

Getting Started Guide



GCSE (9-1) Sciences

Getting Started: GCSE Sciences 2016

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1. Introduction

This Getting Started guide provides an overview of the new GCSE Science specifications, to help you get to grips with the changes to content and assessment, and to help you understand what these mean for you and your students.

We will be providing a package of support to help you plan and implement the new specification.

- Course planners and schemes of work that you can adapt to suit your department
- Mapping documents that map the current GCSEs and International GCSE to our new GCSEs
- A transition scheme to use in Year 9 to bridge the gap from KS3 to KS3, including suggested activities and end-of-unit tests and mark schemes
- A guide to Maths for Scientists; and a Core Practical Guide
- An 'Explaining our exams' document
- Exemplar student answers with examiner commentary

These support documents will be available on the GCSE 2016 Science [pages](#).

To help you with getting started and with further questions, we can support you in hosting local network groups in addition to the on-going support from your local Pearson curriculum support team and from Stephen Nugus and Julius Edwards, our Science Subject Advisors.

2. What's changed?

2.1 What are the changes to the GCSE qualification?

From September 2016, there will be four GCSE qualifications in science that students can take:

- GCSE (9–1) Combined Science (double award)
- GCSE (9–1) Biology
- GCSE (9–1) Chemistry
- GCSE (9–1) Physics.

There will be no longer be a single (Core) GCSE Science option.

A new 9–1 grading system replaces A*–G: Foundation tier will cover grades 1–5; Higher tier will cover grades 4–9. For Combined Science there is a 17-point grading scale, so the highest grade is a 9, 9, followed by a 9, 8, all the way down to a 1, 1. A student's grade for Combined Science will be calculated based on their total score across all papers.

Practical skills

There are no controlled assessments in the new qualifications. Practical skills will be assessed only through the written papers: 15% of marks in exam papers will be for knowledge, understanding and application of practical skills. Students will do eight core practicals per science and 18 for Combined Science, all of which are outlined in the specifications. You can find more information on core practicals and the assessment of practicals skills on page 17 of this document.

In order to meet the requirements set out by Ofqual, you will need to ensure your centre confirms that reasonable steps have been taken to secure that each learner has completed the practical activities set by us, and has made a contemporaneous record of the practical work and knowledge, skills and understanding derived from those practical activities.

The purpose of this statement is to ensure that practical work remains an important part of GCSE Science. In your day-to-day teaching, this just means that you need to ensure you cover the core practicals outlined by us and that your students are recording the work that they are doing as part of carrying out the core practicals. In practice, this could just be completing worksheets, taking results and doing some analysis or writing notes in their exercise books as a follow-up to carrying out the practical. If you prefer, you could use a separate lab book for practical work, but this is not necessary. Indeed, as students will be required to have knowledge of these practical techniques and procedures for the final exam, it may be better to have this practical work sit alongside the relevant theoretical knowledge.

Mathematical skills

The Department for Education has defined a list of maths skills that should be covered in the new GCSE Science qualifications. These maths skills are mapped in our specifications in a column on the right-hand side, indicating where there are good opportunities to cover the maths content. Questions assessing students' use of mathematical skills will make up the following proportions of the papers:

- Combined Science 20%
- Biology 10%
- Chemistry 20%
- Physics 30%.

2. What's changed?

There is a set list of Physics equations to recall and apply in GCSE (9-1) Physics (plus extra equations to just apply which will be included on a formula sheet). More information about these can be found on Page 17 of this document.

Changes to content requirements

In addition to the changes around maths and practical skills, the Department for Education have released subject content for the new science GCSEs. This is made up of two documents: Combined Science GCSE subject content and Separate Science GCSE subject content. All awarding organisations' specifications for GCSE Sciences must meet these criteria.

The subject content published by the DfE is relatively specific, and outlines the content that should be included in the Combined Science as well as the additional content to make up the separate sciences. It also highlights the content that should be higher tier only.

Our specifications have been designed to ensure this subject content is fully covered.

Changes to Assessment Objectives

The GCSE Sciences Assessment Objectives have been revised. They are similarly weighted to those from GCSE 2011. However, it is important to note that AO2 and AO3 were previously found predominantly in the controlled assessment unit. Now that the controlled assessment unit has been removed, you will see more application and analysis in the papers than with the previous 2011 qualifications.

