be required to translate an unprepared verse passage.

The written examination will consist of two papers each of two hours.

PAPER I:

Unseen translation into English and comprehension test.

PAPER II:

Translation into German and free composition.

ORAL EXAMINATION. (i) Dictation;
(ii) Reading aloud, conversation.

Candidates, at Ordinary and Advanced levels, will be expected to show the correct use of the German "ss" and "ß" in both dictation and written work.

Gothic type will not be used in any examination paper at Ordinary or Advanced levels.

German ADVANCED LEVEL

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

ORAL EXAMINATION. (i) Dictation;
(ii) Reading aloud, conversation and discussion.

PAPER I (1½ hours):

Unprepared translation of German prose and verse into English.

PAPER II (2½ hours):

Unprepared translation of English prose into German. An essay of about 250 words in German on a general subject. A choice of five subjects will be offered. Credit will be given for the form of the essay.

N.B.—Candidates must obtain a pass mark on Papers I and II combined in order to gain an Advanced level pass in the subject.

PAPER III (3 hours):

Set books and general literary, cultural and political history. This paper will consist of questions on the Sections A and B below, to be answered in English.

(*a*) Each candidate shall present three books set in the list A for detailed study. In order to avoid exclusive specialisation in one period, each candidate must answer at least one question from Section I and at least one from Section II. Each candidate will also be expected to have read books set under B, as indicated, and will be examined on one of these.

(*b*) A choice of general questions will be set on the literary, cultural and political background of the books selected, and candidates will have to answer one question.

It is not intended that this paper should be a test mainly of translation nor an exercise in the mechanical, even if accurate, reproduction of second-hand description and criticism. It is designed to bring out the candidates' accurate knowledge of the text and personal appreciation of the literary qualities of the work studied. It will therefore consist of short passages of special difficulty or interest for translation and comment, of others for explanation with reference to the context and of questions on the subject-matter, language (e.g. syntactical difficulties, vocabulary, style), prosody, allusions and general import.

A. For detailed study (1740–1805 and from Schiller's death to the present day).

Section I (*up to* 1805).

1. Lessing: *Nathan der Weise* (Harrap).
2. Goethe: *Götz von Berlichingen.*
3. Schiller: *Die Braut von Messina.*
4. *The Harrap Anthology of German Poetry*: Lessing, p. 171–172; Klopstock, p. 172–180; Goethe, p. 207–210, 221–228, 235–237; Schiller, p. 250–252; Novalis, p. 292–295.

Section II (*from* 1805).

5. Hebbel: *Herodes und Mariamne* (Blackwell).

Or Grillparzer: *Sappho* (Macmillan).

6. *The Harrap Anthology of German Poetry*: Chamisso, p. 309–311; Max von Schenkendorf, p. 311–314; Kerner, 314–316; Uhland, p. 316–320; Heine, p. 356–363; Lenau, p. 374–380; Hebbel, p. 402–407; Rilke, p. 501–503; Brecht, p. 535–536.

7. Gotthelf: *Die schwarze Spinne* (Blackwell).
   Or Storm: *Der Schimmelreiter.*
8. Hauptmann: *Die versunkene Glocke* (Blackwell).
9. Keller: *Romeo und Julia auf dem Dorfe.*
   Or Zuckmayer: *Des Teufels General.*

B. For less detailed study:

1. Zweig: *Die Schachnovelle* (Methuen).
2. Hoffmann: *Der goldene Topf* (Blackwell).
3. W. Borchert: *Draussen vor der Tür.*
4. Dürenmatt: *Romulus der Grosse* (Methuen).
5. Böll: *Abenteuer eines Brotbeutels* (Methuen).

For further reference:

(*a*) K. Wildhagen: *English-German, German-English Dictionary.* 2 vols. Allen & Unwin, London.

(*b*) Priebsch & Collinson: *The German Language* (esp. the chapter "The Genius of the German Language"). Faber & Faber, London.
F. J. Stopp: *Manual of Modern German.* University of London Press.
R. B. Farrell: *Dictionary of German Synonyms.* C.U.P.
H. F. Eggeling: *Dictionary of Modern German Prose Usage.* O.U.P.
W. Viereck: *Common German Idioms.* Arnold, London.

(*c*) J. Bithell (ed.): *A Companion to German Studies,* 5th ed., 1955. Methuen, esp. chapters on Painting, Music and History (1618–1939).
C. Baier: *Deutschland und die Deutschen.* Methuen, London.

(*d*) *Der grosse Duden,* esp. vol. 2 *Stilwörterbuch* and vol. 3 *Bildwörterbuch.* Also *The English Duden,* Bibliographisches Institut, Mannheim.

(*e*) Useful volumes for the study of literature have been published by Arnold, London, *Studies in German Literature,* Rowohlt, Hamburg, monographs on *Schiller, Kleist, Hauptmann, Rilke,* by Bowes and Bowes, Cambridge, monographs on *Kleist, Hauptmann, Rilke, Hölderlin.*

For a general survey of German literature—the relevant chapters from Robertson, *History of German Literature*, 3rd edition, Blackwood, London.

(*f*) *Die Blauen Bücher* (Langewiesche Verlag): Die schöne Heimat, Deutsche Dome, Deutscher Barock, Der Rhein, Die Alten Deutschen Städte, Riemenschneider. *Die Langewiesche Bücherei:* Goethe, Strassburg, Münster, Isenheimer Altar, Schwarzwald.

(*g*) *Deutsche Landschaften* ed. Hans Knübel, Harrap.

SPECIAL PAPER

This will be a paper of three hours, comprising:

(*a*) An essay in German on a subject connected with the set books or on the literary, cultural and political background of the books selected (a choice of not less than five subjects will be offered).

(*b*) The critical appreciation in English of a passage of modern German not taken from a set book.

Russian ORDINARY LEVEL

The examination will consist of two written papers and an oral examination.

PAPER I

Either (A) (40 minutes) The candidate to write in Russian in his own words a story which has been read in Russian in the five minutes preceding the examination.

Or (B) (1¼ hours) Translation from English into Russian of two contrasting prose passages, e.g. one conversational and one descriptive.

Since these examinations are alternative, and the reading of the Russian story would disturb candidates attempting alternative B, the two Papers IA and IB will be arranged to follow each other in the time-table.

PAPER II (2 hours)

(i) Translation from Russian into English, and (ii) free composition.

ORAL EXAMINATION

(i) Dictation; (ii) Reading aloud, conversation.

Spanish ORDINARY LEVEL

The examination will comprise the translation of unprepared passages from Spanish into English; a comprehension test, consisting of short questions in English on a prose passage in Spanish; the translation of a prose passage from English into Spanish; a free composition in Spanish; dictation, and an oral test.

Candidates will be expected to have read an original Spanish text, for instance a collection of short stories, or a set of extracts, on which questions may be asked in the oral examination.

The written examination will consist of two papers, each of two hours.

PAPER I: Unprepared translation into English, and a comprehension test.

PAPER II: Translation into Spanish, and free composition.

ORAL EXAMINATION. (i) Dictation;
(ii) Reading aloud, conversation.

Spanish ADVANCED LEVEL

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

ORAL EXAMINATION. (i) Dictation;
(ii) Reading aloud, conversation and discussion.

PAPER I (1½ hours):
Unprepared translation into English of two passages, of which the first shall be in prose; for the second the candidate will have the choice between a second passage of prose, somewhat more difficult than the first, and a piece of verse.

PAPER II (2½ hours):
Unprepared translation of English prose into Spanish; and an essay in Spanish on a general subject. (There will be a choice of at least five subjects, and an essay of about 300 words will be expected.)

N.B.—Candidates must obtain a pass mark on Papers I and II combined in order to gain an Advanced level pass in the subject.

PAPER III (3 hours):
Set books and general literary and historical background. Five questions to be answered in English, two from (*a*), two from (*b*), and the fifth from (*a*) or (*b*) or (*c*).

(*a*) For detailed study:

1. Calderón de la Barca: *La Vida es Sueño*, ed. Sloman (Manchester University Press).
2. V. Terrádez: *Páginas del Quijote* (University of London Press).
3. García Lorca: *La zapatera prodigiosa*, ed. Street (Harrap).

(*b*) For less detailed study—several of the following:

1. *Lazarillo de Tormes*, ed. Jones (Manchester University Press).
2. Cervantes: *Novelas ejemplares* (Clásicos Castellanos, Volume I).
3. Lope de Vega: *Peribáñez y el Comendador de Ocaña* (Hachette).
4. Espronceda: *El estudiante de Salamanca* (Clásicos Castellanos).
5. (i) Camilo José Cela: *Viaje a la Alcarria*, ed. P. Polack (Harrap) (ii) Antonio Buero Vallejo: *Hoy es fiesta*, ed. J. E. Lyon (Harrap).
6. *The Harrap Anthology of Spanish Poetry*: *either* (i) Poets of the Sixteenth and Seventeenth Centuries. p. 171–285 *or* (ii) Poets of the Twentieth Century, p. 372 to end.
7. José López Rubio: *La otra orilla* (Harrap).
8. Miguel Delibes: *El Camino* ed. P. Polack (Harrap).

(*c*) Literary and Historical Background:

1. R. K. Spaulding: *How Spanish Grew* (University of California Press—Paper-back edition).
2. J. Cleugh: *Image of Spain* (Harrap).
3. W. C. Atkinson: *A History of Spain and Portugal* (Pelican)
4. Fisher & Bowen Jones: *Spain: A Geography* (Chatto & Windus).

SPECIAL PAPER

A paper of three hours, comprising:

(*a*) An essay in Spanish on a subject connected with the set books or the literary and historical background. There will be a choice of at least seven subjects.

(*b*) The critical appreciation in English of a passage of modern Spanish not taken from a set book.

NOTE.—*For examinations in science subjects, candidates may bring and use stencils for drawing apparatus.*

Science ORDINARY LEVEL

There will be one two and a half hour paper divided into two parts. Part I will consist of a number of questions requiring short answers, with no choice. Part II will consist of fewer questions, requiring longer answers, with a choice.

The object of the syllabus is to introduce candidates to the methods of science, and something of their applications in every-day life and to give some appreciation of the work of scientists.

An elementary knowledge will be assumed of the units of measurement appropriate to the various topics in the syllabus.

Questions will be set to test candidates' powers of applying elementary scientific principles to the solution of simple problems, particularly biological ones.

The names of scientists in the syllabus are given to indicate that candidates should have some knowledge of their contribution to the particular topic. Biographical details are not required.

A reading list may be obtained on application, enclosing a stamped addressed foolscap envelope, to the Secretary.

(For ease of reference the syllabus is divided into numbered sections and paragraphs, and this does not necessarily imply a teaching order.)

I

1. An elementary study of the night sky. The solar system and how the knowledge of it has been obtained. Ptolemy, Copernicus, Galileo, Tycho Brahe, Kepler, Newton.
2. The earth and gravitation; tides.
3. Eclipses. Sunspots.

4. Simple notions of a galactic system.
5. Rocks; the three main types—igneous, sedimentary, metamorphic, and their recognition. Simple ideas of their origin; the rôle of water. William Smith.
6. Water as a solvent.
7. Water pressure and air pressure. How our knowledge of atmospheric pressure has been built up. Von Guericke, Torricelli, Boyle.
8. The composition of the atmosphere: oxygen, nitrogen, carbon dioxide and water vapour. Priestley, Lavoisier, Ramsay; the inert gases.
9. Oxidation as combination with oxygen, illustrated by the combustion in air or oxygen of hydrogen, carbon, sulphur, phosphorus, calcium, sodium, magnesium, copper, iron.
10. Mixtures, compounds and elements; metals and non-metals.
11. Simple concepts of acids, bases and salts as exemplified by:
    (i) carbonic acid and dilute solutions of mineral acids;
    (ii) sodium hydroxide, magnesium hydroxide, calcium hydroxide;
    (iii) sodium chloride, copper sulphate, magnesium sulphate, calcium carbonate.

II

1. Elementary physiology of a vertebrate:

   Food. Digestion. Spallanzani, Beaumont.

   Respiration, and the release of energy. Lavoisier.

   The skeleton and muscles as a simple mechanical system.

   Blood system. Harvey, Malpighi. Nervous system. Pavlov.

   Excretion.

   Reproduction.

   Sense organs.

2. Plants—structure of a buttercup plant and of a moss; pollination, fertilisation, germination of seeds and spores.

   Nutrition of the green plant; photosynthesis, mineral nutrients, respiration. Hales, Priestley, Ingenhousz, Sachs.

3. Bacteria. Pasteur, Koch.
4. Study of soil, soil micro-organisms, earthworms.
5. Comparison of the elementary physiology of plants and animals.
6. Inter-dependence of plants and animals.
7. Characteristics of living things.
8. The development of living things on the earth—fossils, and elementary ideas of evolution. Darwin. Mendel.

III

1. Atoms. Dalton's atomic theory; the laws of conservation of mass, of constant composition, of multiple proportions. Symbols, formulae.
2. Experiments on the combination of gases by volume: (i) hydrogen and oxygen; (ii) hydrogen and chlorine; (iii) nitric oxide and oxygen; (iv) thermal dissociation of ammonia.
3. Gay Lussac's Law.
4. Avogadro's Hypothesis.
5. The molecule as the simplest particle of a gas which can exist.
6. Diffusion. Brownian movement.
7. Kinetic theory of liquids and gases. Qualitative explanation of pressure in liquids and gases.
8. Heat—expansion of solids, liquids and gases. Change of state.
9. Temperature; idea of absolute zero.
10. Conduction and convection of heat.
11. Radiation. The visible spectrum. Colour. Newton.
12. Infra-red and ultra violet radiation.
13. The electro-magnetic spectrum.

IV

1. Heat exchanges in chemical action: viz. sodium and water; quicklime and water; zinc dust and copper sulphate solution.
2. The Daniell cell.
3. Heating by the electric current.
4. Electrical conductors and non-conductors. Static electricity. Galvani, Volta.
5. Electrolysis of fused solids, e.g., lead bromide. Davy and sodium hydroxide.
6. Electrolysis of solutions in water: viz. copper sulphate with copper electrodes; sulphuric acid with lead electrodes.
7. The general characteristics of electrolytes and non-electrolytes.
8. Faraday; the concept of the electron; ions.

V

1. The purpose of simple machines—examples.
2. Work and energy.
3. Mechanical efficiency.
4. The transformation of energy.
5. Water and wind power.
6. The principles of the simple steam engine and of turbines; the internal combustion engine; the jet and rocket motors. Trevithick, Newcomen, Stephenson, Watt, Parsons, Diesel, Whittle.
7. Electrical energy; generators and transformers; distribution and uses. Simple motors, simple measuring instruments. Faraday.
8. Coal, its destructive distillation; natural gas; oil; nuclear power.
9. Occurrence and principles of extraction of iron and aluminium. Alloys: bronze, steel, duralumin. Properties in relation to uses.
10. Principles of the preparation of thermo-setting and thermo-plastic plastics.
11. Detergents and water-proofing in relation to surface tension.

General Science ORDINARY LEVEL

There will be one two and a half hour paper divided into two parts. Part I will consist of a number of questions requiring short answers, with no choice. Part II will consist of fewer questions, requiring longer answers, with a choice.

The syllabus gives the scope of the subject in general terms. A schedule indicating more exactly the topics and detail expected is available on application, enclosing a stamped and addressed foolscap envelope, to the Secretary.

1. An outline of the structure of the universe and of the solar system with the place of the earth therein. The moon and its phases. Time and its measurement. Gravity.

2. The nature of the earth: its interior: its crust. Rocks, primary and secondary: minerals: ores. Erosion and transport of material. Topography. Soils.

