
GCSE COMBINED SCIENCE: TRILOGY

Insight report:

2019 results at a glance

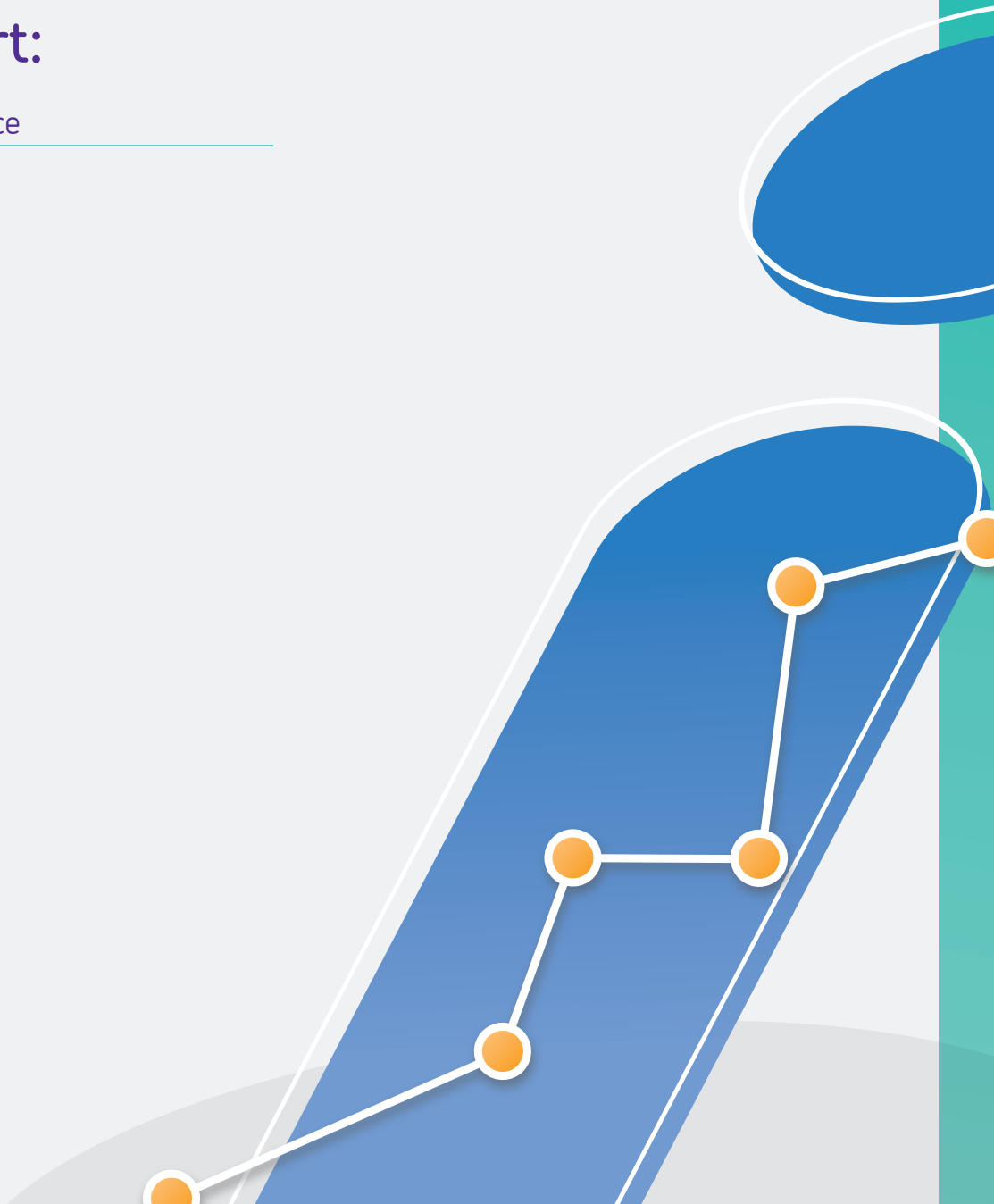
September 2019



2019

aqa.org.uk

insights



How to use this report

This report provides a snapshot of this summer's results. It contains information on grade boundaries and performance by paper. This report is part of our full results insight series. For extra information on results:

- Join your Head of Curriculum for a [video breakdown](#).
- Access our free Enhanced Results Analysis tool. We've created [two-minute tutorials](#) to show you how.
- Navigate to [e-AQA](#) to download the full report on the exam for a detailed breakdown.
- [Book on](#) to one of our Live lessons webinars. The Head of Curriculum for your subject will take you through this year's results and answer your questions.
- [Book on](#) to a Feedback event. See examples from real scripts from the summer to highlight common areas where students did well and where there's room for improvement.