AO1 40%	Demonstrate knowledge and understanding of: <ul style="list-style-type: none">• scientific ideas• scientific techniques and procedures
AO2 40%	Apply knowledge and understanding of: <ul style="list-style-type: none">• scientific ideas• scientific enquiry, techniques and procedures
AO3 20%	Analyse information and ideas to: <ul style="list-style-type: none">• interpret and evaluate• make judgements and draw conclusions• develop and improve experimental procedures

AO1 and AO2 are different to the current assessment objectives as they now contain a second strand that focuses on practical requirements (scientific techniques and procedures). This emphasises that although the controlled assessment unit has been removed, practical work is still an important part of the qualification. There will be questions in the exam papers that assess the knowledge and understanding of core practicals (AO1, second bullet point) and investigative 'scientific enquiry' skills or application of general procedures in core practicals (AO2, second bullet point).

AO3 provides a lot of opportunity for analysis and evaluation as well as developing and improving experimental procedures, so you might see questions that ask for candidates to plan to test a hypothesis.

For more detailed examples and an in-depth look at the assessment objectives and how these influence the questions in exam papers, you can look at the 'Explaining our Exams' document available on our website.

2. What's changed?

2.2 Changes to the specification

Specification overview

The content across Biology, Chemistry and Physics has been split into a number of topics. These topics are arranged such that the first few topics are assessed in Paper 1, and the remainder are assessed in Paper 2 for each subject. There is also an overarching topic that outlines key concepts, which could be assessed in either Paper 1 or Paper 2.

Biology

The topics covered in each paper are shown below.

Paper 1	Paper 2
Key concepts in Biology	Key concepts in Biology
Cells and control	Plant structures and their functions
Genetics	Animal coordination, control and homeostasis
Natural selection and genetic modification	Exchange and transport in animals
Health, disease and development of medicines	Ecosystems and material cycles

Due to the nature of the criteria, the content for Combined Science and for separate Biology is intertwined. The nine topics we have for Combined Science are the same nine topics we have for separate Biology. There is additional content which goes into more depth within each of those topics to cover the additional material required for separate science, e.g. in Topic 3, although inheritance is covered in Combined Science, Mendel is covered in separate Biology only. The specification statements that cover this additional material have been marked with a letter 'B' after the specification number so you can see exactly which content is separate science only, e.g. 3.11B is separate Biology content only.

Chemistry

The topics covered in each paper are shown below.

Paper 1	Paper 2
Key concepts in Chemistry	Key concepts in Chemistry
States and matter and mixtures	Groups in the periodic table
Chemical changes (acids and electrolytic processes)	Rates of reaction and energy changes
Extracting metals and equilibria	Fuels and Earth science
*Separate Chemistry 1 (transition metals, quantitative analysis, dynamic equilibria, chemical cells and fuel cells)	*Separate Chemistry 2 (qualitative analysis, hydrocarbons, polymers, alcohols and carboxylic acids, bulk and surface properties of matter including nanoparticles)

* Separate Chemistry only

2. What's changed?

Key Concepts in Chemistry covers atomic structure and bonding, and this could be assessed in both papers. We have made this content overarching as the basic knowledge of atomic structure and bonding may be needed to answer a question on a later topic, e.g. fuels and hydrocarbons is in Paper 2 and acids is in Paper 1, but both would require fundamental knowledge of atomic structure.

The separate Chemistry content can generally be taught after the Combined Science content, e.g. organic chemistry would follow on near the end after hydrocarbons in fuels. This means you can teach all the Combined Science content first, followed by the Chemistry-only content towards the end of the course.

Physics

The topics covered in each paper are shown below.

Paper 1	Paper 2
Key concepts in Physics	Key concepts in Physics
Motion and forces	Energy – forces doing work
Conservation of energy	Forces and their effects
Waves	Electricity and circuits
Light and the electromagnetic spectrum	Static electricity*
Radioactivity	Magnetism and the motor effect
Astronomy*	Electromagnetic induction
	Particle model
	Forces and matter

*Separate Physics only

For some topics, the content split is similar to Biology in that the topic is the same across Combined Science and separate Physics but Physics students will study the topic in more depth. However, some topics (indicated by an asterisk) are only taught in the separate Physics GCSE, e.g. Astronomy. Even though the number of topics is uneven between Paper 1 and Paper 2, the amount of content covered by each paper is equal – we have just named and split our topics so that they represent the content as accurately as possible.