3. The atmosphere in relation to the earth and as an introduction to the physics and chemistry of gases and to the phenomena of oxidation and reduction. Air and living organisms.

4. Water: its sources and supplies; physics of water; chemistry of water; water as a solvent.

5. The states of matter.

6. Acids, alkalis and salts. The common metals, their compounds and uses.

7. Energy, its sources and transformations: work: machines. The fundamental laws and main applications of electricity and magnetism. Light, its sources and simple relations. Sound as an introduction to wave propagation.

8. The world of living things. The gross structure and life-history of the flowering plant and the salient features of its physiology. Organic compounds, their formation and utilisation in nature. The gross structure and life-history of the earthworm, an insect, a fish, the frog and a mammal. The relation of organisms to the biotic and physical environment. An introduction to microscopic life. The role of micro-organisms, especially fungi and bacteria, in nature.

9. The economic uses of plants and animals.

10. Variation and inheritance. Evolution. The characteristics of living things. Man and his place in nature.

Physics-with-Chemistry ORDINARY LEVEL

The examination will comprise one two and a half hour paper in two parts. Part I will consist of a number of questions requiring short answers, with a limited choice. Part II will consist of fewer questions requiring longer answers, with a wider choice. Some questions will test experimental work and some will include simple calculations. Questions which involve a knowledge of both chemistry and physics will be set.

Velocity. Space-time and velocity-time graphs. Deduction and use of equations of uniform and uniformly accelerated motion in a straight line.

Mass and weight. Relation between force, mass and uniform acceleration. The principle of the spring balance. Momentum. Newton's Laws.

Moment of a force. Principle of moments. Levers. Work. Kinetic and Potential Energy. Transformation and conservation of energy.

Density. The Principle of Archimedes. Flotation. Common hydrometer.

Pressure in a liquid. Gas pressure; simple kinetic theory. Boyle's Law. Aneroid and simple mercury barometers.

Simple quantitative treatment of linear expansion of solids, including a method of determining the coefficient of linear expansion. Qualitative treatment of expansion of liquids. Anomalous behaviour of water. Expansion of gases. Charles' Law. Absolute zero and Absolute Temperature. Heating of a gas on compression and its cooling on expansion. Principle of refrigerator and heat pump.

Thermometers, including clinical thermometer. Centigrade and Fahrenheit scales with interconversion.

Calorie. Thermal capacity. Determination of specific heat of solid by method of mixtures. Latent heats of fusion and evaporation and their determination for water. (Only simple calculations will be set.)

Simple qualitative treatment of conduction, convection and radiation.

Light. Rectilinear propagation. Shadows and eclipses. Pinhole camera. Laws of reflection and refraction and their verification. Formation of images by reflection at plane surfaces. Passage of light through rectangular and triangular

prisms and thin convex lenses. Solution of problems by graphical methods. Total internal reflection and critical angle. Determination of Refractive Index by simple experiments based on (*i*) measurement of angles of incidence and refraction, (*ii*) critical angle.

The visible spectrum. Important features and uses of infra-red and ultra-violet radiation.

Magnets. Methods of magnetisation and demagnetisation. Lines of force. The compass needle. The magnetic effect of an electric current. The electric bell. Electro-magnetic induction and motor effect as illustrated by the simple dynamo and motor. The heating effect of an electric current. Chemical effect of an electric current. Faraday's Laws. Simple cell. Polarisation and local action. Ohm's Law. The watt and kilowatt-hour. Resistances in series and parallel. Simple ammeters and voltmeters. E.M.F. and P.D. of a cell. Internal resistance. Determination of unknown resistance using voltmeter and ammeter.

Elementary atomic and molecular theories. Elements and compounds. Atomic and molecular weights. Chemical reactions. Simple formulae and equations.

The Air; a simple method of estimating composition by volume. Combustion. Water. Composition by weight. Solutions, including determination of solubility of salt by simple method. Hard water. Methods of removing permanent and temporary hardness. Simple method of comparing hardness of water samples. Water of crystallisation. Characteristics of acids, alkalis and salts. Preparation of salts by neutralisation of acid by alkali, insoluble base and carbonate. Insoluble salts by double decomposition and direct combination. Hydrogen and oxygen. Laboratory and large-scale production. Uses. Oxidation and reduction limited to addition and removal of oxygen and hydrogen only. Nitrogen. Ammonia: its laboratory and large-scale production. Ammonium salts. Nitric acid; laboratory preparation from sodium nitrate. Sulphur. Rhombic, monoclinic and plastic sulphur. Sulphur dioxide and trioxide. Contact Process for manufacture of sulphuric acid. Sulphuric acid and its uses. Common salt and hydrochloric acid. Laboratory preparation of chlorine and its simple characteristic reactions. Bleaching powder and sodium hypochlorite. The properties of sodium and its nitrate, hydroxide, carbonate and bicarbonate. Calcium and its oxide, hydroxide, carbonate, bicarbonate, sulphate, chloride and their uses.

Principles of extraction and common industrial uses and properties of iron, aluminium and zinc. Simple concept of alloys, e.g. steel, duralumin, bronze. Catalysis. Carbon and its allotropic forms. Carbon dioxide and carbon monoxide. Coal: its destructive distillation treated simply.
Simple calculations set from the percentage composition of a compound from its formula, the empirical formula of a compound from its percentage composition and the weights of reactants and products taking part in a chemical reaction.

Human Biology ORDINARY LEVEL

The examination will comprise one written paper of two and a half hours.

Introduction

Biology, the science of life, includes within its scope the study of the interrelations of plants and animals and the relation of living organisms to their physical environment. Man, as an animal, is subject to the same general laws of nature as other animals, but, unlike them, is able to exercise a great measure of control over the conditions of his life. The proper exercise of this control, which includes the promotion of health both by individual effort and social organisation, demands an understanding of the nature and biology of other organisms.

Emphasis should be placed rather on general principles than on detailed knowledge of bones, muscle insertions, incubation periods of diseases and so on.

The aim of the syllabus is:

(i) to provide a background of biological knowledge that will ensure an understanding of the principles of health education;

(ii) to give an elementary but sound instruction in the structure and functions of the human organism;

(iii) to encourage a positive attitude towards health.

Wherever possible the structure of the body and its physiology should be studied by observation and simple experiment. The role of the Social and Health Services should be made familiar by personal enquiry and group visits. It is suggested that paragraphs 14–17 of the syllabus should be allotted at least one-third of the total teaching time.

It will be assumed that candidates have previously pursued a course of Elementary Science, including Biology, and that they have a sufficient knowledge of Physics and Chemistry to be able to understand the Physiology and Hygiene included in the work.

Syllabus

1. General principles: the attributes of living organisms with special reference to man. The living cell as a unit of life. Distinction between cells, tissues and organs. The interaction between living organisms and their environment. Stability of internal environment. The comparison between plants and animals. The interdependence of plants and animals. Plants as the ultimate source of man's food. The relationship between form and function.

2. Man as a mammal. General structure of a mammal. Position of the principal organs of the body in relation to one another. (It is suggested that the rabbit or guinea-pig be used for demonstration dissections by the teacher to illustrate general anatomy.)

3. The skeleton and its functions. Types of joints. Muscles, their origin and insertion in relation to movement. Candidates should be familiar with the idea that movement is brought about by the co-ordinated contraction and relaxation of opposing sets of muscles. The principle of levers applied to movement of joints. The characteristics of good posture. The importance of exercise. Work, fatigue, rest.

4. Circulatory system. Position of the heart in the thoracic cavity. Structure and action of the heart. Arteries, arterioles, capillaries, veins. Candidates will be expected to know the main course of the circulation and distribution of blood to the body and principal organs. Blood: composition and functions; haemorrhage; clotting; blood groups. Lymph and lymphatics.

5. The respiratory system. Nose and mouth, trachea, bronchi, lungs, alveoli. The mechanism and control of breathing. Internal respiration leading to the release of energy for the activities of life. Composition of air. Difference between inspired and expired air. Relation between muscular activity, the heart beat, and breathing. Importance of ventilation (to be considered also under regulation of temperature; see paragraph 8).

6. Food and its uses. Basic food requirements; proteins, carbohydrates, and fats; mineral salts, vitamins and water. The importance of a balanced diet and of regular meals. Food requirements during infancy, childhood and adult life. Relative requirements of manual and sedentary workers.

7. The alimentary canal. The structure and function of teeth. Digestion of food in the mouth, stomach and small intestine. Food absorption, transport and utilisation. Functions of the large intestine. Enzymes; simple experiments with enzymes, e.g. ptyalin and pepsin, to illustrate their properties. Liver and pancreas.

8. The structure and functions of the skin; regulation of body temperature. Suitable clothing. The importance of cleanliness of skin and hair.

9. The excretory system; kidneys. Structure and functions of the kidneys and bladder. (The kidneys should be regarded as being composed of a system of tubes supplied by blood vessels and leading to ureters, and no details of the course of the tubules or of the blood vessels will be expected.) Substances in urine.

10. The nervous system. Brain, spinal cord, peripheral nerves. Reflex action; conditioned reflexes; voluntary actions; habit formation. The effect of alcohol on the nervous system. Sleep. The sense organs and their work; the skin as a sense organ; organs of taste and smell. The general structure and action of the eye. Long sight and short sight. The general structure and action of the ear; hearing, balance, movement.

11. The positions of the main endocrine glands and the functions of thyroxine, adrenalin and the sex hormones.

12. Reproduction. Male and female organs. Menstrual cycle. An outline of the growth of the foetus. Special needs of the pregnant woman.

13. An outline of Mendelian inheritance applied to one pair of hereditary factors. Chromosomes and their importance.

14. Common diseases and how they are spread. Simple study of micro-organisms in relation to disease. Simple experiments to show the presence of micro-organisms in air, water, milk and on the hands. Insects as carriers of disease.

Commonly occurring parasites, *e.g.* worms. Immunity, natural and acquired; vaccination.

15. Food storage and preservation. Sources of food contamination. Personal and communal responsibilities in the "handling" of food and food utensils. Cleanliness applied to the preparation, storage and serving of food.

16. Communal responsibilities; housing, and requirements for healthy dwellings; principles involved in the lighting, ventilation and heating of buildings; relation between overcrowding and health; the importance of open spaces, *e.g.* parks and playgrounds; the importance of sunlight to health. Sources of water supply, *e.g.* rainwater, springs, wells and rivers. Impurities in water and their sources; methods of purification. Water-borne diseases, *e.g.* typhoid fever and cholera. Disposal of waste matter, including kitchen waste and sewage.

17. The role of the Local and National Health Services. Public health services in connection with sanitation and the inspection of food. Importance of isolation; disinfection of house, clothing and utensils after infectious diseases. Laws to safeguard the health of factory workers.

Biology ORDINARY LEVEL

The examination will comprise a written paper of two hours and a practical test of one hour which will be taken in the candidates' school. In the practical test only such details of structure as are visible with a simple lens will be required.

The course should be primarily practical and experimental. A knowledge of physics and chemistry sufficient to understand physiological processes will be assumed. Wherever practicable the teaching should be related to human biology.

Explanatory notes are printed in small type.

1. (*a*) *Protoplasm*

The elementary facts about its composition and biological properties; characteristics of living organisms; conditions necessary for life.

This section is intended as a general introduction to biology and should be treated very simply in the first place.

(*b*) *Cells*

Selected examples from animals and plants to show similarities and differences in structure and function; the meaning of the terms tissue, organ and organism.

Different kinds of cells should be demonstrated by microscope or microprojector.

2. *The Mammal*

The general biology, anatomy and elementary physiology of a mammal. These involve looking at the mammal as a living whole organism in its environmental setting.

Although a small mammal, e.g. rat, rabbit or guinea-pig, is used for most of the work, there should be frequent reference to human biology.

(*a*) The main structural features including the general arrangement of the internal organs.

Demonstration dissections by the teacher would suffice.

(*b*) The general plan of the skeleton and its functions. Different types of joints as illustrated by the shoulder, hip and elbow and the way in which muscles act on bones to produce movement. Bones as levers.

Details of the structure of the skull are unnecessary at this stage and some of the names of the articulatory and other processes of vertebrae and other bones may well be simplified.

(*c*) Food and its ingestion. The constituents of an adequate human diet. Teeth and their relation to diet and function in humans, in a carnivore and in a herbivore.

Tests for reducing sugar, starch, protein and fat should be carried out on a few foodstuffs. The importance of vitamins and salts should be indicated.

(*d*) Digestion, parts of the alimentary canal and their functions. Enzyme action. The absorption, transport and utilisation of digested food. The functions of the liver in general body metabolism.

Experiments illustrating the action of two or three digestive enzymes should be performed.

(*e*) The main features of the circulatory system, with a simple account of the structure and action of the heart. Composition and functions of blood. Capillary circulation and a brief reference to the lymphatic system.

It would be sufficient to name only the main blood vessels of the liver and kidney and those entering and leaving the heart. Blood should be examined microscopically. Capillary circulation can be demonstrated in a tadpole's gills or tail or in the web between the toes of a frog.

(*f*) Respiration: the mechanisms of inspiration and expiration; gaseous exchanges in the lungs and tissues; the elements of tissue respiration; a general outline of the energy exchanges of the body.

For anaerobic respiration just the simple breakdown of glucose to lactic acid and the repayment of the oxygen debt incurred would suffice. Experiments on the intake of oxygen and the production of carbon dioxide should be performed.

(*g*) Excretion by kidneys.

The kidney should be treated simply as comprising cortex and medulla and as containing malpighian bodies for pressure filtration and a branched system of tubules, well supplied with blood vessels, allowing for reabsorption. Details of the courses of the tubules and their blood vessels are unnecessary.

(*h*) Structure and functions of the skin.

(*i*) Regulation of body temperature and the importance of the maintenance of a constant body temperature.

Heat gain as well as heat loss should be considered.

(*j*) The defences of the body against infection.

Several health education items are relevant here.

(*k*) The nervous system. A simplified account of the brain and spinal cord. Reflex action and how it differs from voluntary action. The principal sense organs, their positions and functions. The structure of the eye and the ear.

Only the external structure of the brain need be considered, though reference should be made to the distribution of white and grey matter. Reflex action should be illustrated experimentally. Behaviour should be considered a little, especially a contrast between the more "instinctive" and more "intelligent" types.

(*l*) The functions of the endocrine system.

The positions and functions of the main ductless glands should be indicated, and such hormones as thyroxine, adrenaline and the sex hormones should be considered.

(*m*) The reproductive organs and a general outline of the development, nutrition, respiration and birth of the young.

3. *Flowering Plants*

(*a*) The external morphology of an herbaceous flowering plant.

Several common examples should be studied.

(*b*) Characteristic features of three different species of tree in summer and winter, including one deciduous and one evergreen example.

The study of a tree should include an elementary treatment of secondary thickening, including the formation and functions of bark, also demonstration of the function of lenticels and the part played by the abscis layer in the process of leaf fall.

(*c*) The very simple treatment of the structure of root, stem and leaf sufficient for an elementary understanding of (i) to (v).

Sections of the root, stem and leaf of an herbaceous dicotyledon, e.g. sunflower, should be examined with the aid of a microscope or a microprojector, to show distribution of the chief types of tissue, but details of cell structure need not be studied.

(i) The absorption of water and of mineral salts; the movement of water in the plant; transpiration.

Processes of osmosis and diffusion should be demonstrated with an artificial cell and with living material.

The path of the transpiration stream should be demonstrated by use of dyes.

Experimental work should include the loss in weight of a potted plant, or of a leafy shoot in a test tube, the use of cobalt chloride paper, and the effect of external conditions on the rate of water loss. When a potometer is used, its limitations should be stressed.