Contents	Page
Qualification summary	4
Grade boundaries	6
Performance overview	7
Biology Paper 1	9
Biology Paper 2	11
Chemistry Paper 1	13
Chemistry Paper 2	16
Physics Paper 1	19
Physics Paper 2	21
Next steps	23

Qualification summary

This was the second year of the reformed specification, which is assessed by two terminal exams in each science. Each paper has 70 marks and students have 75 minutes in which to complete it. There are three Assessment Objectives. Approximately 40% of the marks (28/70) are for demonstrating knowledge and understanding of: scientific ideas, scientific techniques and procedures (AO1), another 40% (28/70) on application of knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures (AO2) and 20% (14/70) for analysing information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures (AO3).

Students made a good attempt at all the questions but imprecise language caused issues in some responses. Most students were able to answer questions that required basic maths skills but many struggled when these were put in a scientific context; when information was provided in the stem of the question it was often poorly used.

The writing of some students, particularly on the Foundation tier, was difficult to read, especially in extended answer questions, where some students struggled to make a well argued response without contradicting themselves.

Students appeared to have a limited knowledge of or confidence in answering questions relating to practical activities, whether these were based on a particular Required Practical Activity or other experimental activity.

Levels of demand

Questions are set at four levels of demand for this specification with different levels of demand within each of the tiers:

Foundation tier

- Low demand questions are targeted at students working at grades 1–3.
- Standard demand questions are targeted at students working at grades 4–5.

Higher tier

- Standard demand questions are targeted at students working at grades 4–5.
- Standard/high demand questions are targeted at students working at grades 6–7.
- High demand questions are targeted at students working at grades 8–9.

A student's final grade is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level they are working to.

Enhanced results analysis

Conduct your own analysis using data relevant to you. Watch short [tutorials](#) on using Enhanced Results Analysis (ERA) for school, subject, group or student performance; or log straight in through aqa.org.uk/log-in

Grade boundaries

Subject or paper	Max mark	Summer 2019 grade boundaries (raw mark)								
Trilogy, 8464 (Higher)	420	9-9	9-8	8-8	8-7	7-7	7-6	6-6	6-5	5-5*
		269	251	233	216	199	180	161	142	123
		5-5*	5-4	4-4	4-3	3-3	3-2	2-2	2-1	1-1
		123	105	87	78		-	-	-	-

*Note the Higher Tier 5-5 grade boundary is deliberately shown in all rows of the above table.

Subject or paper	Max mark	Summer 2019 grade boundaries (raw mark)								
Trilogy, 8464 (Foundation)	420	5-5*	5-4	4-4	4-3	3-3	3-2	2-2	2-1	1-1
		243	221	200	173	146	119	93	67	41

How to interpret grade boundaries

Grade boundaries are set using a mix of statistics and expert judgement

Our research team uses a range of statistics to make predictions that suggest the most appropriate grade boundaries. The statistical evidence considers the prior attainment of the given cohort as well as the distribution of marks. Senior examiners then review a script sample to confirm the statistically recommended marks are sensible for the grade.

Boundary setting is overseen by Ofqual.

Please note: Grade boundaries are set during the awarding process, as a result of the performance of the cohort taking each exam on the papers that were set in a particular year. Grade boundaries can go up or down, depending upon the characteristics of the cohort and their response to the demand of the papers in that year.