Changes to specification content

The content is 100% prescribed by the Department for Education, including for the separate sciences.

A summary of the changes is given below.

Biology

GCSE (9–1) Combined Science (Double Award)

New content	Content removed from current specification
Human health and disease	Classification of organisms
Plant structures	Thermoregulation
Transpiration and translocation	Trophic levels and pyramids of biomass
Ecosystems	Protein synthesis

2. What's changed?

More examples of human hormone and hormonal control, e.g. thyroxine, adrenaline	Digestion
Contraception	Cloning mammals

Contraception and human evolution has moved from separate science into Combined Science.

Indicator species has moved from Combined Science to separate science only.

GCSE (9–1) Biology (separate science)

The changes below are in addition to those listed above.

New content	Content removed from current specification
The eye	Animal behaviour and communication
Structure and function of the brain	Transgenic plants
	Biotechnology

Content that has moved from Combined Science into separate science only: Thermoregulation, Protein synthesis, Trophic levels, Plant hormones.

Chemistry

GCSE (9–1) Combined Science (Double Award)

New content	Content removed from current specification
Methods of metal extraction (bacterial and phytoextraction)	Igneous, sedimentary and metamorphic rocks
Properties of fullerenes and graphene	Indigestion remedies
More detail on chromatography and separation techniques (including potable water)	Biofuels
More work on acids, including pH and weak and strong acids	Discovery of the noble gases
Activation energy and bond energies	
States of matter and their inter conversions	
The reactivity series, including displacement reactions as redox reactions	

Content that has moved from separate science into Combined Science: More on electrolysis, Avogadro constant and atom economy, Preparation of soluble salts, Equilibrium.

GCSE (9–1) Chemistry (separate science)

The changes below are in addition to those listed above.

2. What's changed?

New content	Content removed from current specification
Glass, clay and ceramics	Hardness of water
Identifying ions using spectroscopic results	Thermal decomposition of carbonates, including limestone
More on fuel cells	Formation of esters
Bulk and surface properties of matter including nanoparticles	Formation of soap and its action
Synthetic and naturally occurring polymers	

Content that has moved from Combined Science into separate science only: Alloys, Tests for ions, Alkanes and alkenes, Addition polymers, Percentage yield calculations, Transition metals, Corrosion of iron and its prevention.

Physics

GCSE (9–1) Combined Science (Double Award)

New content	Content removed from current specification
Inertial mass	Earthquakes
Interactions of objects	Costs and energy saving appliances
More on electricity	Telescopes
Specific heat capacity and specific latent heat	
More detail on forces and matter	
Stretching springs and linear and non-linear relationships	
Thermal insulation and conductivity	
Dangers of large decelerations	

GCSE (9–1) Physics (separate science)

The changes below are in addition to those listed above.

New content	Content removed from current specification
Pressure and pressure differences in fluids	Motion of particles
More on space physics	X-rays and ECGs
Specular and diffuse reflection and scattering	The eye
Magnetism and the motor effect	
Levers, gears and rotational forces	

2. What's changed?

Changes to assessment

The approach used when designing the papers for these GCSE qualifications is very similar to the current approach. The main changes relate to the assessment of practical skills and the level of mathematical skill required within science papers.

For more details on how our exam papers are written, see our guide, 'Explaining our Exams', which takes you through the different assessment objectives and how these are assessed, as well as giving more examples of questions assessing maths skills and practical based questions.

3. Planning

3.1 Planning for delivery of the course

We recognise that schools need flexibility in the way that they deliver GCSE Science, for example running the course over different lengths of time, accommodating different amounts of teaching time and also supporting lower attainers through these new qualifications. To support flexibility, we have produced several documents, free to download, to help with planning. All of these documents are available in Word format so they can be modified once downloaded.

There are three main types of document to support planning:

- Course planners
- Schemes of work
- Detailed planning guides

These documents can be found on [our](#) website, along with other teaching and learning materials.