(ii) An elementary study of photosynthesis.

The necessity for light, carbon dioxide and chlorophyll should be established experimentally, also the formation of starch and the output of oxygen.

(iii) Mineral nutrition; water or sand cultures; protein synthesis very simply treated.

Water or sand culture experiments should be demonstrated.

(iv) Respiration: the nature of the process; energy exchange.

Experiments should be carried out on gaseous exchanges and on heat production.

(v) Growth and tropic movements.

This should include the regions of growth in root and shoot, geotropic responses of primary roots and shoots, phototropism of shoots, and hydrotropism of roots.

(*d*) The parts of a flower and their functions. The detailed mechanism of pollination in not more than two insect pollinated and one wind pollinated flower. Fertilisation and the development of seeds and fruits in the flowers studied.

Fertilisation should be treated without reference to microscopic detail other than the growth of the pollen tube and fusion of nuclei.

(*e*) Fruit and seed dispersal.

This should be illustrated by examples of wind, animal and self dispersal.

(*f*) The structure of seeds and seedlings. Conditions for seed germination.

At least one example of epigeal and one of hypogeal germination should be studied. Experiments on the effects of water, oxygen, temperature and light should be included.

(*g*) Herbaceous perennials illustrating forms of storage organs and vegetative reproduction.

Four examples of varied type should suffice. Vegetative propagation and reproduction by seed should be compared and contrasted.

(*h*) Soils in relation to plant growth. Manuring.

Experimental work should include mechanical analysis, determination of the amount of air, water and humus, and a comparison of the capillarity and porosity of different samples of soil. The importance of organic and inorganic fertilisers should be considered.

4. The external features, mode of life and life history of earthworm, butterfly, honey bee, fish, frog and bird.

This should include whenever possible the study of the living animal in its environment. There should be a simple treatment of the methods of respiration in these types. Only a general consideration of the feeding apparatus of the insect types need be included, just sufficient to provide understanding of the feeding habits.

5. *Micro-organisms*

(*a*) Amoeba: morphology, movement, mode of life, life history. Mucor: morphology, nutrition, life history. Spirogyra: morphology and nutrition.

A microscope, using a two-thirds inch objective, or a microprojector should be used, but higher powers of magnification are unnecessary. Mucor cultures should be set up and studied.

(*b*) The importance of fungi and bacteria as saprophytes in causing decay; the nitrogen cycle; rotation of crops; methods of preserving food. The importance of fungi and bacteria (with a brief mention of viruses) as parasites in causing disease; antisepsis, asepsis, inoculation.

Only a simple treatment of these topics is necessary.
Brief reference should be made to the work of such scientists as Pasteur, Lister, Jenner and Fleming.

6. Differences between animals and plants. A simple treatment of the relations of plants and animals to their environments and to each other, and their complementary functions within the eco-system. An elementary study of a community in some well defined habitat.

Inter-relationships and inter-dependence should be stressed, e.g. food chains.
Pupils should be encouraged to study natural history on their own and through the school natural history society.

7. A simple introduction to the study of heredity and variation and the concept of evolution.

Simple Mendelian inheritance. Linkage, but not sex linkage. Mention of crossing-over is unnecessary.

Biology ADVANCED LEVEL

The examination will comprise two written papers of three hours each, and a practical test of three hours.

The syllabus requires a practical study of the biology of plants and animals based on accurate observation of their structure and on simple physiological experiments. A study of plants and animals in the field is regarded as an essential part of the syllabus; wherever possible, living organisms should be kept under observation in the laboratory and in the garden.

A knowledge of physics and chemistry sufficient for the understanding of environmental factors and elementary physiological processes will be expected.

Botanical and Zoological questions will not be confined to separate papers and general biological questions may occur in both.

1. *The Mammal* (*Rat or Rabbit*)

The skeleton (without details of the skull); dentition.
General arrangement of muscles in relation to movement (names of muscles are not required).
The skin.
The digestive system.
The vascular system.
The respiratory system.
The excretory system.
The nervous system; sense organs.
The reproductive system.
Nutrition: the constituents of a balanced diet; digestion; absorption.
The circulation, composition and functions of blood and lymph.
Respiration: the mechanism of inspiration and expiration; gaseous exchanges in the lungs and tissues; a general outline of the energy exchanges of the body.
Excretion, including a simple account of the action of urinary tubules; sweat glands. Temperature control.
Action of the nervous system and sense organs; reflex action.
Hormones and the endocrine system as exemplified by the thyroid, adrenals, pituitary, islets of Langerhans, gonads.
Reproduction: fertilisation; an outline of development.
Habits in relation to environment.

2. *Flowering Plants*

The morphology and anatomy of an herbaceous dicotyledonous plant (e.g. wallflower) and of a tree (e.g. oak).
The detailed structure of at least two simple flowers, regular and irregular.
The elements of the physiology and life processes of flowering plants, illustrated by simple experiments where appropriate.
Photosynthesis.
Respiration: aerobic and anaerobic.
Intake and conduction of water.
Transpiration.
Mineral nutrition.
Growth, primary and secondary.
Tropic responses to iight and gravity.
Self-pollination and cross-pollination; fertilisation.
An outline of the development of the embryo-sac and embryo.
Fruit and seed formation and dispersal.
The structure and germination of dicotyledonous seeds (epigeal and hypogeal); conditions necessary for germination; utilisation of food reserves.

3. *Other Organisms*

A practical study of a range of plants and animals is required, based as far as possible on examination of living organisms and on ecological observation. The choice of types is such that collectively it illustrates diversity of structures, movement, nutrition, respiration, behaviour and reproduction.
An elementary study of bacteria.
Paramecium (excluding details of conjugation), Amoeba, Euglena, Chlamydomonas, Monocystis.
Spirogyra; Fucus.
Mucor; Cystopus.
The external features and outline of life history of Pellia and Dryopteris.
Hydra.
An earthworm (omitting details of the reproductive system).
The life histories and behaviour of a butterfly, bee and mosquito.
The external features and life history of the frog.

4. *Structure and Physiology of Cells*

The cell as the unit of life. The structure of plant and animal cells. Cell and nuclear division (mitosis). Cell differentiation and tissue formation including vascular and mechanical tissues of flowering plants and the histology of blood, connective tissue, including cartilage and bone, epithelia, muscle and nerves.

An elementary study of carbohydrates, fats and proteins. Enzymes and their role in cell metabolism. The permeability of membranes; diffusion. The water relations of the cell; osmosis.

An outline of gametogenesis including meiosis; fertilisation.

5. *General Biological Topics*

Perennation and vegetative propagation in plants; storage of food in specialized plant organs; hibernation and migration in animals.

Parasitism, symbiosis and saprophytism.

Soil structure and fertility in relation to plant life; carbon and nitrogen cycles.

6. *Ecology*

An elementary study of the plant and animal ecology of any one habitat.

The balance of nature; conservation of biological resources.

Energy relations in plants and animals.

Attention should be given to observational and experimental investigations of the interrelations between the plants and animals in the habitat selected and of the influence of soil, climate, human and other biotic factors.

Candidates may submit, on or before May 15th, records of their own individual field studies attested by the responsible teacher. These will be taken into consideration by the examiner.

7. *Evolution and Heredity*

An outline of the concept of and evidence for evolution; natural selection.

An elementary study of heredity.

8. *Biology in the Service of Man*

Three of the following should be studied.

(i) Food supply and an expanding human population.

(ii) The control of disease in man in relation to personal hygiene and public health.

(iii) Insects as vectors of disease and methods of controlling them.

(iv) Plant and animal breeding.

PRACTICAL EXAMINATION

Candidates may be asked to send their practical notebooks, duly attested by their teachers, for on examiner's inspection. They may be asked to dissect an earthworm, rabbit or rat*, to perform simple physiological experiments and to investigate and comment on plant and animal specimens and material. Candidates will be expected to be able to make simple temporary preparations and to use the compound microscope. Great importance is attached to accurate observation and clear line drawings.

**Candidates and schools must state on or with their entry forms which of the rabbit or rat they prefer for their practical examination.*

The practical examination will be held in the laboratories of recognised schools for their candidates, and in the laboratories of the University of Bristol for private study candidates and for candidates from unrecognised schools.

SPECIAL PAPER

This will be a three hour paper on the same syllabus.

Botany ADVANCED LEVEL

The examination will comprise two written papers of three hours each, and a practical test of three hours.

The syllabus requires a practical study of plant biology based on accurate observation of plant structure, and simple physiological experiments, together with field and garden studies.

1. *The elements of the structure and physiology of flowering plants.*

(*a*) The comparative morphology of typical dicotyledonous and monocotyledonous plants, and their main anatomical features treated in relation to function.

The structure of plant cells, nuclear and cell division and differentiation, including secondary thickening.

(*b*) Physiology: water relations, photosynthesis, mineral nutrition, respiration, growth and tropic responses.
An elementary study of the chief chemical constituents of plant cells; enzymes and their role in metabolism. The permeability of membranes.

(*c*) Reproduction: the structure of flowers; pollination mechanisms; fertilisation; the development of seeds and fruits. Dispersal of fruits and seeds; germination.
Vegetative propagation.

2. *The variety and classification of plants.*

The general principles underlying the classification of the plant kingdom. The study of unicellular, filamentous and thalloid algae, e.g. *Chlamydomonas*, *Spirogyra*, *Ulothrix*, *Vaucheria*, *Fucus;* bacteria; a saprophytic and a parasitic fungus, e.g., *Mucor*, *Aspergillus*, *Saccharomyces*, *Cystopus*, *Erysiphe*, *Psalliota;* a liverwort and a moss; a fern; a gymnosperm.

The meaning of the terms family, genus, species and variety, illustrated by reference to common British flowering plants.

A study of the *Ranunculaceae*, *Leguminosae* (*Papilionaceae*), *Rosaceae*, *Scrophulariaceae*, *Labiatae*, *Compositae*, *Liliaceae* and the vegetative and floral structure of a grass. Exercises based on the use of one of the British Floras.

3. *Plants in relation to their environment.*

The general principles of ecology. Observations and records throughout the year of plant communities developed in at least two different habitats with reference to the influence of edaphic, climatic and biotic factors. Soil fertility; C and N cycles.

The variety of form and of life history of flowering plants in relation to habitat, and mode of nutrition.

4. *Heredity and evolution.*

The principles of heredity, including Mendelian inheritance and an outline of the nuclear changes associated with the reproductive cycle. Variation.

An outline of the concept of and evidence for evolution.

PRACTICAL EXAMINATION

Candidates should bring with them: Bentham and Hooker: *Handbook of the British Flora*; or Watts: *A School Flora*; or Clapham, Tutin and Warburg: *Flora of the British Isles*; or *Excursion Flora of the British Isles;* or F. K. Makins: *Concise Flora of Britain* 2nd edn.

They may be asked to send their practical notebooks, duly attested by their teachers, for the examiner's inspection. They will be expected to show acquaintance with and the ability to cut plant sections, to use a single stain and make simple microchemical tests. Double staining and permanent mounting will not be required.

Candidates may be asked to perform simple physiological experiments and to investigate and comment on plant specimens. Great importance is attached to accurate observation and clear line drawings. Candidates are expected to be able to use the compound microscope.

The Practical examination will be held in the laboratories of recognised schools for their candidates, and in the laboratories of the University of Bristol for private study candidates and for candidates from unrecognised schools.

SPECIAL PAPER

This will be a three hour paper on the same syllabus.

Zoology ADVANCED LEVEL

The examination will comprise two written papers of three hours each, and a practical test of three hours.

The syllabus requires a practical study of animal biology based on accurate observation of animal structure, simple physiological experiments, and appropriate field studies.

1. The elements of animal structure and physiology as illustrated by the study of a mammal.

(*a*) The functional morphology and relationships of the principal organs of the body. This should include: the skeleton (without details of the skull except teeth), the general arrangement of muscles in relation to movement (names of muscles not required), the skin, the digestive system, the vascular system, the respiratory system, the urino-genital system (including an account of the action of the urinary tubules), the nervous system and sense organs.

(*b*) Digestion, storage and utilisation of products of digestion, the constituents of a balanced diet, digestive enzymes. The circulation, composition and functions of blood and lymph. Breathing, the mechanism of inspiration and expiration, gaseous exchange in the lungs and tissues; elementary study of tissue respiration.
Excretion.
Temperature control.
Hormones and the endocrine system as exemplified by the thyroid, adrenals, pituitary, islets of Langerhans and the gonads.
Reflexes and reflex action.
Growth and reproduction; the development and care of young.

(*c*) An outline of the structure and physiology of cells to include protoplasm, its physical and chemical nature, cytoplasm and nucleus, mitosis, the cell surface.
The histology of the following vertebrate tissues: blood epithelial, connective, skeletal, glandular, muscular and nervous; and of the following mammalian organs: duodenum, liver, kidney, gonads, spinal cord, skin (compared with that of the frog and dogfish).

2. The variety of animals.

A practical study of the animals listed below, based as far as possible on examination of living specimens and on field observation, to include the diversity of their structure, nutrition, respiration, excretion, reproduction, behaviour and locomotion.

(1) Protozoa: *Euglena*, *Polytoma*, *Amoeba*, *Paramecium*, *Monocystis*, *Plasmodium*.

(2) *Hydra* and *Obelia*.

(3) A Planarian (excluding reproductive system); *Fasciola*.

(4) Earthworm.

(5) Cockroach. The life history and feeding habits of a butterfly, honey bee, mosquito, aphid, housefly or blowfly (details of mouth parts not required).

(6) Snail (external features, feeding and life-history only).

(7) Dogfish.

(8) Frog.

(9) Bird (limited to general behaviour and adaptations to feeding and flight).

3. In addition to the general features of the reproductive process in the animals listed above, a detailed study (so far as this can be made with the aid of a hand lens) of the development of the frog and of the bird. The function (but not the origin) of the embryonic membranes in the bird and mammal.

4. The principles involved in the classification of animals: the basic distinguishing characteristics of the main phyla, and of the classes of the arthropods and of the vertebrates.

5. The principles of heredity, including an elementary knowledge of Mendelian inheritance and sex-linkage together with their cytological background. A detailed study of chromosome changes during meiosis is not required, but the importance of pairing and subsequent separation of homologous chromosomes should be realised.

6. The modern concept of animal evolution and evidence supporting it.

7. The relations of animals to the environment based on a study of animals in any one selected habitat. The inter-relationships of animals with other organisms.

PRACTICAL EXAMINATION

Candidates may be asked to send their practical notebooks, duly attested by their teachers, for the examiner's inspection.

They may be asked to dissect the following: rabbit or rat*, frog, dogfish, cockroach, earthworm.

Candidates will be expected to be able to make simple stained permanent preparations, to use the compound microscope, and to identify and comment on animal specimens and material. Great importance is attached to accurate observation and clear line drawings.

**Candidates and schools must state on or with their entry forms which of the rabbit or rat they prefer for their practical examination.*

The practical examination will be held in the laboratories of recognised schools for their candidates, and in the laboratories of the University of Bristol for private study candidates and for candidates from unrecognised schools.

SPECIAL PAPER

This will be a three hour paper on the same syllabus.

Geology ORDINARY LEVEL

The examination will comprise one written paper of two and a half hours on the following syllabus. Candidates should make full use of drawings to illustrate their answers.

The course of study should be linked so far as it is possible with the geology of the school district. Field excursions form a vital part of the training and cultivate scientific enquiry and observation under natural conditions. Practice is desirable in the collection of specimens, the observation of agents of erosion and deposition, simple field sketching and the study of simple geological maps.