Watch our two-minute team stories to find out more about how we set grade boundaries and ensure fairness. Visit [aqa.org.uk/team-stories](https://www.aqa.org.uk/team-stories)

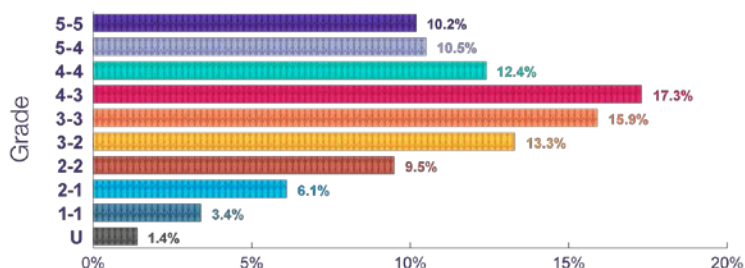
Performance overview

Grade summaries

The figures below represent the performance of those students who entered each tier in Combined Science: Trilogy in 2019. The performance of those students gaining a grade 4 or grade 5 on either tier is equivalent, though the number of marks they will have needed to gain to get each grade will be different, as will their experience of the paper they sat.

Grade summary: Foundation

This shows the percentage of students achieving each grade.

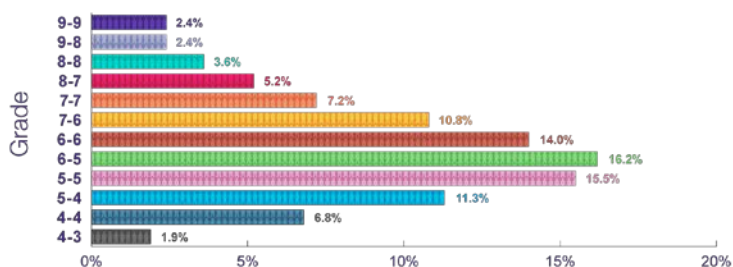


AQA GCSE Combined Science: Trilogy

Grade summary

Grade summary: Higher

This shows the percentage of students achieving each grade.



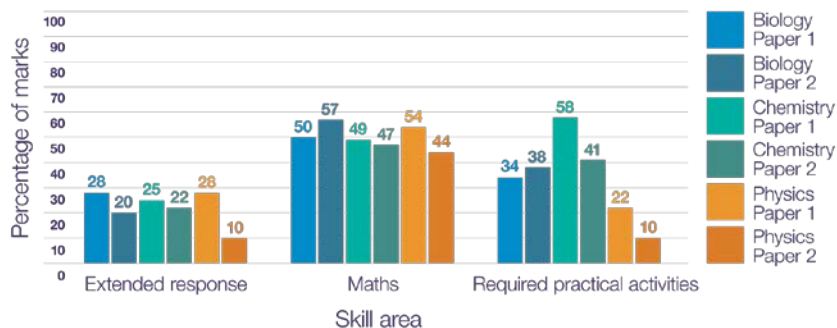
Total achieving (3-U = 2.7%)

AQA GCSE Combined Science: Trilogy

Grade summary

Performance by skill area

Performance of students by skill area – Foundation



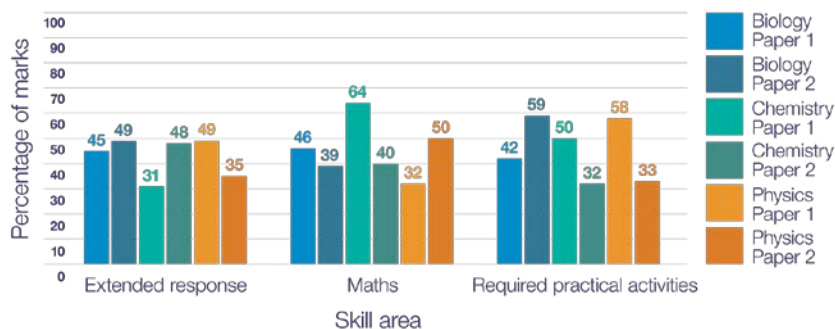
AQA GCSE Combined Science: Trilogy

Performance of students by skill area – Foundation

On each paper, a number of marks are allocated to test the following skill areas: extended response, maths and practical skills.

This graphic shows the mean percentage of marks achieved for each skill area.

Performance of students by skill area – Higher



AQA GCSE Combined Science: Trilogy

Performance of students by skill area – Higher

On each paper, a number of marks are allocated to test the following skill areas: extended response, maths and practical skills.

