

3.2 Assessment

All candidates must enter for three papers.

Core candidates take:		Extended candidates take:	
<p>Paper 1 45 minutes</p> <p>A multiple-choice paper consisting of 40 items of the four-choice type.</p> <p>(This paper will test assessment objectives AO1 and AO2.) Questions will be based on the Core syllabus content.</p> <p>40 marks</p> <p>This paper will be weighted at 30% of the final total mark.</p> <p>Externally assessed.</p>		<p>Paper 2 45 minutes</p> <p>A multiple-choice paper consisting of 40 items of the four-choice type.</p> <p>(This paper will test assessment objectives AO1 and AO2.) Questions will be based on the Extended syllabus content (Core and Supplement).</p> <p>40 marks</p> <p>This paper will be weighted at 30% of the final total mark.</p> <p>Externally assessed.</p>	
and:		and:	
<p>Paper 3 2 hours</p> <p>A written paper consisting of short-answer and structured questions.</p> <p>(This paper will test assessment objectives AO1 and AO2.) Questions will be based on the Core syllabus content.</p> <p>120 marks</p> <p>This paper will be weighted at 50% of the final total mark.</p> <p>Externally assessed.</p>		<p>Paper 4 2 hours</p> <p>A written paper consisting of short-answer and structured questions.</p> <p>(This paper will test assessment objectives AO1 and AO2.) Questions will be based on the Extended syllabus content (Core and Supplement).</p> <p>120 marks</p> <p>This paper will be weighted at 50% of the final total mark.</p> <p>Externally assessed.</p>	

All candidates take:			
either:		or:	
<p>Paper 5 2 hours</p> <p>Practical Test</p> <p>This paper will test assessment objective AO3.</p> <p>Questions will be based on the experimental skills in Section 6.</p> <p>The paper is structured to assess grade ranges A*A*–GG.</p> <p>60 marks</p> <p>This paper will be weighted at 20% of the final total mark.</p> <p>Externally assessed.</p>		<p>Paper 6 1 hour 30 minutes</p> <p>Alternative to Practical</p> <p>This paper will test assessment objective AO3.</p> <p>Questions will be based on the experimental skills in Section 6.</p> <p>The paper is structured to assess grade ranges A*A*–GG.</p> <p>60 marks</p> <p>This paper will be weighted at 20% of the final total mark.</p> <p>Externally assessed.</p>	

4. Syllabus aims and assessment objectives

4.1 Syllabus aims

The syllabus aims listed below describe the educational purposes of a course based on this syllabus. These aims are not intended as assessment criteria but outline the educational context in which the syllabus content should be viewed. These aims are the same for all learners and are not listed in order of priority. Some of these aims may be delivered by the use of suitable local, international or historical examples and applications, or through collaborative experimental work.

The aims are to:

- provide an enjoyable and worthwhile educational experience for all learners, whether or not they go on to study science beyond this level
- enable learners to acquire sufficient knowledge and understanding to:
 - become confident citizens in a technological world and develop an informed interest in scientific matters
 - be suitably prepared for studies beyond Cambridge IGCSE
- allow learners to recognise that science is evidence-based and understand the usefulness, and the limitations, of scientific method
- develop skills that:
 - are relevant to the study and practice of science
 - are useful in everyday life
 - encourage a systematic approach to problem-solving
 - encourage efficient and safe practice
 - encourage effective communication through the language of science
- develop attitudes relevant to science such as:
 - concern for accuracy and precision
 - objectivity
 - integrity
 - enquiry
 - initiative
 - inventiveness
- enable learners to appreciate that:
 - science is subject to social, economic, technological, ethical and cultural influences and limitations
 - the applications of science may be both beneficial and detrimental to the individual, the community and the environment.

4.2 Assessment objectives

AO1: Knowledge with understanding

Candidates should be able to demonstrate knowledge and understanding of:

- scientific phenomena, facts, laws, definitions, concepts and theories
- scientific vocabulary, terminology and conventions (including symbols, quantities and units)
- scientific instruments and apparatus, including techniques of operation and aspects of safety
- scientific and technological applications with their social, economic and environmental implications.

Syllabus content defines the factual material that candidates may be required to recall and explain.