1. *Mineralogy.*

Properties of minerals necessary for identification in the hand specimen. Elementary study of the commonest rock-forming minerals and ore minerals: quartz, felspars, micas, hornblende, haematite, magnetite, iron and copper pyrites, galena, calcite, fluorspar, rock-salt, gypsum, barytes, limonite, olivine, tourmaline, garnet, zinc blende, malachite and azurite.

2. *Petrology*

Forms of igneous intrusions and extrusions: dykes, sills, batholiths, lava flows, necks. Foliation. Metamorphic aureole. Common types of sedimentary, igneous and metamorphic rocks: conglomerate, breccia, sandstone, shale, mudstone, marl, clay, limestone (including chalk), dolomite-rock, flint, chert, coal; granite, syenite, diorite, andesite, gabbro, quartz porphyry, dolerite, rhyolite, trachyte, basalt, obsidian, slate, quartzite, marble, schist, gneiss.

3. *Palaeontology*

Modes of occurrence, preservation and value of fossils. An understanding of the structure of the commonest invertebrate fossils as exemplified by a type from the following groups: corals, crinoids, echinoids, brachiopods, lamellibranchs, gastropods, ammonites, belemnites, trilobites, graptolites. An appreciation of the range of age of each group.

4. *Physical Geology*
The geological cycle. Deposition in littoral, shallow and deep water. Earthquakes. Volcanic activity. Denudation; weathering in different climates; erosion, transport and deposition by water, wind and ice. Marine erosion. The water cycle. Formation of springs, rivers and lakes. Earth movements as indicated by raised beaches, submerged forests, drowned valleys and uplifted marine deposits. The relationship between structure and scenery.

5. *Structural Geology*
Stratification, dip, strike, outcrop; folding, faulting, unconformity, joints, cleavages.

6. *Historical Geology*
The principles of stratigraphy. A general outline of the geological history of England and Wales with particular reference to conditions under which the rocks were formed.

7. *Economic Geology*
Character and mode of occurrence of mineral deposits of igneous and of sedimentary origin. Coal. Petroleum. Water supply. Building materials.

Chemistry

Mathematical Tables
Four Figure Mathematical tables should be provided by schools for their candidates. Private study candidates sitting at University centres will be provided with tables by the Board. Slide rules may be used in the examinations.

ORDINARY LEVEL

The examination will comprise one two and a half hour paper in two parts. Part I will consist of a number of questions requiring short answers, with no choice. Part II will consist of fewer questions requiring longer answers, with a choice.

1. General theory and principles of chemistry to be illustrated by reference to the subject-matter of 2, 3 and 4. Candidates will be expected to show that they have seen, or have themselves performed, experiments to illustrate the syllabus.

2. Elementary atomic and molecular theories. Elements and compounds. Atomic and molecular weights. Chemical reactions. Simple formulae and equations.

3. Acids, bases and salts. Solutions of electrolytes. Electrolysis. Oxidation—reduction reactions; electro-chemical series.

4. The scope of the examination will include hydrogen; oxygen; water; nitrogen; the atmosphere; ammonia; oxides of nitrogen; nitric acid; chlorine; hydrochloric acid; sulphur; hydrogen sulphide; sulphur dioxide; sulphur trioxide; sulphuric acid; carbon; carbon monoxide and dioxide; methane; coal gas. The nature and the characteristics of the following metals and their important compounds: sodium, calcium, aluminium, zinc, iron, lead, copper.

5. Calculations may be set on: the formula of a compound from its composition by weight, given the atomic weights; the quantities (weights and volumes) of reactants and products taking part in a chemical reaction; the equivalent weights of elements; electrolysis.

Chemistry ADVANCED LEVEL

The examination will comprise two written papers of three hours each, ~~and a practical test of three hours.~~

NOTE: *Candidates will be provided with a copy of the periodic table (extended form) in the written examinations.*

To permit individuality of treatment in the courses given in schools a wide choice of questions will be given. Candidates will, however, be expected to show a sound knowledge of inorganic, physical and organic chemistry. Questions may be set to test experience of techniques employed in practical chemistry.

1. The structure of the atom; atomic number, isotopes, and the periodicity of atomic structure.

2. Qualitative ideas of valency theory, including the concept of the *limiting* types of chemical bond: covalent and ionic. Localised and non-localised covalent bonds; hydrogen bond. Shapes of simple inorganic molecules: linear, trigonal, tetrahedral and octahedral.

3. Consideration of the properties of compounds formed by the elements of the various groups of the periodic table (extended form).

General study of each group, with a more detailed study of the following elements and their important compounds.

(i) H
(ii) Na
(iii) Mg
(iv) Al
(v) Si, Sn
(vi) N, P
(vii) O, S
(viii) F, Cl, I
(ix) Three transition elements selected from Ti to Cu inclusive.
(x) Zn, Hg.

4. The mole. The perfect gas: $PV = nRT = (w/M)RT$. The extent to which real gases are perfect. The use of the equation $PV = (w/M)RT$ for the approximate determination of the molecular weights of gases and of vapours. Determination of accurate molecular weights by the method of limiting densities. Real gases at high pressures and at low temperatures; the critical state; liquefaction.

5. Simple treatment of kinetic theory of gases leading to equation $PV = \frac{1}{3}nmc^2 = nRT$.
Perfect gas mixtures: $PV = (n_1+n_2+\ldots)RT$. Definition of mole fraction. Definition of partial pressure. The partial pressures in a perfect gas mixture.

6. Phase equilibria of a pure substance. Enantiotropy.
Variation of vapour pressure of a pure liquid with temperature. Boiling point. Steam distillation.
Boiling-point diagrams for liquid mixtures (including azeotropes). Fractional distillation.
Freezing-point diagrams for liquid mixtures forming simple eutectics.

7. Dilute solutions. Partition of a solute between two immiscible solvents.
Determination of molecular weight of an involatile solute in dilute solution by the lowering of vapour-pressure, elevation of boiling-point or depression of freezing-point. Osmotic pressure.

8. Elementary treatment of rates of chemical reactions in gases and in solutions; dependence on partial pressures or concentrations; dependence on temperature. Catalysis.

9. Chemical equilibrium. Equilibrium law and its application to homogeneous and heterogeneous reactions including simple numerical calculations. Dependence of equilibrium constants on temperature.

10. Thermochemistry. The law of conservation of energy. Calorimetric determination of ΔH for chemical reactions. Combination of heats of reaction.

11. Electrolysis. The Faraday. Electrochemical series. Electron-transfer (oxidation—reduction) reactions.
Electrolytic conduction. Conductivity; molar conductance. Contrasting characteristics of strong and weak electrolytes.

12. Application of the equilibrium law to ionic equilibria with emphasis on simple numerical calculations. Proton transfer (acid-base reactions). Acidity constants, the ionic product of water, stability constants of complex ions, solubility products, pH, buffer solutions, titration curves. Indicators.

13. The purification of organic compounds by crystallisation and distillation. Tests for the purity of crystalline and liquid substances.

14. The detection and quantitative estimation of carbon, hydrogen, nitrogen, oxygen, sulphur and halogens in organic compounds.
The determination of empirical, molecular and structural formulae.

15. Homology. The tetrahedral carbon atom. Structural, optical and geometrical isomerism.

16. The main sources of organic compounds. Coal, petroleum.

17. The hydrocarbons, aliphatic and aromatic. Saturation, unsaturation and aromatic character. Addition and substitution.

18. The preparation of compounds of the aliphatic and aromatic series containing the functions —halogen, >O, —OH, —CHO, >CO, —CO_2H, —CO_2Et, —$CONH_2$, —CN, —NO_2, —NH_2, —SO_3H, as illustrated by one or two examples of each class.

19. The chemical properties of one or two examples of each of the above classes of compounds. The properties of the substituents mentioned above as functions; and the way in which these properties depend on the character of the groups to which the functions are attached.

Practical work

Practical Work should be related to the syllabus. All candidates must submit their practical notebooks, duly attested by their responsible teachers, not later than the third week in May, to the Board's assessors, whose address will be sent to Heads of schools and to private study candidates, after their entries have been received. Any candidate whose practical notebook is considered by the Assessors to be unsatisfactory will not be admitted to the examination. There will be no practical examination.

Explanatory Notes for the Advanced Level Chemistry Syllabus and a Book List may be obtained on written application to the Secretary, enclosing a stamped addressed foolscap envelope.

SPECIAL PAPER. This will be a three-hour paper on the same syllabus, but requiring more quantitative treatment.

Physics

Mathematical Tables

Four Figure Mathematical tables should be provided by schools for their candidates. Private study candidates sitting at University centres will be provided with tables by the Board. Slide rules may be used in the examinations.

ORDINARY LEVEL

The examination will comprise one two and a half hour paper in two parts. Part I will consist of a number of questions requiring short answers, with no choice. Part II will consist of fewer questions requiring longer answers, with a choice. The metric system will be used.

1. *Mechanics*

Mass, length and time. Velocity, acceleration, force, moments, centre of gravity, momentum, energy, work and power. Questions set will be of an experimental rather than of the applied mathematics type.

2. *Properties of Matter*

An elementary concept of the molecular structure of matter, as appropriate throughout the syllabus.

Density, pressure in a liquid, principle of Archimedes, air pressure, Boyle's Law. Barometers, pumps. Hooke's Law. Surface tension treated qualitatively.

3. *Vibrations and Waves*

Examples of vibration. Resonance. Frequency, wavelength, velocity, amplitude as illustrated by e.g. the ripple tank. Longitudinal and transverse waves, stationary waves. Reflection and refraction of waves.

4. *Sound*

Experiments illustrating the production and transmission of sound. Sound as wave motion. (See paragraph 3.)

5. *Light*

Rectilinear propagation. Reflection and refraction at plane surfaces. Properties and uses of curved mirrors and thin lenses, treated experimentally and graphically. Simple optical instruments i.e., magnifying glass, camera, one form of telescope, projector. Dispersion and colour treated qualitatively.

6. *Heat*

Expansion of solids, liquids and gases, solids and gases to be treated quantitatively. Measurement of temperature (knowledge of specialised thermometers not required). Measurement of heat; specific heat. Heat as a form of energy; quantitative relations. Change of state; latent heat. Qualitative treatment of vapour pressure and water vapour in the atmosphere. Conduction, convection and radiation.

7. *Magnetism and Electricity*

Simple magnetic phenomena. Magnetic fields. Terrestrial magnetism (questions on magnetometry will not be asked).

Qualitative treatment of elementary electrostatics.

Chemical effects of an electric current. Faraday's Laws of electrolysis. Interchange of chemical and electrical energy as exemplified by primary and secondary cells treated qualitatively.

Magnetic effect of a current; current measuring instruments.

Potential difference. The relation of current and potential.

Resistance.

Measurement of resistance by substitution and the use of voltmeter and ammeter.

Heating effect of a current; electric power.

Elements of electromagnetic induction. Transformers, motors and dynamos. Distribution of electrical energy.

8. *Atomic Physics*

A knowledge of the nature and properties of cathode rays as exemplified in the cathode ray tube. Construction of a thermionic diode and its use as a rectifier; thermionic emission. The production and properties of X-rays. Alpha, beta and gamma radiation: qualitative treatment of absorption and radio-active decay; half-life.

Explanatory Notes for the O.L. Physics Syllabus may be obtained from the Secretary by sending a stamped self-addressed foolscap envelope.

Physics ADVANCED LEVEL

The examination will comprise two written papers of three hours each, and a practical test of three hours.

General Physics

1. Fundamental units and measurements. Use of dimensions and dimensional equations.

2. Vector and scalar quantities.

3. Newton's laws of motion. Uniform motion. Equations of motion.

4. Universal gravitation. Determination of acceleration due to gravity and of G (one method).

5. Uniform motion in a circle. K.E. of rotation. Moment of inertia (not calculations in particular cases).

6. Simple harmonic motion.

7. Moduli of elasticity. Behaviour of stretched wire. Determination of Young's modulus.

8. Surface tension in terms of force and work. Its measurement by capillary rise and balance. Pressure difference across a spherical surface.

9. Friction between solids. Viscosity; one method of determining coefficient.

Wave Motion and Sound

1. General characteristics of wave motion. Longitudinal and transverse waves. Progressive and stationary waves. Doppler effect.

2. Factors affecting the velocity of sound in air. Velocity of sound by resonance tube.

3. Forced vibrations. Resonance. Vibration of strings, tuning forks, air columns. Beats.

4. Determination of frequency of fork by stroboscope and sonometer.

5. Loudness, pitch, quality.

Heat

1. Temperature scales and thermometers. Mercury-in-glass, gas, electrical resistance, thermocouple and other simple types.

2. Measurement of heat. Determination of specific heat and latent heat.

3. Historical development of the idea of energy. Heat as a form of energy. Relations between thermal, electrical and mechanical units of energy.

4. Thermal expansion of solids and liquids.

5. Boyle's and Charles' laws. Derivation of the equation $p=\frac{1}{3}\rho c^2$. Specific heat of a gas. The two principal specific heats of a gas and their determination. Equation for adiabatic expansion and its use but not derivation.

6. Properties of vapours. Experimental results of Andrews. Van der Waal's equation. Liquefaction of gases. Refrigeration.

7. Conduction and convection. Determination of thermal conductivity for good and bad solid conductors. Newton's law of cooling.

8. Radiation. Heat exchange. Emissive and absorptive powers. Stefan's law.

Light

1. Reflexion at plane and spherical surfaces.

2. Refraction at plane surfaces. Critical angle and total reflexion.

3. Refraction through prism and thin lenses. Minimum deviation formula. Thin prism. Full formulae for a thin lens.

4. Telescopes, microscopes, spectacles. Spectrometer. Simple calculations on these.

5. Colour phenomena. Qualitative treatment of chromatic aberration.

6. Emission and absorption spectra. Detection and properties of infra-red and ultra-violet radiation. The complete electromagnetic spectrum.

7. Luminous intensity, illumination, luminous flux, lumen. Inverse square and cosine law. Modern photometers.

8. Velocity of light (one terrestrial method).

9. Wave and corpuscular theories of light treated historically. Huygen's principle and construction for reflexion and refraction.

10. Conditions for interference. Young's fringes. Newton's rings.

11. Diffraction. Plane grating.

12. Simple treatment of plane polarized light.

Electricity and Magnetism

1. Elementary magnetostatics: unit pole, magnetic field, inverse square law.

2. Magnetic properties of materials. Magnetization curves Hysteresis.

3. Electrostatics: unit charge; inverse square law; induction, intensity, potential, potential gradient; capacitance of sphere, of two concentric spheres, of two parallel plates. Farad. Two condensers in parallel, in series. Influence of dielectric on capacitance. Energy of charged conductors.

4. Magnetic field at centre of coil, on axis of long solenoid, near to long straight wire. Absolute unit of current. Ampere, coulomb.

5. Absolute unit of potential difference, volt.

6. Force on conductor in magnetic field. Application to moving coil galvanometer. Voltmeter, ammeter. Use of ballistic galvanometer.

7. Ohm's law, resistivity, temperature coefficient of resistivity. Kirchhoff's laws. Wheatstone network.

8. Potentiometer for e.m.f., resistance, current.

9. Heating effect of current.

10. Electrolysis. Faraday's laws. The Faraday. Simple ionic theory. Simple cells. Energy considerations in cells. Back e.m.f. Accumulators.

11. Seebeck and Peltier effects. Measurement of thermo-e.m.f.

12. Induced e.m.f. Mutual- and self-induction treated qualitatively.

13. Alternating current. R.M.S. value of current and e.m.f. Vectorial treatment. A.C. ammeters and voltmeters.

14. Conduction of electricity through gases. Cathode rays. Discovery of electron. Measurement of e/m, v, and e. Thermionic emission. Simple valves and their uses. Principles of the cathode ray tube.