This graphic shows the mean percentage of marks achieved for each skill area.

Biology Paper 1 insights

This is a snapshot. Learn more about every question from the summer 2019 series in our reports on the exam. Visit aqa.org.uk/log-in and follow:

e-AQA > Secure Key Materials > GCSE > Science/PE > Combined Science: Trilogy (new specification) > Reports on the exam

Highlights from summer 2019

Foundation

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none">Practical based questions: Some students were able to provide good answers to the questions focused on practical skills, in particular the question on the effect of light intensity on the rate of photosynthesis.	<ul style="list-style-type: none">Knowledge and understanding: Many students did not have a secure understanding of some of the basic biological content such as how lungs are adapted for gas exchange or why root hair cells do not contain chloroplasts. Many were unable to identify a guard cell from a photograph of stomata. Although symbols are acceptable rather than the name of the chemical these need to be correct. Incorrect versions, eg O₂, O or O₂, CO₂ or CO₂, were frequently seen. Many students could not state that malaria is caused by a protist, or how the spread of malaria can be controlled. Students struggled to apply their knowledge of what happens during the digestive process to the visking tubing experiment.Practical based questions: Many students were unable to demonstrate the practical skills of how to use a microscope rather than just knowing the names of parts of the microscope. Many students could not identify independent variables, often giving dependent variables instead. Students often could not correctly identify the resolution of a balance.

	<ul style="list-style-type: none"> Mathematical skills: Many students could not calculate surface area and/or volume. Students made errors in their substitution, unit conversions or calculation when applying formulae. Those that showed their working were often able to gain compensatory marks. Some students could not express their answer to the specified number of significant figures.
--	---

Higher

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none"> Mathematical skills: Students generally demonstrated good maths skills. They demonstrated the skill of rounding their answer to two significant figures. More students showed their working for calculations. Knowledge and understanding: Students' knowledge of the disease malaria and how it is prevented was good. Most students could give at least one difference between bacterial and eukaryotic cells. 	<ul style="list-style-type: none"> Knowledge and understanding: Students found it difficult to apply their knowledge and understanding of the digestive system to explain the results given for the visking tubing experiment. Understanding of how plants use nitrates appeared poor. Practical based questions: Many students could not describe how to use a light microscope or how to achieve a magnification of $\times 50$. They could not explain the procedure in a clear step-by-step way. Mathematical skills: Few students were able to use a graph to calculate a rate. When asked to plot and draw a line of best fit students often did not achieve all 3 marks due to the poor drawing of lines of best fit. Many students were not able to calculate surface area to volume ratio. Most students could calculate the real length of a root hair but could not convert the units correctly.

Biology Paper 2 insights

Foundation

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none">• Knowledge and understanding: Students had a secure understanding of homeostasis, the importance of adaptations to survive in the environment and food chains.• Mathematical skills: Students were able to calculate means and construct bar charts.	<ul style="list-style-type: none">• Knowledge and understanding: Students were not secure in their knowledge and understanding of biotic factors, identifying the features of an organism that helps them survive or the name of genetic material scientists use to identify characteristics and the term genome. Many students were unable to recall the male and female sex chromosomes. Students generally were able to complete a Punnett square. Most students were unable to explain why a garden is not a stable community.• Practical based questions: For the question on the Required Practical Activity on estimating populations, very few students could give a method which would allow them to place quadrats in a random way. In the question about reaction times, many students were unable to explain the concept of using group A as a control group. A significant number could not identify the range in results or give two control variables.

Higher

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none">• Knowledge and understanding: Students had a secure knowledge of greenhouse gases and global warming. There were many good attempts at the extended response question describing the carbon cycle.• Practical based questions: There was evidence that students had a good understanding of the methods of the Required Practical Activities and could interpret and explain the data provided.	<ul style="list-style-type: none">• Knowledge and understanding : Students did not have a secure understanding of genetic engineering, particularly what herbicide resistance means in term of yield. Students were unable to explain why the human genome project is important. Some gave a reason but were unable to follow this up with an explanation of how it could help in the future. Evolutionary trees and the term ancestral species is a new part of the specification. Students found the concept of speciation difficult to apply when describing natural selection in the context of orchid colour. Many students found it difficult to accurately define the term homeostasis, often using vague and imprecise language.• Mathematical skills: Many students were not able to convert an answer into standard form and to two significant figures. At the highest level of demand students found it difficult to use data from a graph to describe why a person had diabetes.• Practical based questions: A significant number of students could not give two control variables in the otherwise well answered question about reaction times. Students were not able to identify the two improvements needed to increase validity when taking random samples.