3.2 Overview of documents available

There are several versions of each of these documents, designed to support any variation in GCSE (9-1) Science delivery:

Course planners

Within the main document there are planners to support:

- 3-year GCSE (9-1) Combined Science
- 3-year GCSE (9-1) Separate Sciences
- 2.5-year GCSE (9-1) Combined Science
- 2.5-year GCSE (9-1) Separate Sciences
- 2-year GCSE (9-1) Combined Science
- 2-year GCSE (9-1) Combined Science Separate Sciences

3-year GCSE (9-1) Combined Science for lower attainers

Schemes of work

There are schemes of work to support each of the course planners listed above:

- 3-year GCSE (9-1) Combined Science
- 3-year GCSE (9-1) Separate Sciences
- 2.5-year GCSE (9-1) Combined Science
- 2.5-year GCSE (9-1) Separate Sciences
- 2-year GCSE (9-1) Combined Science
- 2-year GCSE (9-1) Separate Sciences

3-year GCSE (9-1) Combined Science for lower attainers

Five-year schemes of work have also been developed, with Key Stage 3 based on the Exploring Science course:

3. Planning

5-year scheme including a 3 year GCSE (9-1) Combined Science

5-year scheme including a 3 year GCSE (9-1) Separate Sciences

5-year scheme including a 2.5 year GCSE (9-1) Combined Science

5-year scheme including a 2.5 year GCSE (9-1) Separate Sciences

To follow:

5-year scheme including a 2 year GCSE (9-1) Combined Science

5-year scheme including a 2 year GCSE (9-1) Separate Sciences

To follow:

Combined Science content followed by the Separate Science content including a 3-year GCSE (9-1)

Combined Science content followed by the Separate Science content including a 2.5-year GCSE (9-1)

Combined Science content followed by the Separate Science content including a 2-year GCSE (9-1)

Detailed planning guides

These are schemes of work designed for those using the Edexcel GCSE (9-1) resources on the ActiveLearn Digital Service. They are most suited to delivery of Combined Science over three years due to the large amount of practical work suggested throughout. If necessary, amendments could be made to remove some of the practical work (other than core practicals) to make them suitable for a shorter teaching period.

These planning guides provide activity ideas and equipment lists that support the first half of the Combined Science course.

Term 1 based on a 3-year GCSE (9-1) Combined Science

Term 2 based on a 3-year GCSE (9-1) Combined Science

Term 3 based on a 3-year GCSE (9-1) Combined Science

Course planners

We are aware that science teaching time varies widely between schools. In producing our course planners, we collected information from many schools about teaching time allocation for science. This information was used to calculate the average number of hours of teaching available to students studying either Combined Science or separate sciences, and these values were then used as a guide in developing the course planners and schemes of work.

The table below shows the approximate number of teaching hours on which the course planners are based.

	3-year GCSE Course Planner	2.5-year GCSE Course Planner	2-year GCSE Course Planner
GCSE (9-1) Combined Science	416 hours	340 hours	260 hours
GCSE (9-1) Separate Sciences	528 hours	460 hours	378 hours

3. Planning

Guided learning hours

The number of guided learning hours, as recommended by the DfE and Ofqual, remains at 120 hours per science GCSE. Based on the model shown above, and due to the volume of content in the GCSE course, all of our routes use more than the recommended 120 hours per GCSE.

In deciding which planner would best suit your setting, it is recommended that the number of teaching hours you have available to deliver GCSE (9-1) Combined Science and GCSE (9-1) Separate Sciences is calculated. The number of hours available in your setting should then be compared to the numbers of teaching hours on which our course planners are based. Select the course planner that most closely matches in terms of hours, making amendments to either condense topics into fewer lessons or extend topics into more lessons; this can be done by adapting the course planner as it is in Word format.

Below is a worked example:

In a school where Combined Science will be delivered over three years

Year	Number of teaching hours per week	Number of teaching weeks	Total number of hours per year
9	2.5	39	97.5
10	4	39	156
11	4	27 (to allow for revision and exams)	108
Total number of hours to deliver Combined Science			361.5

Comparing the total number of teaching hours in this setting (361.5 hours) to those used to produce the course planners (previous table), this most closely matches with the 2.5-year GCSE course planner for Combined Science (340 hours). The 2.5-year GCSE (9-1) Combined Science course planner would be the most appropriate starting point for this department. They have an additional 21.5 hours available compared to this course planner. The next step would be to identify topics that would benefit from additional time and allocate the additional 21.5 hours accordingly.

This example highlights the importance of considering teaching hours, rather than duration of Key Stage 4, in selecting a course planner (and scheme of work).