15. Production and properties of X-rays. Radioactivity. Alpha, beta, gamma rays. Identification and detection. Rutherford atom. Radioactive decay.

Alternative syllabus to sections 1 *to* 6 *inclusive in Electricity and Magnetism, in terms of rationalized M.K.S. units.*

1. Definition of the ampere in terms of force; of the coulomb; and of the volt in terms of work.

2. *Either* (a) Electromagnetic induction, magnetic flux, the weber (volt-sec.). Ballistic use of moving coil instruments to measure flux. The force on a straight wire carrying a current in a uniform magnetic field. Moving coil galvanometer.
Or (b) Magnetic induction B defined in terms of the force on a conductor in a magnetic field; the weber; the practical measurement of magnetic fields by determining the force on a current-carrying conductor. Couple on a coil in a uniform magnetic field. Moving coil galvanometer.

3. *Either* (a) Magnetizing force (field intensity) from the general expression

$$\delta H = \frac{i\,\delta l\,\sin\theta}{4\pi r^2}$$

for the following cases: on the axis of a circular coil, and a solenoid (no proof), and at a distance from a long straight wire. Definition of permeability. Force between two long straight wires. Value of μ_0 from definition of ampere.

Or (b) Magnetic induction from the general expression

$$B = K\sum\frac{i.\,ds\,.\,\sin\theta}{r^2}$$

for the following cases: on the axis of a circular coil and a solenoid (no proof), and at a distance from a long straight wire. Induced e.m.f. in a circuit. Ballistic use of moving coil instruments to measure flux. Definition of permeability. Force between two long straight wires. Choice of K to agree with definition of the ampere.

4. Simple form of current balance; absolute measurement of current and resistance.

5. Magnetic properties of materials. B/H curves. Hysteresis.

6. Electrostatics. Electric intensity (field) defined as potential gradient. Electric flux (coulomb). Permittivity. Value of ϵ_0. Capacitance of parallel-plate condenser. Energy of a charged conductor. The principle of the electrostatic voltmeter.

The practical examination will be held in the laboratories of recognised schools for their candidates, and in the laboratories of the University of Bristol for private study candidates and for candidates from unrecognised schools.

SPECIAL PAPER

This will be a three hour paper which will cover the whole of the advanced level syllabus, but afford a wide choice of questions and be selective in character.

Mathematics

General

Candidates will be allowed to use the Cambridge Four Figure Tables whenever they give the required degree of accuracy; they should be provided by schools for their cadidates; private study candidates sitting at University centres will be provided with tables by the Board. Candidates may provide their own slide rules and use them for all Mathematics papers at both Ordinary and Advanced levels, unless otherwise stated in the rubric of the examination paper.

Mathematics ORDINARY LEVEL

The examination will comprise two papers of two and a half hours each.

Each paper may contain questions on any part of the syllabus and the solution of any question may require a knowledge of more than one part of the syllabus. Each paper will contain a short compulsory Section I, the purpose of which is to test accuracy.

Section II of each paper will contain some questions more closely related to the work of secondary technical schools. These will be the last two questions on each paper.

1. *Numbers*

The commoner systems of weights, measures and money, including metric units. Fractions, decimals, ratio, percentage, proportion and proportional parts, calculation of averages, use of square roots and common logarithms. 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, including a knowledge of the relevant formulae.

An understanding of the dimensions of the terms in a formula will be expected.

3. *Formulae and Equations*

Construction, interpretation and easy manipulation of a formula. The use of fractional and negative indices. Common factors, factors of $(a^2 - b^2)$, and easy trinomial factors. Simple manipulation of fractions. Simple equations, quadratic equations and linear simultaneous equations in two variables.

4. *Graphs, Variation, Functionality*

Graphs from numerical 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^3," and their illustration by sketch graphs. Graphical treatment of the functions

$$y = cx + d, \qquad y = bx^2 + cx + d, \qquad y = ax^3 + cx + d,$$

$$y = d + \frac{e}{x}, \qquad y = d + \frac{f}{x^2},$$

where the constants are numerical. The gradients of these graphs, by drawing or by calculation. (Questions will not involve the theoretical treatment of limits.) Application of gradients to (*a*) rates of increase, (*b*) easy linear kinematics involving the distance-time and speed-time curves. The area "under" a graph and its applications.

5. *Two and Three Dimensional Figures*

A sound appreciation of the properties set out below will be expected.

Properties of angles at a point, angles made with parallel lines, the angle-sum of a polygon. Congruency of triangles, with applications to the isosceles triangle, parallelogram, rectangle, rhombus and square. Similarity of triangles. Sine, cosine and tangent of an angle, acute or obtuse. Area properties of rectangles, parallelograms, triangles and trapezia, including the formula $\frac{1}{2}bc \sin A$. The Theorem of Pythagoras and its extensions to any triangle. Solution of triangles. The properties of chords, angles and tangents of circles. Applications of similarity, including the areas and volumes of similar figures. Simple loci. The use of intersecting loci. Plotting of simple loci other than the circle.

Proofs of the following theorems may be required: *Questions on these will not appear in Section I of the Examination Papers.*

1. The sum of the interior angles of a triangle is equal to two right-angles.

2. The opposite sides and angles of a parallelogram are equal; each diagonal bisects the parallelogram; the diagonals bisect one another.

3. A quadrilateral is a parallelogram if both pairs of its opposite sides or its opposite angles are equal or if the diagonals bisect one another.

4. Parallelograms on the same base and between the same parallels are equal in area.

5. If parallel lines cut off equal intercepts on one transversal, then they cut off equal intercepts on any other.

6. The angle which the arc of a circle subtends at the centre is double that which it subtends at any point on the remaining part of the circumference.

7. If a straight line touch a circle, and from the point of contact a chord is drawn, the angles which this chord makes with the tangent are equal to the angles in the alternate segments.

8. If two chords of a circle cut at a point, the rectangles contained by their segments are equal and if the point lies outside the circle, each of these rectangles is equal to the square on the tangent to the circle from the point of intersection.

9. If the vertical angle of a triangle is bisected internally or externally, the bisector divides the base internally or externally into segments which have the same ratio as the other sides of the triangle.

10. The areas of similar triangles are proportional to the squares on corresponding sides.

Candidates will be expected to understand the differences between a theorem and its converse.

Elementary constructions and their use in constructing:

(*a*) triangles, quadrilaterals and circles from simple data;

(*b*) inscribed and circumscribed circles of a triangle;

(*c*) square equal in area to a given rectangle;

(*d*) tangents to a circle from an external point; common tangents to two circles;

(*e*) a segment of a circle containing a given angle.

The normal to a plane, the angle between a straight line and a plane, the angle between two planes. Simple problems in three dimensions soluble by reduction to plane figures.

6. *Practical Applications*

Questions involving drawing, trigonometry, or geometrical reasoning may be set on topics such as:

(*a*) simple map problems, scales, contour lines, slopes;

(*b*) determination of positions by two bearings;

(*c*) heights and distances;

(*d*) simple plan and elevation problems;

(*e*) latitude and longitude: meridian and small circles on a sphere.

Additional Mathematics ORDINARY LEVEL

The examination will comprise two papers, each of two and a half hours.

Each paper will be divided into three sections:

(*a*) Trigonometry and Geometry.

(*b*) Algebra and Calculus.

(*c*) Mechanics.

Four questions will be set in each section and candidates will be asked to answer not more than seven questions which may be chosen from any part of the paper. The syllabus will include that prescribed for Elementary Mathematics, together with the following:

(*a*) *Trigonometry and Geometry*

Angles of any magnitude; the addition formulae and their consequents; very simple trigonometric equations excluding their general solution; graphs of sine, cosine and tangent; circular measure, length of circular arc, area of circular sector; the geometry and trigonometry of the circum-circle, in-circle, escribed circle, orthocentre, centroid.

Co-ordinate geometry of points and straight lines (using rectangular axes), including the equations $y = mx + c$, $ax + by + c = 0$, $\frac{x}{a} + \frac{y}{b} = 1$.

The equation of the circle with given centre and radius.

Conditions for parallelism and perpendicularity of two lines.

Distance between two points.

Co-ordinates of the point dividing the line joining two given points in a given ratio.

(*b*) *Algebra and Calculus*

Solution of two simultaneous equations, one linear and one quadratic. Use of the remainder theorem and the factor theorem.

Elementary theory of logarithms.

Arithmetic and geometric progressions (including the sum to infinity); use of the binomial theorem for a positive integral index.

Differentiation and integration of powers of x (proofs and the integration of $1/x$ excluded); rates of increase, velocity, acceleration, areas and volumes; differentiation of a function, products and quotients; equations of tangents at given points to the curves $y = k/x$, $y = k/x^2$, $y = f(x)$, where $f(x)$ is a polynomial in x.

(*c*) *Mechanics*

The composition and resolution of coplanar vectors; elementary graphical methods; moments; couples.
Numerical examples on the equilibrium of a body under the action of a system of coplanar forces.
Determination of centre of mass in simple cases; friction; simple machines, efficiency.
The laws of motion; elementary applications of the principles of the conservation of energy and of linear momentum.
The motion of a particle under a force which is constant in magnitude and direction.
Simple problems of relative velocity.

Pure Mathematics ADVANCED LEVEL

The examination will comprise two written papers of three hours each.

All parts of the syllabus may be represented in each paper.

The syllabus will include that prescribed for Mathematics at the Ordinary Level and Sections (*a*) and (*b*) of the Additional Mathematics syllabus together with the following:

1. *Algebra.*

Theory of quadratic functions; relations between roots and coefficients of equations of degree not exceeding four. Linear equations in three unknowns. Evaluation of determinants of the second and third order. Simple manipulation of inequalities. Partial fractions. Permutations and combinations with simple applications to probability. Binomial theorem for a positive integral index. (Questions on the greatest term and on sums and properties of the coefficients will not be asked.) Use of the exponential and logarithmic series, and of the binomial series for any index. Simple approximations. Numerical solutions of equations by graphs and by successive approximations.

2. *Calculus.*

Limits; differentiation of algebraic, direct and inverse trigonometrical functions, logarithmic and exponential functions; differentiation of functions using parameters; integration as the inverse of differentiation including the use of partial fractions, integration by change of variable, integration by parts. Tangents, normals, maxima and minima; points of inflexion; sketching of simple curves. Plane areas using plane polar co-ordinates; plane areas, volumes of solids of revolution, mean centres, moments of inertia using Cartesian and parametric co-ordinates. Use of Taylor's and Maclaurin's theorems. Formation of differential equations by elimination of arbitrary constants. The mathematical expression of given problems as differential equations. Solution of differential equations by separation of variables. Linear equations of first and second order with constant coefficients, and such that a particular integral can be found by trial.

3. *Geometry.*
Rider work on Section 5 of the syllabus in Mathematics at Ordinary level, together with the geometry in Section (*a*) of the Additional Mathematics syllabus. Properties of points, lines, and planes in space; the simpler solid figures, including the tetrahedron and sphere. Straight line and circle; parabola and central conics referred to usual rectangular axes; the parametric representations ($a \cos t$, $b \sin t$), (at^2, $2at$), (ct, c/t) of the ellipse, parabola and rectangular hyperbola. A knowledge of the focus-directrix property of conics will be assumed.

4. *Trigonometry.*
The addition formulae and their consequents. Inverse trigonometrical functions; solution of equations, including general solutions. Solution of triangles by half-angle formulae; applications to problems in two or three dimensions.

SPECIAL PAPER

This will be a paper of three hours including more difficult questions on the syllabus at Advanced level and questions on the following:

finite series; elementary vector algebra, excluding scalar and vector products; complex numbers with their geometrical representation and application; hyperbolic functions; inverse hyperbolic functions; lengths of curves; further properties of triangles and circles; coaxial and orthogonal circles; partial differentiation of functions of two variables; total differentials; change of variable.

Approximately half of the Special paper will be set on the additional Special syllabus, and half on the Advanced level syllabus.

Applied Mathematics ADVANCED LEVEL

The examination will comprise two written papers of three hours each.

Paper I will consist of questions on Kinematics and Dynamics, and Paper II of questions on Statics, Hydrostatics and Statistics.

1. *Kinematics and Dynamics.*
Displacement, velocity, acceleration; relative velocity; application of vectors to two-dimensional problems; simple harmonic motion; uniform circular motion. Laws of motion; motion of a particle projected freely under gravity; motion of a particle in a horizontal or vertical circle; simple pendulum.

Simple examples of the motion of connected particles; motion of a particle attached to a string or spring obeying Hooke's Law; impulse, momentum, work, energy, power; force-time and force-distance diagrams; direct and oblique impact. Rotation of a rigid body about a fixed axis; compound pendulum. A knowledge of units and dimensions will be expected.

2. *Statics and Hydrostatics.*

Composition and resolution of forces and couples in a plane; graphical methods; application of vectors to two-dimensional problems; light frameworks; conditions of equilibrium under a coplanar system of forces including simple cases of more than one rigid body; simple statical problems in three dimensions; centres of gravity; friction; light elastic strings and springs.

Fluid pressure under gravity; centres of pressure; equilibrium of floating bodies.

3. *Statistics.*

The tabulation and graphical representation of statistical data. Averages; mean, mode, median. Moving averages. Index numbers. Measures of dispersion; quartiles, mean deviation, standard deviation, including use of assumed mean in calculating mean and standard deviations. The addition and multiplication laws of probability, with simple illustrations. Frequency distributions. The binomial distribution. General ideas of sampling; standard error. Applications of the formulae $\sqrt{(pq/n)}$, $\sqrt{(npq)}$ and $\sigma/\sqrt{n}$ for testing the significance of a proportion and a mean in large samples.

Candidates will be able to obtain full marks without answering questions both on Hydrostatics and on Statistics.

SPECIAL PAPER

This will be a paper of three hours including more difficult questions on the syllabus at Advanced level and questions on the following:

impulsive motion of connected particles; instantaneous centre of the motion of a lamina; bending moments and shearing stress in a loaded horizontal beam; simple cases of the potential energy criterion of stability.

Pure and Applied Mathematics ADVANCED LEVEL

The examination will comprise two papers of three hours each. In both papers a wide choice of questions will be given.

PAPER I. PURE MATHEMATICS

The syllabus will include that prescribed for Mathematics at the Ordinary level and Sections (*a*) and (*b*) of the Additional Mathematics syllabus together with the following:

1. *Algebra and Calculus.*

The theory of quadratic functions. Partial fractions. Binomial theorem for a positive integral index. (Questions on the greatest term and on sums and properties of the coefficients will not be asked.) Use of the exponential and logarithmic series and of the binomial series for any index; simple approximations; numerical solution of equations by graphs. Differentiation of algebraic, trigonometrical, logarithmic and exponential functions; simple integrations involving these functions, including the use of partial fractions, integration by change of variable, integration by parts. Tangents, normals, maxima and minima; points of inflexion; sketching of simple curves. Plane areas, volumes of solids of revolution and mean centres. (Questions will not be set involving polar co-ordinates.)

2. *Geometry and Trigonometry.*

Elementary treatment of the analytical geometry of the straight line, circle and parabola, including the use of the parametric representations ($a \cos t$, $a \sin t$), (at^2, $2at$). A knowledge of the focus-directrix property of the parabola will be assumed. Simple trigonometrical equations. Solution of triangles by half-angle formulae. Applications to problems in two and three dimensions.