Chemistry Paper 1 insights

Foundation

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none">• Knowledge and understanding: Most students understood that Mendeleev left gaps in his periodic table. Most students could apply the information in a diagram to deduce the order of reactivity of metals. Most students were able to identify the electronic structure of argon as 2.8.8.• Mathematical skills: Most students were able to calculate the mean from a set of experimental data, and the temperature change that occurred during a reaction. Most were able to calculate the mass of chlorine produced in a reaction.• Practical based questions: The majority of students could name, and successfully take a reading from, a thermometer. Many could correctly identify the variables to be kept constant in an experiment. Most students could correctly sequence the steps in a given practical procedure.	<ul style="list-style-type: none">• Practical based questions: Students need to be able to demonstrate their knowledge and understanding of the practical activities they have carried out during the course, including the method they used and the reasons for the steps they took when carrying out required practicals. Many students could not describe observations they would have made during practical activities. Vague use of scientific terminology, such as the use of 'amount' instead of 'mass' or 'volume' was common and so could not gain marks.• Extended response questions: Some students did not score well on the extended response question, either because they didn't take note of the command word, or they wrote unclear responses in which they contradicted themselves. When describing a practical method, that method must enable a valid outcome to be achieved. Lower attaining students often rewrite the stem of the question without giving any extra detail.• Mathematical skills: Students found the questions assessing mathematical skills difficult, eg not giving answers to the required number of significant figures and incorrectly ignoring some results when calculating means. Students rarely converted between units correctly (eg from cm^3 to dm^3).• Knowledge and understanding: Most students did not give state symbols

	correctly. Non-bonding electrons on oxygen were often missed out of diagrams. Most students were unable to describe the colour of universal indicator with an acid and an alkali.
--	---

Higher

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none"> Practical based questions: Most students demonstrated a good understanding of the requirements of the question based around Required Practical Activity 10. They correctly gave the need to control variables, though many missed out important steps in the process. Bullet point answers were clear and correctly sequenced. Mathematical skills: Students used a variety of methods to correctly calculate the concentration of a solution. Many students presented their working clearly, enabling examiners to identify where errors had been made and award those marking points which had been achieved. Most students could extract a required answer from a graph of results. 	<ul style="list-style-type: none"> Make use of the information provided: Basic knowledge and understanding in familiar and unfamiliar situations, including in the laboratory, are tested throughout this paper. It is essential that students read and analyse the information provided in the question, then read and understand the question (especially the key command word) before writing their response. Extended response questions: Many students provided vague and imprecise responses, for example when describing the trend in reactivity down Group 1 or comparing the bonding and structure of sodium chloride and hydrogen chloride. Knowledge and understanding: Common scientific terms, such as 'electronic structure', 'formula', 'molten' and 'liquid' were used incorrectly by many students. Knowledge and understanding of the different types of bonding in elements and compounds was not secure. Some students stated that magnesium has more 'outer shells' than beryllium. Many students did not appreciate that oxygen always has two sharing pairs of electrons. The impact of weak intermolecular forces on boiling point was poorly understood by many students, as was the effect of size of molecule on the

s trength of these forces.

A number of students gave two answers (one right and one wrong), when only one was required. In such cases, no marks could be awarded.

- **Practical based questions:**

Only a small number of students were able to select the correct pH change when nitric acid was added to ammonia solution. Descriptions of practical methods were often poorly sequenced.