Teacher split

The Combined Science course planners (including the lower attainers course planner) are based on classes shared between two teachers (based on school feedback). The Biology topics are suggested for one teacher and Chemistry for another teacher, with the Physics topics split between both teachers. The separate science course planners are based on classes having three teachers, each teaching an entire specialism. As all course planners are in Word format, these can be amended to suit alternative teaching systems.

Assessment

Within the 3-year course planners a lesson has been allocated at the end of each topic to allow for revision and assessment. This is also the case within the 2.5-year Combined Science course planner. Within the 2.5-year Separate Science and 2-year course planners (both Combined Science and separate sciences), there is not

3. Planning

specific time allocated for revision and assessment; end-of-topic assessment would, therefore, need to be considered within the planned content.

Schemes of work

Following selection of an appropriate course planner, the scheme of work to match this should be used. The scheme of work can be used either with or without access to the resources on the ActiveLearn Digital Service. All schemes of work provide full coverage of the specification (the lower attainer scheme covers Foundation-level material only).

Lesson length

An indication is given within each 'lesson' as to whether these are recommended for one hour or two hours of teaching. As schemes of work are provided in Word format, these can be amended to suit differing lesson lengths. When amending or removing activities teachers will need to be responsible for ensuring that the specification is still covered in full.

Lesson format

All schemes are written to the same format and include the same key features:

- Specification points covered
- Teaching activity suggestions, including suggestions for 'Starter', 'Exploring' (student-led) and 'Explaining' (teacher-led) stages of a lesson
- Suggestions for differentiation, including suggestions of ways to differentiate at each stage of a lesson to both 'support' and 'extend'
- Maths skills, as defined by the DfE
- Practical opportunities, including core practicals, suggested practicals plus other suggestions. Where lessons are adapted to a shorter duration, practical work other than that linked with core practicals could be removed. However, the use of practical work would be encouraged wherever possible to support the development of practical skills

Five-year schemes

Five-year schemes of work are designed based on Exploring Science at Key Stage 3. Although it would be useful to have access to Exploring Science resources to follow these schemes, it is not essential.

Lower attainer schemes

Lower attainer schemes of work are designed for delivery of Combined Science to students targeting grades 1-3. These cover the entire specification but only include Foundation-tier specification points, with no reference to Higher-tier material. The first term of these schemes is based on transition materials to allow bridging from Key Stage 3 to 4. This first term covers the majority of material suggested in the transition materials, with some amendments to support lower attainers specifically. For example, additional time is suggested for some areas thought to be fundamental to future understanding and some activities have been amended to provide a more practical, hands-on experience. This term introduces students to ideas that will be revisited later in the course, supporting spiralling of ideas throughout Key Stage 4. For those students who have used the original transition materials (available from the Edexcel website), this lower attainer scheme could be implemented from Term 2.

3. Planning

Free resources for teaching Terms 1 and 2

Each lesson for the first two terms of the 3-year Combined Science detailed planning guide has the following associated resources available on the ActiveLearn Digital Service:

- 1 x detailed lesson plan
- 1 x PowerPoint with learning outcomes
- 1 x knowledge retention quick fire quiz
- 1 x practical worksheet with student instructions
- 1 x student book spread
- 1 x digital resource (video, animation, interactive or PowerPoint presentation)
- Checkpoint teaching and learning support (3 x worksheets, 1 x PowerPoint)
- 2 x differentiated homework worksheets
- 1 x set of answers

In addition, there are short End of Unit summative tests to check progress after approximately every 12 hours of teaching.

Term 3 onwards plus the separate science resources are available as a paid-for subscription service.