PAPER II. APPLIED MATHEMATICS

1. *Kinematics and Dynamics.*

Displacement, velocity, acceleration; relative velocity; simple harmonic motion; uniform circular motion. Laws of motion; motion of a particle projected freely under gravity; simple pendulum. Simple examples of the motion of connected particles; rectilinear motion of a particle attached to a string or spring obeying Hooke's Law; impulse, momentum, work, energy, power; force-time and force-distance diagrams; direct impact.

2. *Statics.*

Composition and resolution of forces and couples in a plane; graphical methods; simple light frameworks; conditions of equilibrium under a coplanar system of forces including simple cases of more than one rigid body; friction; centres of gravity; light elastic strings.
A knowledge of units and dimensions will be expected.

3. *Statistics.*

The tabulation and graphical representation of statistical data. Averages; mean, mode, median. Moving averages. Index numbers. Measures of dispersion; quartiles, mean deviation, standard deviation, including use of assumed mean in calculating mean and standard deviations. The addition and multiplication laws of probability, with simple illustrations. Frequency distributions. The binomial distribution.

General ideas of sampling; standard error. Applications of the formulae $\sqrt{(pq/n)}$, $\sqrt{(npq)}$ and $\sigma/\sqrt{n}$ for testing the significance of a proportion and a mean in large samples.

Candidates will be able to obtain full marks without answering questions both on Statics and on Statistics.

Correct answers to 8 *questions out of* 12 *on each paper will gain full marks. Candidates must satisfy the examiners in both papers in order to obtain a pass at Advanced level.*

SPECIAL PAPER—none.

Geometrical and Machine Drawing ORDINARY LEVEL

The examination will comprise two papers, each of two and a half hours.

PAPER I

Plane Geometry

Construction and use of scales. Enlargement and reduction of irregular plane figures. Construction of triangles, quadrilaterals and polygons. Construction of similar figures and figures of equal area. Problems on circles, tangents, and the joining of arcs. Loci, including simple problems on paths of points in link mechanisms. Construction of ellipse, parabola, hyperbola, cycloidal and involute curves.

Solid Geometry

Elements of orthographic projection in first angle, including projection into an auxiliary plane. Determination of true shapes and lengths. Projection of simple solids, including plane sections. Freehand pictorial sketching of simple objects from their orthographic projections. Isometric and oblique drawings. Developments of surfaces of prisms, cylinders, right pyramids and right cones. Simple problems on intersection of prism, cylinder, cone and sphere. Developments of intersecting surfaces. Projection of the helix and examples of its application to screw threads and helical springs.

PAPER II

Machine Drawing

Orthographic projection in first angle including full, half and revolved sections of simple machine parts. Simple assembly drawings from sketches, or detailed drawings, of component parts. Lettering, dimensioning and general layout of drawings.

Drawings to be in accordance with the recommendations of the British Standard 308A, 1958 (abridged edition) for Engineering Drawing Practice.

Engineering Drawing ADVANCED LEVEL

The examination will comprise two papers, each of three hours, on the following syllabus:

Drawings will be in accordance with the recommendations of the British Standard 308, 1953 for Engineering Drawing Practice and are to be in first and third angle projection.

PAPER I

Conic Sections. The construction of conic sections, and problems involving their principal properties.

Roulettes. The construction of a cycloid, trochoid, epicycloid, hypocycloid and involute to a circle. Elements of gearing.

Cams. The construction of plane cam profiles to give periodic motions to followers with roller or flat ends.

Graphical Statics. The funicular polygon and its uses. Determination of the forces in the members of a statically determinate plane pin-jointed framework.

Solid Geometry. Orthographic projection of points and straight lines. Traces of lines and planes. Identification of planes. Determining the true length and inclination of a line; the angle between two intersecting straight lines; the angle between two plane surfaces. The inclination of a plane to the reference planes. Determining the true lengths and projections of perpendiculars from points to lines or planes, and the distance between two skew lines.

Projecting the section of a solid cut by any plane, and finding its true shape.

Intersections and developments of surfaces including transition pieces.

Spheres in contact.

Oblique drawings and isometric projection.

Freehand and pictorial sketching of simple solids from their orthographic projections in first and third angle projection.

PAPER II

The preparation of assembly drawings and detail drawings which may include sectional views as in clause 8 of B.S.S. 308, 1953 (above).

Art

PRELIMINARY

The examination is designed to test candidates who have imaginative or creative talent in the graphic arts and in crafts, and who have pursued a broad study of the history of Art. The examination at Ordinary level is intended to test candidates in Art *or* a Craft and in the history of Art. The examination at Advanced level is designed as a test of higher attainment in Art *and* a Craft as well as a broad knowledge of the history of Art.

ORDINARY LEVEL

Paper I of two and a half hours, and either Paper II (three hours) or Paper III (three hours plus five hours Practical work).

ADVANCED LEVEL

Paper I of three hours, Paper II of three hours and Paper III of three hours plus five hours Practical work.

GENERAL INFORMATION

The paper used may be white or tinted of any size up to imperial, except for Memory Life Drawing (Paper II*e*) and Paper III sections (*d*), (*e*) and (*f*), where quarter-imperial may be preferred.

Course Work. Candidates may be required, after the examination, to submit specimens of various types of work done during the two years before the examination.

Schools presenting candidates will be informed as soon as possible after the practical paper(s) if the work of any of their candidates is required.

PAPER I: HISTORY AND APPRECIATION OF ART

This paper will be divided into three sections, A, B and C as shown below.

Candidates are free to answer questions entirely from one section, from two or all three sections, and the questions may be answered by drawing or writing or both.

A. Outline History of European Painting, with reference only to the outstanding influences, movements and personalities.

B. Outline History of European Architecture and Sculpture with particular reference to Classic, Romanesque and Gothic, Renaissance and the 19th and 20th century eras.

C. Design in Everyday Life. The development of design in relation to furniture, household equipment, interior decoration, textiles, dress, transportation and decorative crafts.

Certain questions will be included to give candidates the opportunity of revealing personal taste and reaction to the above mentioned aspects of Art and Craftsmanship. Candidates are advised to refer, in their answers, to paintings, buildings, sculpture and everyday objects which they have themselves seen and studied.

PAPER II: TEST OF CREATIVE ABILITY IN PICTURE MAKING OR OF DRAUGHTSMANSHIP AS AN EXPRESSION OF STRUCTURE, FORM, COLOUR, ETC.

Candidates are required to make a drawing or painting, in any medium, selected from one of the following sub-sections.

Schools must state with their entry forms, and private study candidates on their entry forms, which sub-sections they wish to take.

(*a*) *Imaginative Picture Making*

A choice of at least four subjects, one of which is to be carried out as far as possible as a completed painting.

(*b*) *Picture Making from objects, plants, etc., visible to the candidates*

Certain objects are specified by the Examiner and placed on a plain table, but not grouped. Additional objects, parts of the room or an imagined background may be added at the discretion of the candidates. This paper is not to be regarded as an exercise in still life painting but in pictorial composition, the given objects forming the starting point, the end being a composition in terms of line, form, colour and tone.

(*c*) *Drawing or Painting from Natural Objects*

A plant or plants sufficiently complete to indicate the manner of growth; or a living plant in a pot; or a live animal or bird; or a group of natural objects such as shells, but not stuffed birds or animals.

(*d*) *Drawing or Painting from Fashioned Objects*

A group of fashioned objects of varying shape and structure. Not more than 14 candidates may work from a large group of objects and not more than five from a small group.

(*e*) *Drawing or Painting from Life*

The test must be taken in two parts, as follows:

1¼ hours. *Two Memory Pictures* of a figure in action. For each the model will be observed in a different pose for a period of six minutes and no further observation will be permitted. No work will be allowed during the period of observation.

1¾ hours. *Work from the posed figure dressed in simple clothes.* The picture may be a portrait or of the full figure at the discretion of the candidates and more than one may be submitted for examination if candidates wish. Candidates may also include the immediate surroundings of the posed figure.

PAPER III: DESIGN AND PRACTICE OF A CRAFT

Heads of schools are asked to notify the Secretary in writing before October 1st of the year preceding the examination, of the crafts in Paper III which will be offered by their schools.

Candidates may be tested in ONE of the following crafts:

Schools must state with their entry forms, and private study candidates on their entry forms, which Crafts they wish to take.

(*a*) Embroidery.

(*b*) Weaving. (Two questions, one of which must be carried out in the supplementary test.)

(*c*) Fabric printing. Screen or block process.

(*d*) Lettering, Writing and Illumination.

(*e*) Lino cutting and/or wood engraving in black and white or in colour.

(*f*) Design for book production, including a choice of bookbinding, illustration and typographical layout.

(*g*) Design for stage décor and theatre costume.

(*h*) Puppetry.

(*i*) Modelling in clay and terra-cotta; Sculpture in stone, plaster and wood. (This test to be carried out in the selected medium in one stage.) (Time allowed—eight hours.)

(*j*) Pottery.

The paper in Design and Practice of a Craft must be taken in two stages, except in the case of (*i*) Sculpture in stone, plaster and wood.

Stage I consists of a paper of three hours, e.g. a drawing giving a full indication of candidates' designs for the craft selected. During the last half-hour of the test candidates are required to make a tracing, *which they must keep for reference in Stage II*, of the design they intend to execute in material.

Stage II consists of the practical execution in materials of the design submitted in Stage I. A whole day of five hours, morning and afternoon, is allowed for the working of Stage II and candidates must complete sufficient of their craft to show evidence of their design in its proper medium. In sections (*c*), (*h*), (*i*) and (*j*) further time is allowed to complete the work.

Paper III is marked mainly on the evidence of work done in Stage II, but credit is given for ideas developed in Stage I.

Candidates, particularly in crafts (*e*), (*g*) and (*h*) may spend much of Stage I in making several trial designs. They should indicate, however, the design they intend to execute in Stage II and only the selected design should be traced and retained for working purposes in Stage II.

An interval of not less than four days is allowed between Stage I and Stage II to enable candidates to make sure of obtaining the material they need for the execution of their craft.

The work of both stages—I and II—must be submitted for marking by the examiners.

NOTE.—The Board issues a bibliography for Art. A copy may be obtained on application, enclosing a stamped and addressed foolscap envelope, to the Secretary.

Music ORDINARY LEVEL

The examination will comprise two papers of two hours each and Aural Tests.

AURAL TESTS

These will be conducted by the teachers in the schools presenting candidates. Private study candidates will go to a school or to the University of Bristol for the examination.

PART I (45 minutes)

Candidates will be required to write:

(*a*) *Rhythmic Dictation*

Two simple rhythms of four bars each in either $\frac{3}{4}$, $\frac{4}{4}$ or $\frac{6}{8}$ time. The passage will be played as a melody four times and the candidates will be expected to write the rhythm on a monotone.

(*b*) *Melodic Dictation*

Two simple melodies of four bars, one in a major and one in a minor key, in $\frac{3}{4}$, $\frac{4}{4}$ or $\frac{6}{8}$ time. The key and time-signature will be stated and each passage played five times—once straight through, each half twice, and twice again straight through. The tonic chord will be sounded each time the passage is started.

(*c*) *Two-part Dictation*

Two groups each of three two-part chords. Each group will be played three times, preceded by the tonic chord. The name of the key will be given.

(*d*) *Names of Cadences*

A short musical passage, containing four cadences, will be played three times through, with a slight pause where the cadences occur. No inverted cadences will be used.

N.B.—Tests in (*a*) and (*b*) will begin on the first beat of the bar and will contain no syncopation or rests. For tests (*b*) and (*c*) the Treble Clef only will be used.

PART II

Sight Singing

Candidates will be required to sing, hum or whistle a simple eight-bar melody at sight. It will be in a major key and will contain no modulation. Candidates may sing the test in any key suitable to their voices. The key may be transposed by the examiner to suit the candidate.

PAPER I—2 hours.

Candidates will be required:

(*a*) To show a knowledge of the following:
Major and minor Scales, Clefs (including alto and tenor), Intervals, Triads and Transposition.

(*b*) *Either* to write a melody to a stanza of poetry of four lines,
Or to complete a melody sixteen bars long, the opening of which is given.

(*c*) To add a free melodic part above or below a melody of not more than eight bars.

(*d*) To harmonise a melody in four vocal parts, writing in short score.

N.B.—(*c*) and (*d*) will require a knowledge of the primary triads, first inversions and the cadential $\frac{6}{4}$.

PAPER II—2 hours

Candidates must bring to the examination the scores of the works they have studied. These must not contain any matter, whether printed or manuscript, additional to the musical text, and any extraneous notes or marks must be removed or totally obscured.
The numbering of bars is to begin with the first *complete* bar of each movement and where there is a repeat, with first time and second time bars, these bars are to be indicated with corresponding numbers, e.g. 11a, 11b, and so on.

Candidates will be required:

(*a*) To show some knowledge of the music composed within the period 1650–1950. The questions in the examination paper will be grouped in four periods: 1650–1750, 1750–1830, 1830–1900, 1900–1950. There will be twelve questions on the paper, three in each section, and candidates will answer any two.

(*b*) To make a study of the main characteristics of two of the following works:

Haydn: *London Symphony* (No. 104).
Vaughan Williams: *Fantasia on a Theme by Tallis.*
Schumann: Song Cycle *Dichterliebe.*

Music ADVANCED LEVEL

Candidates must take the Aural Tests and Papers I and II. They must satisfy the Examiner in the Aural Tests in order to pass the subject at Advanced level.

AURAL TESTS

All candidates will go to the University of Bristol for the Aural Tests.

PART I (1 hour)

(*a*) *Dictation*

To write from dictation:

(i) A time pattern of reasonable difficulty.
(ii) A melody, including modulation to related keys, of about eight bars, on the treble stave.
(iii) A passage in two-part counterpoint written on the treble and bass staves, of not more than six bars.
(iv) A four-part harmony test, four bars long, in simple duple, simple triple, or simple quadruple time, making use of any chords in the harmony syllabus, but without modulation.

N.B.—Each passage will be played five times, the first time straight through, the second and fourth times in sections, and the third and fifth times straight through. In all tests the pulse will be given and named before the start.
In (i), (ii) and (iii) the time signature $\frac{6}{8}$ may be used.
The tonic chord will be played before tests (ii), (iii) and (iv) are started.

(*b*) *Modulation Recognition*

To recognise modulations to related keys. Each modulation will be played separately three times.

PART II

(*a*) *Sight Singing*

To sing at sight a melody of about sixteen bars of reasonable difficulty. The passage may include modulations to related keys.

(*b*) *General Musicianship*

A *viva-voce* examination to test the candidate's general musicianship. Candidates will bring and perform on a melodic instrument or perform on the pianoforte.
Notice of the chosen instrument must be sent with the candidate's entry.

PAPER I—3 hours

(*a*) *Elementary Composition*

(*i*) *Melody*

Either the writing of a melody to about eight lines of poetry

Or the completion of a vocal melody about sixteen bars long, of which the opening is given.

(*ii*) *Free Counterpoint*

The addition of a violin part to a given 'cello part, about sixteen bars long, or *vice versa*.

(*iii*) *Harmony*

The harmonisation, in four vocal parts, of a melody or bass, or the completion of a three part instrumental passage, showing a knowledge of diatonic harmony.

(*b*) *Orchestral Score-reading*

Tests and questions designed to show a knowledge of orchestral score-reading. These may include simple questions on instruments and the re-writing at correct pitch on the treble or bass stave of parts written with a C Clef or written for transposing instruments.

PAPER II—3 hours

Candidates must bring to the examination the scores of the works they have studied. These must not contain any matter, whether printed or manuscript, additional to the musical text, and any extraneous notes or marks must be removed or totally obscured.