Chemistry Paper 2 insights

Foundation

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none">• Mathematical skills: Students made good attempts at those questions involving graphs and bar charts. Most students were able to gain marks by plotting points on a graph within the accepted tolerance. Most students could correctly read a percentage from a bar chart.• Knowledge and understanding: Most students were able to write a balanced symbol equation, with clear indications of working shown on many scripts. The displayed structural formula for butane was correctly drawn by many. Enzymes were recognised as catalysts in biological systems by a majority of students.• Practical based questions: The idea of doing more tests or making more measurements to improve an investigation was often stated. Some students demonstrated a fundamental understanding of the experiment described, suggesting that they were familiar with similar situations.• Extended response questions: More successful students gave succinct, clearly reasoned and supported judgements when asked to evaluate the carbon footprint of different cars.	<ul style="list-style-type: none">• Practical based questions: Many students implied that there were 100 seconds in a minute or confused 0.20 minutes as being 20 seconds when recording experimental data in a table. Some students were unable to demonstrate any understanding of how to construct a table of experimental results. Few students could produce a method to provide a valid outcome when asked to determine the mass of dissolved solids in a sample of river water. The test for pure water was not well known.• Extended response questions: Many students did not gain marks in these questions, usually because of an error in identifying the command word and so not providing a reasoned response to the question. In the question requiring students to evaluate the carbon footprint of different cars, many students attempted calculations using the data from the question but provided no further written response. Many students used vague scientific terminology, such as 'amount' instead of 'mass' or 'volume', which were not worthy of a mark.• Knowledge and understanding: Students had difficulty identifying the difference between mixtures and compounds. Students did not have a secure knowledge of tests for gases such as oxygen. There was much confusion between covalent

	<p>and ionic bonding. Conditions for cracking, the identification of the activation energy on a diagram and the profile of a catalysed reaction were not well known.</p> <ul style="list-style-type: none"> • Mathematical skills: Mass and volume conversions proved challenging.
--	--

Higher

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none"> • Mathematical skills: Many students made good attempts at the mathematical questions and many were able to provide answers in correct standard form, even when this was not specifically requested. • Knowledge and understanding: The majority of students knew the correct test for oxygen. Most students could correctly identify reactions involving complete and incomplete combustion. 	<ul style="list-style-type: none"> • Practical based questions: Few students could produce a method to provide a valid outcome when asked to determine the mass of dissolved solids in a sample of river water. The test for pure water was not well known. A large number of students could not explain how chromatography separates components, with many explaining how to conduct such an experiment. • Knowledge and understanding: Questions based on recall from newer sections of the specification (eg those on sustainable development and the greenhouse effect) were poorly answered. Many students could not explain how unknown dyes can be identified using R_f values. Students were not able to describe the mechanics of phytomining. Many students were unable to balance the equation for the combustion of butane. Most students did not use the idea that a fractionating column had a temperature gradient when answering the question on the separation of fractions of crude oil.

	<ul style="list-style-type: none">• Extended response questions: Many students did not gain marks in these questions, usually because of an error in identifying the command word and so not providing a reasoned response to the question. In the question requiring students to evaluate the carbon footprint of different cars, many students attempted calculations using the data from the question but provided no further written response.• Mathematical skills: Many students incorrectly converted units (mg to g and cm^3 to dm^3) with multiplication by 10 or 100 being common errors. Lines of best fit were often sketched, with 'double lines' being provided. Some students tried to provide straight lines of best fit when a curved line was required; many plotted their points as dots, which are less easy to see and mark than crosses.
--	---

Physics Paper 1 insights

Foundation

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none">• Mathematical skills: Most students could recognise the anomalous result in an experimental set of data. When plotting graphs, the majority could plot points which were within acceptable tolerances. Most students correctly identified the gradient of the graph as describing the rate of change of temperature.• Knowledge and understanding: The majority of students knew that solar panels would reduce the need to burn fossil fuels and understood that renewable resources were ones which are replenished.	<ul style="list-style-type: none">• Knowledge and understanding: Many students were unfamiliar with key aspects of Working scientifically, for example few were able to describe the peer review of scientific journals, with some assuming a journal was some form of personal diary. Many students struggled to recall the correct symbols for quantities in equations. When a recalled equation can be written using words, symbols or a combination of both are acceptable, as long as the correct symbols are used. In future papers, the correct symbols will be included in the question and only these correct symbols or words will be accepted.• Practical based questions: The majority of students did not appear to know that the current is the same at any point around a series circuit. Most could not amend a circuit that they should be familiar with from Required Practical Activity 16.• Mathematical skills: A number of students appeared unsure of which equation to use in a calculation and simply multiplied two numbers together, divided one by the other and then decided which looked to be the 'best' answer. Most students could not express a correctly completed calculation to two significant figures: many did not even try. Many students drew dot-to-dot or straight lines, when a smooth curve of best fit was required.