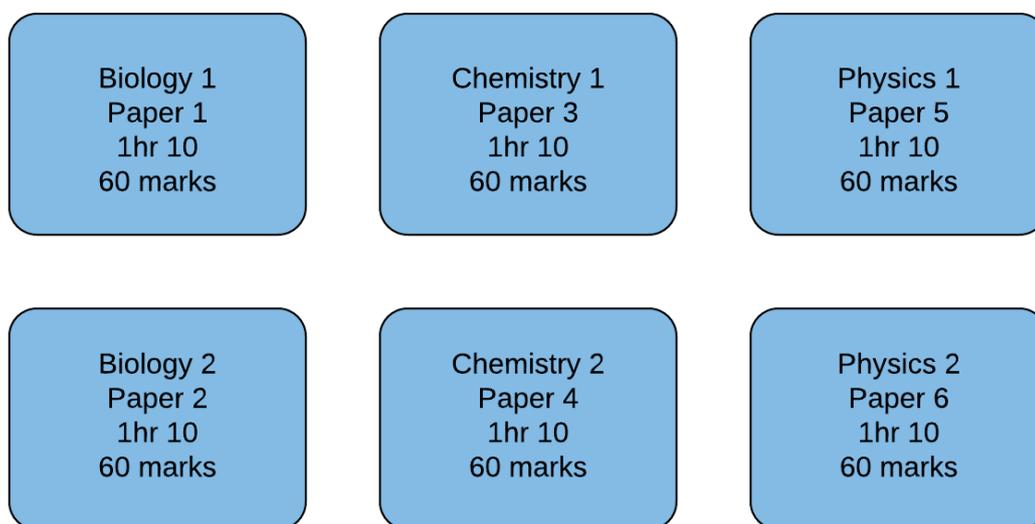
4. Assessment guidance

4.1 Assessment Objectives

AO1 40%	Demonstrate knowledge and understanding of: <ul style="list-style-type: none"> scientific ideas scientific techniques and procedures
AO2 40%	Apply knowledge and understanding of: <ul style="list-style-type: none"> scientific ideas scientific enquiry, techniques and procedures
AO3 20%	Analyse information and ideas to: <ul style="list-style-type: none"> interpret and evaluate make judgements and draw conclusions develop and improve experimental procedures

4.2 Assessment model

Combined Science



For our Combined Science qualifications, we opted for two papers for each science. Each paper will be 1 hour and 10 minutes and will be 60 marks. The convention for our GCSE Science papers in recent times has been for assessments to test at a mark a minute. You will see that our new papers have slightly more than a minute for each mark. This is to account and allow for candidates to have some consolidation time, but also to take into account the new practical skills requirements which may require a bit more thinking time; candidates may be asked, for example, to consider and plan an experiment, or analyse and evaluate some results.

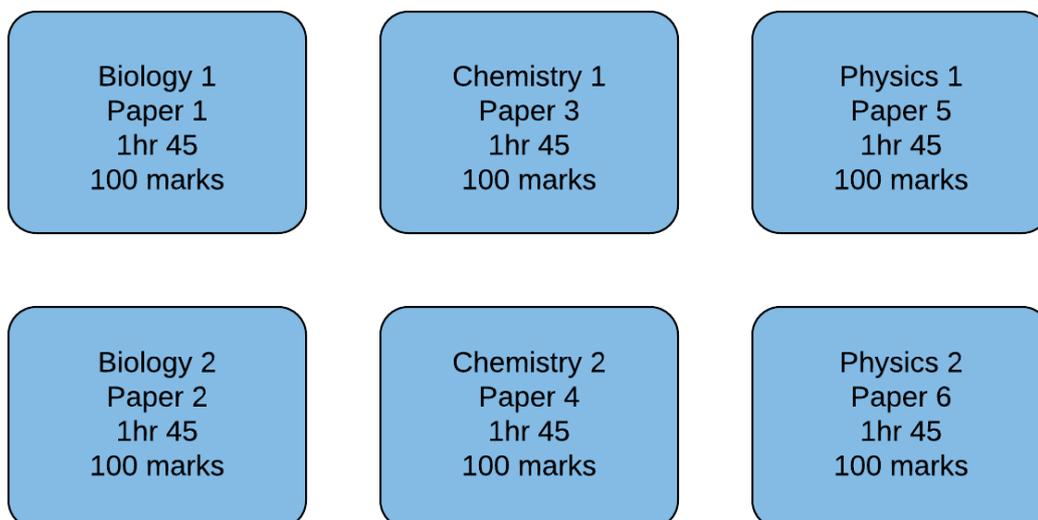
4. Assessment guidance

The papers are split according to topic, with half the content for each discipline in one paper (e.g. Biology 1) and half the content in the second paper (e.g. Biology 2). At the start of every specification, the first topic lists key ideas that may be assessed in both paper 1 and paper 2. These are either fundamental ideas of the science, e.g. cells in Biology or atomic structure and bonding in Chemistry, or skills, e.g. handling units in Physics. There is more detail on the topic split in section 2.2 of this document.