Candidates will also be asked questions which require them to apply this material to unfamiliar contexts and to apply knowledge from one area of the syllabus to another.

Questions testing this assessment objective will often begin with one of the following words: *define, state, describe, explain (using your knowledge and understanding) or outline (see the Glossary of terms used in science papers in section 7.6).*

AO2: Handling information and problem solving

Candidates should be able, in words or using other written forms of presentation (i.e. symbolic, graphical and numerical), to:

- locate, select, organise and present information from a variety of sources
- translate information from one form to another
- manipulate numerical and other data
- use information to identify patterns, report trends and draw inferences
- present reasoned explanations for phenomena, patterns and relationships
- make predictions and hypotheses
- solve problems, including some of a quantitative nature.

Questions testing these skills may be based on information that is unfamiliar to candidates, requiring them to apply the principles and concepts from the syllabus to a new situation, in a logical, deductive way.

Questions testing these skills will often begin with one of the following words: *predict, suggest, calculate or determine (see the Glossary of terms used in science papers in section 7.6).*

AO3: Experimental skills and investigations

Candidates should be able to:

- demonstrate knowledge of how to safely use techniques, apparatus and materials (including following a sequence of instructions where appropriate)
- plan experiments and investigations
- make and record observations, measurements and estimates
- interpret and evaluate experimental observations and data
- evaluate methods and suggest possible improvements.

4.3 Relationship between assessment objectives and components

The approximate weightings allocated to each of the assessment objectives are summarised in the table below.

Assessment objective	Papers 1 and 2	Papers 3 and 4	Papers 5 and 6	Weighting of AO in overall qualification
AO1: Knowledge with understanding	63%	63%	–	50%
AO2: Handling information and problem solving	37%	37%	–	30%
AO3: Experimental skills and investigations	–	–	100%	20%
Weighting of paper in overall qualification	30%	50%	20%	

4.4 Grade descriptions

The scheme of assessment is intended to encourage positive achievement by all candidates.

A **Grade AA** candidate will be able to:

- recall and communicate precise knowledge and display comprehensive understanding of scientific phenomena, facts, laws, definitions, concepts and theories
- apply scientific concepts and theories to present reasoned explanations of familiar and unfamiliar phenomena, to solve complex problems involving several stages, and to make reasoned predictions and hypotheses
- communicate and present complex scientific ideas, observations and data clearly and logically, independently using scientific terminology and conventions consistently and correctly
- independently select, process and synthesise information presented in a variety of ways, and use it to draw valid conclusions and discuss the scientific, technological, social, economic and environmental implications
- devise strategies to solve problems in complex situations which may involve many variables or complex manipulation of data or ideas through multiple steps
- analyse data to identify any patterns or trends, taking account of limitations in the quality of the data and justifying the conclusions reached
- select, describe, justify and evaluate techniques for a large range of scientific operations and laboratory procedures.

A **Grade CC** candidate will be able to:

- recall and communicate secure knowledge and understanding of scientific phenomena, facts, laws, definitions, concepts and theories
- apply scientific concepts and theories to present simple explanations of familiar and some unfamiliar phenomena, to solve straightforward problems involving several stages, and to make detailed predictions and simple hypotheses
- communicate and present scientific ideas, observations and data using a wide range of scientific terminology and conventions
- select and process information from a given source, and use it to draw simple conclusions and state the scientific, technological, social, economic or environmental implications
- solve problems involving more than one step, but with a limited range of variables or using familiar methods
- analyse data to identify a pattern or trend, and select appropriate data to justify a conclusion
- select, describe and evaluate techniques for a range of scientific operations and laboratory procedures.

A **Grade FF** candidate will be able to:

- recall and communicate limited knowledge and understanding of scientific phenomena, facts, laws, definitions, concepts and theories
- apply a limited range of scientific facts and concepts to give basic explanations of familiar phenomena, to solve straightforward problems and to make simple predictions
- communicate and present simple scientific ideas, observations and data using a limited range of scientific terminology and conventions
- select a single piece of information from a given source, and use it to support a given conclusion, and to make links between scientific information and its scientific, technological, social, economic or environmental implications
- solve problems involving more than one step if structured help is given
- analyse data to identify a pattern or trend
- select, describe and evaluate techniques for a limited range of scientific operations and laboratory procedures.