Higher

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none">• Knowledge and understanding: The majority of students were able to correctly identify how to connect an ammeter and voltmeter in a circuit involving a resistor. Most recognised that the current decreased as the resistance of a variable resistor was increased. Most students were able to correctly recall the equation $V=IR$.• Extended response questions: The majority of students were able to describe changes in the arrangement and/or motion of particles; those students who drew diagrams to aid their descriptions and explanations tended to score well.	<ul style="list-style-type: none">• Knowledge and understanding: Many students struggled to recall the correct symbols for quantities in equations. When a recalled equation can be written using words, symbols or a combination of both are acceptable as long as the correct symbols are used. In future papers, the correct symbols will be included in the question and only these correct symbols or words will be accepted.• Practical based questions: Students did not answer questions relating to the Required Practical Activities well.• Mathematical skills: Very few students recognised the need to draw a tangent to a curve in order to measure the rate of change from a graph of results.

Physics Paper 2 insights

Foundation

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none">• Mathematical skills: Most students were able to use the given equations to calculate the weight of a gymnast and to calculate the length of a table tennis table. Most students were able to calculate a percentage. Most students were able to calculate mean reaction times.• Knowledge and understanding: Most students were able to select the correct explanation for the change in velocity of a table tennis ball.	<ul style="list-style-type: none">• Practical based questions: Few students were able to gain many of the available six marks for the question on the ripple tank Required Practical Activity. A significant minority did not attempt this question.• Mathematical skills: Many students did not convert units (eg kN to N) when this was required by the question.• Knowledge and understanding: Most students could not explain why the resultant force on a smaller falling ball was greater than that on a larger ball of the same mass. Few students were able to link kinetic energy to movement and change in gravitational potential energy to height. Questions on the electromagnetic spectrum were not well answered. Many students struggled to recall equations stated in the specification.

Higher

Themes where students did best	Themes where students did less well
<ul style="list-style-type: none">• Mathematical skills: The majority of students could calculate a mean from a set of values. Most students were able to calculate the mass of a person from data about the forces on the springs of a mattress.• Practical based questions: Many of those students who had used a ripple tank were able to describe how to use it to take relevant measurements and how to use their data to calculate the required values.	<ul style="list-style-type: none">• Practical based questions: Few students were able to gain many of the available 6 marks for the question on the ripple tank Required Practical Activity. Many students simply repeated the information from the question, and did not describe how to take measurements and undertake calculations using their results.• Knowledge and understanding: Although some students knew that water waves were transverse, they could not describe what the waves were perpendicular to, or describe the direction of travel. Few students could explain why both bumper cars came to rest after crashing. Most students were unable to gain any marks for an explanation of why a coil rotates when there is a current in the coil of a simple motor. Few students demonstrated knowledge of how wavefront diagrams can be used to explain refraction and even fewer were able to include the normal when drawing emergent rays.• Mathematical skills: Very few students were able to select the correct equation ($F = BIl$) and substitute the given data to calculate the current in a wire. Very few students converted the units correctly (mT to T). Many students could not recall the equation Force = spring constant x extension and, of those who could, few gave the unit N/m for the spring constant. Where students gave an incorrect answer to a calculation, they were unable to gain marks if their working did not demonstrate understanding of the physics being considered.

Next steps

Access our full suite of insight resources:

- [Results insight video series](#)
- [Enhanced Results Analysis](#)
- [Reports on the exam](#)
- [Live lessons webinars](#)
- [Feedback events](#)
- [Visit Exampro for past papers, related mark schemes and examiner comments.](#)

Contact us

T: 01483 477756

E: gcsescience@aqa.org.uk

aqa.org.uk/science

Responsible for multiple sciences?

Results insights are available for all our GCSE specifications:

- [Chemistry](#)
- [Physics](#)
- [Biology](#)
- [Combined Science: Synergy](#)