The numbering of bars is to begin with the first *complete* bar of each movement and where there is a repeat, with first time and second time bars, these bars are to be indicated with corresponding numbers, e.g. 11a, 11b, and so on.

(*a*) *History of Music*

A general outline of the history of music from 1550 to the present day.

The questions in the examination paper will be grouped in four periods, 1550–1750, 1750–1830, 1830–1900, 1900 to the present day. Candidates will have a free choice of questions and may confine themselves to one period only.

(*b*) *Set Works*

Schubert: *Winter Journey Song Cycle.*

Sibelius: *Symphony No. 2 in D.*

Beethoven: Piano Sonata in D minor, op. 31, No. 2.

SPECIAL PAPER

There will be a three hour paper, consisting of the following:

(i) An elementary composition question on the advanced syllabus, but of a more difficult standard.

(ii) General questions on the history and literature of music, including a critical essay.

The *viva-voce* examination will be extended for Special paper candidates so that the compulsory instrumental test includes instrumental sight reading. Candidates may also offer a vocal test if they so wish. The music for these tests must be selected by the candidate and a copy must be sent to the Secretary at least six weeks before the date of the examination. In addition, any candidate with a special interest in composing may, if he or she so desires, submit an original composition which will be taken into consideration in judging the candidate's standard of musicianship. This should be submitted to the Secretary a month before the written examination and authenticated as original by the teacher.

Domestic Subjects

Cookery ORDINARY LEVEL

The syllabus is planned:

To develop in the pupil good habits of health based on an elementary knowledge of the functions of the body and of nutrition.

To continue the study of health education by a further study of food.

To give training in planning and carrying out, individually, the practical work of the course.

The examination will include:

One paper of two and a half hours with a considerable choice of questions.

A practical test of two and a half hours on the preparation, cooking and service of food and the care of cooking equipment.

Candidates may be asked to send to the Board records compiled during the course.

General Notes on the Practical Examination.
Materials for the practical tests are to be provided by the schools.

A period of one and a half hours will be allowed for written supervised preparation, three days before the examination. Shopping lists, question papers and time plans will be handed to the Domestic Subjects mistress at the end of the period.

A period of up to fifteen minutes may be allowed immediately before the practical examination, at the discretion of the responsible teacher, for the collection of equipment and serving dishes.

Candidates may have access to books during the preparation period, and during the practical examination. Candidates will be given credit for good management of utensils during the examination.

They will be expected to know the cost of the ingredients they are using.

Syllabus:

1. Study of:
   (*a*) Nutrition, illustrated by the planning of meals.
   (*b*) The changes which take place in food during normal cooking processes.
2. (*a*) Preparation and service of meals in a variety of circumstances.
   (*b*) Cost and choice of food. Use of convenience foods.
   (*c*) Protection, storage and home preservation of foods.
3. (*a*) Care and cleanliness of surroundings for preparation of meals.
   (*b*) Choice, cost, use and care of equipment.

Housecraft ORDINARY LEVEL

This course is intended only for those schools which have a flat or similar accommodation for the teaching of Housecraft, and Heads of Schools are asked to inform the Board on or before October 1st, in the year preceding the examination, what accommodation is provided.

There will be one two and a half hour paper divided into two parts. Part I will consist of a number of questions requiring short answers, with no choice. Part II will consist of fewer questions, requiring longer answers, with a choice.

1. An elementary knowledge of the functions of the body.
2. The health of the family.
   (a) Conditions for good health.
   (b) Prevention of the spread of disease: nature and causes of infection, simple home nursing.
3. Planning and carrying out the routine work of the home.
4. (*a*) Choice, use and care of household equipment.
   (*b*) Consumers' advisory services.
5. Utility services.
   (*a*) Water—supply, distribution and disposal.
   (*b*) Electricity—production and distribution.
   The magnetic and heating effects of an electric current and the application of these to the construction and use of domestic electrical equipment. Fuses.
   (*c*) Fuels. Formation of coal—its use as a fuel. Production of other types of fuel from coal and their uses. Smokeless fuels.
   (*d*) Coal gas.
   (*e*) Meter reading and heat units.
6. Sewage and refuse disposal.
7. Choice, care and maintenance of furniture and furnishings.
8. Storage of food and its protection from contamination.
9. Family and household budgeting.
10. Kitchen planning for economy of time and labour.
11. Safety in the home: prevention of fire and accidents; simple first aid.
12. The cleansing action of water and detergents. Laundering and care of clothes.

NOTE: *This subject may be taken with Cookery in the same examination.*

There is, however, some overlap with Ordinary Level Human Biology, and candidates therefore will not be allowed to offer both in the same examination.

Needlecraft ORDINARY LEVEL

The aim of the syllabus is to encourage personal standards in the selection and design, making and care of garments, and in grooming.

The Examination will include:

A written paper of two and a half hours with a choice of questions.

A practical test of two and a half hours on the processes involved in the making of garments. Candidates may have access to books during the practical examination.

Course Work:

The examiner may visit the school to examine work done by candidates, or the school may be asked to post their work to the examiner. Candidates may show records of individual work compiled during the course and must select from a personal outfit one or two garments which they have made, and present or send them for examination. Candidates must be prepared to try on garments which they have made for themselves.

Syllabus:

1. An elementary study of fabrics and their use for clothes. Colour, design and style in dress, the aesthetic value of decoration, and its relation to construction.
2. The processes used in making garments. Use of commercial patterns to make simple garments, including adjusting the patterns and fitting the garments.
3. Maintenance of clothes, including laundering, repair and valeting. Care and use of the sewing machine and other equipment used in needlecraft.

Handicraft

Course Work. Candidates may be required after the examination, to submit specimens of various types of work done during the two years before the examination.

Woodwork ORDINARY LEVEL

Three papers will be set.

(1) A practical workshop test of three hours.

(2) Technical Drawing tests of two and a half hours.

(3) A written paper on the technology of the subject of two and a half hours.

(1) *Practical Test*

Preparation of a woodwork example containing joints selected from the following:

Housing joints.

Halving joints.

Mortise and tenon joints.

Through and lap dovetail joints.

Screwed joints.

Fitting of butt hinges and some shaping requiring the use of a firmer chisel, scribing gouge and/or spokeshave.

(2) *Technical Drawing*

Candidates will be examined in their ability to

(i) make and read detailed drawings in first angle projection of woodwork articles or constructions, lined and dimensioned in English units in accordance with British Standard 308A, 1958 (abridged edition) for Engineering Drawing Practice.

(ii) show sections on planes at right angles to principal planes of reference;

(iii) make freehand sketches in first angle projection, and illustrative sketches;

(iv) read and make drawings in isometric and oblique projection;

(v) construct scales, divide lines into any number of equal parts and construct regular plane figures (including the ellipse);

(vi) prepare a cutting list.

Some knowledge of simple design as covered by fitness for purpose, material, construction, shape and proportion will be expected.

(3) *Technology*

Construction, use and care of tools and principles upon which they work.

Grinding and sharpening of edged tools.

Construction and applications of common joints and reasons for their use.

Use of nails, screws, glass paper.

Preparation and use of: glue, paints, stains and polishes.

Fitting of hinges and locks.

Recognition, properties, defects and uses of common hard and soft woods; growth, conversion and seasoning. Plywoods and manufactured boards.

An elementary knowledge of Period furniture, Jacobean, Eighteenth-century and Modern with some reference to well-known designers, past and present.

Schools presenting candidates will be informed as soon as possible after the practical paper(s) if the work of any of their candidates is required.

S.N. **Woodwork** ADVANCED LEVEL

Four papers will be set.

(1) A practical workshop test (4 hours).

(2) Technical Drawing tests (3 hours).

(3) A design paper (3 hours).

(4) A written paper on the technology of the subject (3 hours).

(1) *Practical Test*

Preparation of woodworking samples containing joints selected from: halving, dovetail halving and bridle joints including those incorporating a mitre; mortise and tenon joints, including those on moulded edges with suitable scribing or mitre, twin and fork tenons; through, lapped and secret lapped and mitred dovetails, including those with mitres on face edge; through, stopped and dovetail housing; use of screws and slot screwing.

The candidate should be familiar with the rebate plane, plough plane and moulding planes, and the use of the chisel, gouge and spokeshave for shaping. Fitting of cabinet hinges, locks, stays, stops and any other piece of cabinet hardware.

(2) *Technical Drawing*

This paper is primarily intended to test the candidate's ability to make and read working drawings of articles, which might be encountered in the School Workshop, from detailed specifications, but not to design such articles.

(i) Drawings in first and third angle projections, lined and dimensioned in English units in accordance with British Standard 308A, 1958 (abridged edition) for Engineering Drawing.

(ii) Show sections on planes at right angles to principal planes of reference.

(iii) Make freehand sketches.

(iv) Read and make isometric and oblique drawings.

(v) Construct scales, divide lines into any number of equal parts.

(vi) Construct regular figures in so far as they would be used in a workshop.

(3) *Design*

(i) Details of the design studies will be issued at least three months before the date fixed for the examination, and candidates will prepare notes, illustrations and sketches for their examination answers in their own time. They must bring these to the examination. These should show that the candidate has spent adequate time in reading, thought and planning concerned with the set design study and should be a folio of drawings (not merely a collection of rough sketches) which will be handed in with the finished scale drawings.

(ii) In the three hours of the examination candidates will make finished scale drawings from their notes and sketches, in answers to questions on the design of a utilitarian piece of woodwork, which will test their appreciation of fitness for purpose, suitable constructions, good form and proportion, appropriate materials, decorative treatments and finishes.

(4) *Technology of Woodwork*

This paper will be divided into four sections. The candidate will be expected to answer at least one question from each section.

(i) Tools. Construction, use and maintenance of tools, including the lathe, and the principles upon which they work. A comparison between hand and industrial woodworking techniques.

(ii) Construction. Application of the joints listed for the practical test with particular reference to stool, carcass and framed constructions. Drawer construction and fitting. Preparation of joints, stains, polishes and adhesives. Use of decorative treatments, veneering and inlaying.

(iii) Timber. Structure of wood. Timber trees. Geographical distribution. The conversion, seasoning, market forms and methods of preservation. Timber defects. Plywoods, manufactured boards and veneers. Recognition of common hardwoods and softwoods. The work of the Forestry Commission.

(iv) History. The principal forms of English Furniture to the present time. The historical development of hand tools.

A Handicraft reading list may be obtained on application, enclosing a stamped addressed envelope, to the Secretary.

Metalwork ORDINARY LEVEL

Three papers will be set.

(1) A practical workshop test of three hours.

(2) Technical Drawing tests of two and a half hours.

(3) A written paper on the technology of the subject of two and a half hours.

(1) Practical workshop examination tests, requiring proficiency in the operations detailed will be set for each of the following groups. A candidate will be required to make the example set for one group only but a certain amount of drilling, filing, fitting and cutting may form part of the work required in any group.

(i) *Formal Metalwork and Forging*

Filing.	Drawing down.
Fitting.	Bending.
Drilling and countersinking.	Annealing, hardening and tempering of plain carbon steels.
Cutting with hacksaw and cold chisel.	Twisting.
Riveting.	Screwing with taps and dies.
Cold bending.	Brazing and sweating.

(ii) *Turning (with appropriate formal metalwork).*

Plain turning between centres or in three jawed self-centring chuck.
Simple boring.
Knurling.
Drilling on lathe.

S.N. (iii) *Sheet and hammered metalwork*

Bending.
Folding.
Wiring.
Hollowing.
Sinking.
Simple raising.
Hard and soft soldering.
Planishing.

(2) *Technical Drawing*

Detailed drawings pertaining to metalwork in first angle projection, lined and dimensioned in accordance with British Standard 308A 1958 (abridged edition) for Engineering Drawing Practice.

Measurements in English units. Conventional methods of drawing screw threads, nuts, bolts and rivets. Hatching. Sections on planes at right angles to principal planes of reference.

Construction of scales and regular plane figures (including the ellipse).

Simple developments for sheet metalwork.

Knowledge of simple design, fitness for purpose, suitability of construction, materials and finish, proportion.

(3) *Technology*

Construction, use and care of hand and simple machine tools: lathes, drilling machines, bench shears, grinding wheels. Sharpening of cutting tools.

Recognition and elementary knowledge of derivation, uses and working properties of:

cast iron, plain carbon steels, high speed steel, copper, brass, tinplate.

Elementary knowledge of everyday methods of producing metal parts by:

casting, forging, turning, milling, shaping.

Lubricants and cutting fluids.

Composition and use of soft and hard solders, fluxes.

Use of rivets, bolts and screws.

Annealing, hardening and tempering of carbon steel. Case hardening.

Hammered metalwork.

Composition and use of dips and pickles for brass and copper.

Folding and wiring of sheet metal.

Some knowledge of the work of art craftsmen in metal, such as Benvenuto Cellini and Jean Tijou; and of well-known engineers such as Joseph Whitworth, the Stephensons, Henry Bessemer.

S.N. **Metalwork** ADVANCED LEVEL

Three papers will be set.

1. A Practical Examination (4 hours).
2. A written paper on the Technology of the subject (3 hours).
3. A Drawing and Design paper (3 hours).

1. PRACTICAL EXAMINATION

Workshop tests, requiring proficiency in the operations given below will be set for each group. A candidate will be required to make the piece set for one group only, but a certain amount of bench fitting may be required in each group.

Group A. *Engineering Metalwork and Forgework*

Correct use of measuring and marking out equipment normally found in the school workshop.

Filing, use of cold chisels and hacksaw, scraping, drilling, riveting, use of taps and dies, cold bending, hard soldering and brazing.

Simple forging, including drawing down, upsetting, bending and twisting.

Hardening and tempering of plain carbon steels.
Work on the lathe including taper turning, screw cutting, boring, reaming, knurling, use of faceplate and independent jaw chuck.

Group B. *Hammered Metalwork*

Hollowing, raising, sinking, planishing.
Seamed work based on cylindrical, conical and polygonal shapes.
Hard and soft soldering.
Use of twisted wires and pierced work for decoration.
Simple forging and the use of special tools for decorative work.
Making and fixing of hinges.
Elementary lathe work in three jaw chuck or between centres, for turning non-ferrous metals, plastics or fibrous materials.

2. TECHNOLOGY

There will be three sections to this paper and candidates will be required to answer at least one question from each section.
Section A—Materials
The general properties, basic principles of production (but not of detailed preparations) of the following metals and alloys, and the forms in which they are commonly supplied:
iron, carbon and alloy steel, aluminium, copper, zinc, tin, lead, brass, bronze, gilding metal.
Methods used in heat treatment of plain carbon steels; annealing, normalising, hardening, tempering, surface hardening.
Lubricants, cutting fluids, abrasives and abrasive wheels.
Rivets, bolts, screws and other fastenings.

Section B—Tools and Equipment
The construction, use and care of the usual hand tools, used in both engineering and hammered metalwork. Hand forging equipment.
The main features, basic construction and standard equipment of the following machines:
Lathe, together with an elementary treatment of the cutting action of lathe tools and the effects of variation of rake and clearance angles. Form tools.
Sensitive Drilling Machine. Flat and twist drills; the effects of incorrect grinding and setting.
Plain milling and shaping machines, together with the main types of cutting tools used with these machines, including those for producing keyways and slots.

Buffing and bench grinding machines.
Simple equipment for sand moulding and casting.