6.2 Description of Components, Paper 5: Practical Test and Paper 6: Alternative to Practical

These papers are based on testing experimental skills. One question on each paper assesses the skill of planning. This question will be based on any one of the sciences, which could be: Biology, Chemistry or Physics and may vary between each examination series. The questions do not assess specific syllabus content from Section 5: Syllabus content. Any information required to answer these questions is contained within the question paper or from the experimental context and skills listed below.

Questions are structured to assess across the grade range A*A*–GG.

Paper 5: Practical Test will typically consist of six to seven exercises, one of which will **not** require the use of apparatus.

Paper 6: Alternative to Practical will test the same experimental skills as Paper 5, and will contain many of the same question parts.

Experimental skills tested in Paper 5: Practical Test and Paper 6: Alternative to Practical

Questions may be set requiring candidates to:

- carefully follow a sequence of instructions
- describe, explain or comment on experimental arrangements and techniques
- select the most appropriate apparatus or method for a task and justify the choice made
- draw, complete or label diagrams of apparatus
- perform simple arithmetical calculations
- take readings from an appropriate measuring device or from an image of the device (e.g. thermometer, rule, protractor, measuring cylinder, ammeter, stopwatch), including:
 - reading analogue and digital scales with accuracy and appropriate precision
 - interpolating between scale divisions when appropriate
 - correcting for zero errors when appropriate
- plan to take a sufficient number and range of measurements, repeating where appropriate to obtain an average value
- describe or explain precautions taken in carrying out a procedure to ensure safety or the accuracy of observations and data, including the control of variables and repetition of measurements
- identify key variables and describe how, or explain why, certain variables should be controlled
- record observations systematically, for example in a table, using appropriate units and to a consistent and appropriate degree of precision
- process data, using a calculator where necessary
- present and analyse data graphically, including the use of best-fit lines where appropriate, interpolation and extrapolation, and the determination of a gradient, intercept or intersection
- interpret and evaluate observations and experimental data
- draw an appropriate conclusion, justifying it by reference to the data and using an appropriate explanation
- comment critically on a procedure or point of practical detail, and suggest an appropriate improvement
- evaluate the quality of data, identifying and dealing appropriately with any anomalous results
- identify possible causes of uncertainty, in data or in a conclusion

- make estimates or describe outcomes which demonstrate their familiarity with an experiment, procedure or technique
- plan an experiment or investigation, including making reasoned predictions of expected results and suggesting suitable apparatus and techniques.

Biology

Candidates may be asked questions on the following experimental contexts:

- the use of familiar, and unfamiliar, techniques to record observations and data, process them and make deductions from them
- recall of simple chemical tests, e.g. for food substances and the use of limewater, hydrogencarbonate indicator, litmus and Universal Indicator paper
- recognise, observe, record and measure images of familiar, and unfamiliar, biological specimens
- make a clear line drawing from an image of a specimen, calculating the magnification and adding labels as required.

Chemistry

Candidates may be asked questions on the following experimental contexts:

- simple quantitative experiments involving the measurement of volumes and/or masses
- rates (speeds) of reaction
- measurement of temperature based on a thermometer with 1 °C graduations and energetics
- problems of an investigatory nature, possibly including suitable organic compounds
- filtration
- electrolysis
- identification of ions and gases
- metals and the reactivity series
- acids, bases, oxides and the preparation of salts
- redox reactions and rusting.

Physics

Candidates may be asked questions on the following experimental contexts:

- measurement of physical quantities such as length or volume or force or density
- cooling and heating
- springs and balances
- timing motion or oscillations
- electrical circuits, circuit diagrams and electrical symbols
- optics equipment such as mirrors, prisms and lenses
- procedures using simple apparatus, in situations where the method may not be familiar to the candidate
- use or describe the use of common techniques, apparatus and materials, for example ray-tracing equipment or the connection of electric circuits
- explain the manipulation of the apparatus to obtain observations or measurements, e.g.:
 - when determining a derived quantity, such as the extension per unit load for a spring
 - when testing/identifying the relationship between two variables, such as between the p.d. across a wire and its length
 - when comparing physical quantities, such as two masses, using a balancing method.