Students can sit Foundation or Higher tier, but they must choose **all** Foundation or **all** Higher. It is not possible to mix tiers on Combined Science. Foundation tier papers cover grades 1 to 5. Higher tier papers cover grades 4 to 9.

Separate Sciences

As with Combined Science, the content of the specification is divided into two for each science and assessed in two different papers, with a small overarching topic that could be assessed in either paper. There are two papers for each science, and each paper will be 1 hour and 45 minutes and will be 100 marks. Again you'll see that the 1 mark per minute ratio has been modified.



To create the separate science papers we take the 6 questions from each combined science paper, and insert 4 additional whole questions to make up 10 questions in each separate science paper. These additional 4 questions are interspersed throughout the separate science paper to ensure we are assessing the separate science content across the grade range, e.g. questions 3, 5, 7, 9 in a paper could be separate science only and the others would be common to the combined science paper.

Students can sit Foundation or Higher in each of the three science GCSEs, but they cannot mix tiers between units 1 and 2. Foundation tier covers grades 1 to 5. Higher tier covers grades 4 to 9.

4. Assessment guidance

4.3 Assessing maths

There are set percentages of marks allocated to the assessment of mathematical skills:

- Combined Science 20%
- Biology 10%
- Chemistry 20%
- Physics 30%.

The breadth of maths that will be assessed has been specified by the DfE and can be found in our specifications in Appendix 1. This is a list of appropriate mathematical skills to be used in a science context. There are also specific use of mathematics statements at the end of each topic.

Ofqual has specified the level of mathematics as follows: KS3-level mathematics for Foundation tier science; Foundation tier-level mathematics for Higher tier science. Not all the mathematics specified by the DfE is at the appropriate standard to count towards the mathematics percentage set by Ofqual; however, as it forms part of the content specified by the DfE it should be assessed. Therefore, there may be mathematical questions – in addition to the ones that count towards the required percentages – that will be at a lower level than that specified by Ofqual, which will cover the DfE content requirements.

Physics equations

For Physics GCSE and the Physics component of Combined Science, there are equations to remember and equations candidates need to be able to apply, numbers differing depending on the route they take. There is no such requirement for Chemistry or Biology. Requirements, in terms of numbers of equations, are as follows:

Recall and apply

	Number in Combined Science	Number in Physics
Foundation	19	21
Higher	20	22

Apply only

	Number in Combined Science	Number in Physics
Foundation	6	7
Higher	8	11

There will be three scenarios in which we will use these equations:

1. Recall and apply: candidates will be asked to remember the equation, then apply it.
2. Apply only: in some scenarios, we might actually give one of the equations and ask candidates to apply it. NB this will also be from the recall and apply list of equations.
3. Select and apply: This will be from the apply only list, which will be given on a formula sheet in the examination. The requirement is that candidates need to be able to select the appropriate formula and use it, so the question will ask the candidate to choose a formula from the formula sheet and perform the calculation.

4. Assessment guidance

4.4 Assessing practicals

We will have at least 15% of marks assigned to the assessment of practical skills. This is assessment of both knowledge of core practicals and of candidates' ability to apply that knowledge to new contexts, or to apply investigative skills to scenarios presented in the examinations.

Core practicals

At the heart of all of this is the core practicals. We have been careful to define the core practicals we expect. The reason for this is two-fold: firstly, to ensure that the methodology centres use is consistent with the apparatus and techniques that the DfE want all learners to experience; secondly, so that we can be clear on what constitutes AO1 and what is AO2. AO1 tests knowledge and understanding of our defined core practicals, so all candidates should know about the specific technique we have outlined. Application of knowledge of these techniques forms the basis of AO2 questions. Scientific enquiry-type questions form the basis of AO2 and AO3. For this reason, while it is only compulsory to do the specified core practicals, we do recommend candidates experience a broad range of practical work so they become accustomed to the questions they will be asked for AO2 and AO3.

It is important to note that questions set in a practical context but testing the theoretical knowledge and understanding will not count towards the marks for practical. Questions that are assigned to the 15% allocation are ones where candidates will be at an advantage if they have carried out the core practical. Questions that test the more generic processing skills around scientific enquiry, such as data analysis, plotting graphs and calculating means will also not count towards the 15% practical mark total.

For more information on our papers see our 'Explaining our Exams' guide.