Section C—Processes
Use of the surface plate, measuring and marking out tools, including height gauges, slip gauges and toolmakers' buttons.
Use of tools for bench fitting including drilling, reaming, riveting, cutting screw threads by hand.
Use of tools for hammered work in non-ferrous metals, including folding, seaming, wiring, piercing. Annealing and use of dips and pickles. Brazing, hard and soft soldering, sweating.
The principles of hand forging; simple foundry practice.
Surface protection of finished work.
The machining of simple castings.
The production of fine limit bores, tapers and screw threads using a lathe.
Uses of shaping and milling machines for production of flat surfaces, keyways and slots.

3. DRAWING AND DESIGN

The preparation of drawings, in first and third angle projection, of simple machine parts or simple assembly drawings from sketches or detail drawings.
Full, half, revolved, staggered and aligned sections.
Descriptive treatment of fastenings, gears, springs and bearings. (Numerical treatment will not be required.)
Development of surface shapes, including oblique pyramids and prisms and those resulting from the intersection of prisms, pyramids, cones, cylinders and spheres.
The determination of true lengths of lines, of true shapes and the magnitude of angles.
A choice of questions on design will be based on a set study, details of which will be issued three months before the date fixed for the examination. Sketches and notes on the design study may be used during the examination.
All drawings are to be in accordance with the recommendations of the British Standard 308, 1953 for Engineering Drawing Practice and will be in either first or third angle projection.

Course Work. While preparing for the examination a candidate must undertake a study and prepare an illustrated report on a technological, aesthetic or historical facet of a metalwork craft. This report, together with examples of practical work if required, should be available for inspection by the examiner.

Mathematics and Statistics for Commerce ORDINARY LEVEL

The examination will comprise two papers of two and a half hours each, set on the following syllabuses. Accuracy in calculation, as well as a knowledge of principles, will be required.

PAPER I

1. *Numbers.*

The commoner systems of weights, measures and money, including metric units. Fractions, decimals, ratio, percentage, proportion and proportional parts, calculation of averages, use of square roots and common logarithms. 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.

An understanding of the dimensions of the terms in a formula will be expected.

3. *Formulae and Equations.*

Construction, interpretation and easy manipulation of a formula. The use of fractional and negative indices. Common factors: factors of $(a^2—b^2)$, and easy trinomial factors. Simple manipulation of fractions. Simple equations, quadratic equations and linear simultaneous equations in two variables.

4. *Commercial Arithmetic.*

Simple interest and its application to loan charges and the discounting of bills of exchange; the "third, tenth and tenth" rule. Compound interest and its application to sinking funds, annuities, present and future values, freehold and leasehold property.

Calculations arising from transactions in stocks and shares: nominal and market values, incomes and yields.

Simple problems involving rates, taxes, bankruptcy and insurance.

PAPER II

5. *Graphs, Variation, Functionality.*

Graphs from numerical 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^3", and their illustration by sketch graphs. Graphical treatment of the functions,

$$y = cx + d, \quad y = bx^2 + cx + d, \quad y = d + \frac{e}{x},$$

where the constants are numerical.

6. *Statistical Methods.*

Problems of classification. The concept of a representative value and the calculation of weighted and unweighted arithmetic averages. Frequency distributions. Measures of dispersion for data that cannot be grouped. The meaning of probability, and simple calculations based on probability and requiring a knowledge only of the addition and multiplication theorems of probability. Methods of sampling with examples of bias and random errors. The idea of correlation and simple correlation charts. Methods of constructing index numbers; the purpose and method of construction of the Ministry of Labour index of retail prices.

7. *The Presentation of Statistics.*

Pictorial representation of statistical information—the frequency polygon, cumulative frequency diagrams, the histogram, single-line graphs of time series, bar and circular diagrams, natural, ratio and percentage scales.

Logarithms and algebraic methods may be employed in solving problems. The use of the slide-rule is permitted. Mathematical tables will be provided by schools for their candidates, and by the Board for private study candidates sitting at University centres.

Principles of Accounts ORDINARY LEVEL

The examination will be designed to test the candidates' understanding of the basic principles of book-keeping by double entry; their ability to record by this method straightforward trading and financial transactions; and their ability to construct and interpret Final Accounts and Balance Sheets in simple commercial form.

The examination will comprise two papers, one of two and a half hours and one of one and a half hours, and candidates must satisfy the Examiners in each paper.

Each of the papers will cover the whole range of the syllabus. The first paper will contain questions requiring the lengthier type of worked example; the second paper will include, besides examples, questions of an essay type.

Questions will be based upon the following syllabus:

The necessity of keeping accounts, and the reasons for keeping them in generally accepted forms.

Double-entry book-keeping and its advantages. The preparation of accounts on double-entry principles from incomplete records. The Ledger and Ledger Accounts. The distinctions between Real, Nominal and Personal Accounts, and their respective treatment. Balancing the accounts. The construction, uses and limitations of the Trial Balance.

The Cash Book, the columnar Petty Cash Book and their uses. Cash Discount. The Petty Cash imprest system. Simple Bank Reconciliation Statements.

The main subsidiary books; Journal, Sales, Purchases and Returns Books. Trade Discount. Writing up the subsidiary books from original documents and other information, and posting to the Ledger Accounts. Knowledge and interpretation of the documents used in writing up the books of prime entry.

The production of Final Accounts and simple Balance Sheets, with straightforward adjustments for stock valuation, depreciation, bad and doubtful debts and items due but unpaid, or paid in advance. The calculation of profit or loss; distinction between capital and revenue; income on account of capital. Gross and net profits and their relationship to turnover, expenses and capital. The distinction between Receipts and Payments Accounts and Income and Expenditure Accounts.

Accounting procedure for withdrawing profits and capital from businesses other than joint stock companies. Elementary treatment of Partnership Accounts.

Elementary treatment of sectional balancing and Control Accounts.

Knowledge of the treatment of income tax is *not* required.

Ability to perform the arithmetical processes involved is an essential part of the work.

Marks will be deducted for untidiness and poor presentation generally.

Principles and Practice of Commerce ORDINARY LEVEL

The examination will consist of one paper of two and a half hours. The purpose of the examination is to test the candidate's understanding of some of the commoner commercial practices within the limits set by the following syllabus which will provide for a study of the structure of the commercial world.

(1) *Business Units*

Types of business unit: sole traders, partnerships, private and public companies, producers' and consumers' co-operatives, public corporations.

Sources of capital. Ordinary and preference shares. Debentures. Bank and trade credit. Advantages and disadvantages of these methods of raising funds.

(2) *Distribution*

Stages in the process of distribution. The functions of wholesalers and retailers. Different types of retail organisation, e.g. department, multiple and self-service stores.

Organized markets for raw materials and transactions on them. Transport and delivery.

Advertising: purpose, methods, advantages and disadvantages to producers, distributors and consumers. Market research.

Terms and methods of payment. Cash, credit, discounts. Hire purchase transactions.

The pricing of goods. Methods employed. Rate of turnover and its importance. The importance of stock control.

(3) *Banking and financial services*

Commercial banks distinguished from other types of banks. The services rendered by commercial banks and by other financial institutions, e.g. savings banks, building societies, merchant banks.
The main principles of insurance, with special reference to life, fire, accident, burglary, marine, fidelity and loss of profits policies.
An outline of the work of the stock exchanges.

(4) *Overseas trade*

The balance of trade and the balance of payments.
Methods of international payment, e.g. bills of exchange and documentary credits.

The functions of the main agents concerned with overseas trade, e.g. clearing and forwarding agents.

An outline of procedure involved in foreign trade with reference to bills of lading and associated documents, insurance, customs regulations.

A reading list may be obtained on application, enclosing a stamped addressed foolscap envelope to the Secretary.

SOUTHERN UNIVERSITIES' JOINT BOARD FOR SCHOOL EXAMINATIONS

Examination Time-Table for 1966

ADVANCED LEVEL AND SPECIAL PAPERS

Schools are free to start and finish papers at any time within half an hour of the times given below.

It is the responsibility of private study candidates, who are permitted to sit at schools, to ascertain from the school the times at which their papers will begin.

Modern Language Oral Examinations will be held in May and June.

Monday, 23rd May	9.30—12.30	Use of English Paper
Monday, 13th June	9.00— 1.00	Metalwork Practical
	9.30—12.30	English Literature I
		Chemistry I
	2.00— 4.30	Spanish II
	2.00— 5.00	History I
		Physics I
		Woodwork Drawing
Tuesday, 14th June	9.00— 1.00	Woodwork Practical
	9.30—12.30	French III
		Pure Mathematics I
		Pure and Applied Mathematics I
		Art III—Stage I
	2.00— 4.00	Geography I (practical)
	2.00— 5.00	Greek I
		Applied Mathematics I
		Engineering Drawing I
Wednesday, 15th June	9.30—12.30	Latin I
		Biology I
		Zoology I
		Pure Mathematics II
		Art II
		Metalwork Drawing and Design
	2.00— 4.30	French II
	2.00— 5.00	Physics II
		Woodwork Design
Thursday, 16th June	9.30—12.30	English Literature II
		Botany I
		Woodwork Technology
	2.00— 5.00	History II
		Spanish III
		Applied Mathematics II
		Pure and Applied Mathematics II
Friday, 17th June	9.30—11.00	German I
	9.30—11.30	Greek II
	9.30—12.30	Religious Knowledge I
		Economics I
		Biology II
		Zoology II
		Engineering Drawing II
	2.00— 4.30	Greek III
		Geography II
	2.00— 5.00	Metalwork Technology

Monday, 20th June	9.00—p.m.	Art III—Stage II
	9.30—12.00	Latin III
	9.30—12.30	Economics II
		Chemistry II
	2.00— 5.00	General Paper (*Ordinary Level*)
Tuesday, 21st June	9.30—10.30	English Literature III
	11.00—12.30	French I
	9.30—12.30	Botany II
		Physics S
	2.00— 4.00	Latin II
	2.00— 5.00	Economics S
		Pure Mathematics S
Wednesday, 22nd June	9.30—12.30	Botany S
		Applied Mathematics S
		Music I
		Art I
	2.00— 5.00	Religious Knowledge II
		German III
		Biology S
		Zoology S
Thursday, 23rd June	9.30—12.00	German II
	9.30—12.30	Music II
		Chemistry S
	2.00— 4.00	Greek S I
	2.00— 4.30	Geography III
Friday, 24th June	9.30—12.30	Music Aurals and Dictation (*at the University of Bristol*)
	2.00—	Music Aurals (*continued*)
	2.00— 5.00	English Literature S
Monday, 27th June	9.30—12.30	French S
	2.00— 3.30	Spanish I
	2.00— 5.00	Religious Knowledge S
		History S
Tuesday, 28th June	9.30—12.30	German S
		Physics Practical
	2.00— 5.00	Geography S
Wednesday, 29th June	9.30—12.30	Biology Practical
	10.00—12.00	Latin S I
	2.00— 5.00	Music S
Thursday, 30th June	9.30—12.30	Zoology Practical
	10.00—12.00	Latin S II
	2.00— 4.00	Greek S II
	2.00— 5.00	Spanish S
Friday, 1st July	9.30—12.30	Botany Practical

SOUTHERN UNIVERSITIES' JOINT BOARD FOR SCHOOL EXAMINATIONS

Examination Time-Table for the Summer 1966

ORDINARY LEVEL

Schools are free to start and finish papers at any time within half an hour of the times given below.

It is the responsibility of private study candidates, who are permitted to sit at schools, to ascertain from the schools the times at which their papers will begin.

Modern Language Oral examinations for recognised Schools and Cookery practicals will be held, and Needlecraft course work examined, during May and June.

Friday, 17th June	9.30—12.30	Art III—Stage I
	2.00—	Music Aurals
Monday, 20th June	9.30—12.00	Needlecraft Practical
	9.30—12.30	Woodwork Practical
	2.00— 4.30	Housecraft Theory
	2.00— 4.30	Metalwork Drawing
	2.00— 5.00	General Paper
Tuesday, 21st June	9.30—12.00	Cookery Theory
	9.30—12.30	Metalwork Practical
	2.00— 4.30	Needlecraft Theory Woodwork Drawing
Wednesday, 22nd June	9.30—12.30	Art II
	9.30—	Art III—Stage II
Thursday, 23rd June	9.30—12.00	English Language
	2.00— 4.30	Mathematics I Arithmetic
Friday, 24th June	9.30—12.00	Mathematics II
	2.00— 4.30	English Literature A and B
Monday, 27th June	9.30—11.45	Geography I
	2.00— 4.00	French I
Tuesday, 28th June	9.30—10.30	Biology Practical
	10.45—12.45	Biology Theory
	9.30—12.00	Human Biology
	2.00— 4.30	Latin I Geometrical and Machine Drawing I Principles of Accounts I
Wednesday, 29th June	9.30—12.00	History A, B, C, D
	2.00— 4.00	German I

Thursday, 30th June	9.30—12.00	Science General Science Chemistry
	2.00— 4.30	Physics with Chemistry Physics
Friday, 1st July	9.30—12.15	Religious Knowledge
	2.00— 4.30	Greek I Geology Art I
Monday, 4th July	9.30—11.30	French II
	2.00— 4.15	Geography II
Tuesday, 5th July	9.30—11.30	Music I
	2.00— 3.30	Principles of Accounts II
	2.00— 4.00	Latin II
	2.00— 4.30	Geometrical and Machine Drawing II
Wednesday, 6th July	9.30—11.30	Spanish I
	9.30—12.00	Woodwork Theory
	2.00— 4.00	Greek II Music II
	2.00— 4.30	Mathematics and Statistics for Commerce I
Thursday, 7th July	9.30—11.30	German II
	2.00— 4.30	Additional Mathematics I Metalwork Theory
Friday, 8th July	9.30—12.00	Principles and Practice of Commerce
	2.00— 4.30	Additional Mathematics II Mathematics and Statistics for Commerce II
Monday, 11th July	9.30—12.00	Greek Civilisation
	2.00— 4.00	Spanish II
Tuesday, 12th July	9.30—10.10	Russian I A
	10.30—11.45	Russian I B
	2.00— 4.00	Russian II

SOUTHERN UNIVERSITIES' JOINT BOARD FOR SCHOOL EXAMINATIONS

Examination Time-Table

WINTER G.C.E. ORDINARY LEVEL EXAMINATION 1966

Schools are free to start and finish papers at any time within half an hour of the times given below.

It is the responsibility of private study candidates, who are permitted to sit at schools, to ascertain from the schools the times at which their papers will begin.

Modern Language oral examinations will be held in December after the written papers.

Monday, 21st November	10.00—12.30	Mathematics I
	2.00— 4.00	French I
Tuesday, 22nd November	10.00—12.00	Spanish I
	10.00—12.30	Latin I
	2.00— 4.15	Geography I
Wednesday, 23rd November	10.00—12.30	History A, B and C
	2.00— 4.30	English Language
Thursday, 24th November	10.00—12.30	Science General Science Physics with Chemistry Physics
	2.00—4.30	English Literature A and B
Friday, 25th November	9.30—10.30	Biology Practical
	10.45—12.45	Biology Theory
	9.30—12.00	Human Biology
	2.00— 4.00	Spanish II
	2.00— 4.30	Chemistry
Monday, 28th November	10.00—12.30	Greek I Geology Additional Mathematics I
	2.00— 4.00	German I
Tuesday, 29th November	10.00—12.15	Geography II (Sections A, B, C, D and E)
	2.00—4.00	French II
Wednesday, 30th November	10.00—12.30	Mathematics II
	2.00— 4.00	Latin II
Thursday, 1st December	10.00—12.30	Additional Mathematics II
	10.00—12.45	Religious Knowledge
	2.00— 4.00	Greek II German II
Friday, 2nd December	10.00—12.30	Greek Civilisation
	2.00— 4.00	Music I
Monday, 5th December	10.00—12.00	Music II
	2.00—	Music Aurals and Dictation

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