



GCSE

Combined Science: Trilogy

8464/B/1H Combined Science: Trilogy Biology Paper 1H

Report on the exam

Published: August 2024 v1.0

Support and guidance from AQA

Our reports on the exams are part of a suite of support we offer to enhance your understanding of our assessments and your students' performance.

Mark ranges and award of grades

Grade boundaries and cumulative percentage grades are available on the [results statistics](#) page of our website.

Enhanced Results Analysis (ERA)

Use our exam results analysis tool to create and customise different reports to help understand your students' performance.

ERA is our free online service for you to gain a detailed insight into your students' results. You can:

- analyse your students' scores for each exam question
- identify topics, skills and types of question where students may need further support
- compare your students' performance with those of other classes and with students in other AQA schools nationally.

For more information on ERA, log in through Centre Services.

Professional development

Attend one of our [feedback courses](#) where you can review example responses from students and commentaries from our examiners.

Enhance your understanding of GCSE science mark schemes and how to apply them with our [eLearning](#) courses.

AQA resources

We explain common misunderstandings and mistakes that students make when answering exam questions, and provide top tips on good exam technique in our [Teaching Guide](#).

Enhance your understanding of vital aspects of the GCSE science assessments using our dedicated [Teacher training](#) (Focus on Success) packs.

Contents

The below table is interactive. You can press the control button click on the title of the question to go directly to that page.

Contents	Page
Overview	4
Summary of overall performance	4
Question 1	5
Question 2	8
Question 3	9
Question 4	10
Question 5	11
Question 6	13
Question 7	15

Overview

This paper is one of the six examined components for Combined Science: Trilogy. All of these papers follow a similar structure and test the same assessment objectives.

This paper has 70 marks available to students and is made up of seven questions.

- Approximately 40% of marks assess AO1; 40% of marks assess AO2; and 20% of marks assess AO3.
- Approximately 40% of marks target Standard demand, 40% of marks target Standard/high demand and 20% of marks target High demand.

Questions 1 and 2 on this paper and questions 6 and 7 on the Foundation Tier paper are common. These questions are identical and are targeted at standard demand.

Questions are set at three levels of demand for this paper:

- **Standard demand** questions are designed to broadly target grades 4–5.
- **Standard/high demand** questions are designed to broadly target grades 6–7.
- **High demand** questions are designed to broadly target grades 8–9.

A student's final grade is based on their attainment across all six papers.

Summary of overall performance

The questions that were common with the Foundation tier differentiated very well, particularly question 01.4, where understanding of the role of enzymes in the digestion of fat and protein was required. It was clear which students knew it well, and those who struggled to get into the question.

Many students could answer questions around immunity and drug testing gaining a high number of the marks.

Generally, students found application (AO2) questions more challenging. Most students could not articulate the process of the cell cycle at a high level, only gaining credit for saying it was mitosis.

Knowledge of the how cancer spreads was not well demonstrated.

The questions assessing maths skills in this paper (02.3, 02.4, 02.5 and 04.2) were generally answered well, with the exception of 05.3 which students found very demanding.

The use of weakly phrased sentences and imprecise language lead to a lack of clarity in many responses. For example, reference to just 'chromosomes splitting' in question 06.1 was insufficient.

Question 1 (standard demand)

01.1 Nearly all students attempted this question however, 78% could not gain any marks. Many made the link to fructose being cheaper but simply stated that 'it' or 'the fructose' would be cheaper or easier to get without stating why fructose would be cheaper. Despite being told not to refer to sweetness some students still said the drink would taste better.

Several students suggested that more people with diabetes would buy the drink but had not linked this to why (less sugar used). Many students said that the company would sell more as people would like the sugary taste of it or that people would become addicted to the drink.

It was very rare to see the suggestion that the consumer would pay less sugar tax.

0 1 . 1 Glucose and fructose are different sugars.
Fructose has a much sweeter taste than glucose.

Suggest **two** reasons why the drinks company uses fructose in the drink rather than using glucose.

Do **not** refer to sweetness in your answer. **[2 marks]**

1 less fructose would be needed to produce the same sweetness if glucose was used

2 this would cut down costs ~~for the~~ for the company as less fructose ^{would} be bought to ^{produce} the drink

A typical example of a response (from the Higher tier paper) that gained 2 marks as the student conveys the idea that there is less fructose used and it is therefore cheaper to produce the drink.

01.2 On the Higher tier paper this question was generally well answered with over 70% gaining 2 or 3 marks, although there was some confusion with other food tests, especially the Biuret test. The most common errors were to omit heating the mixture, to heat to a temperature below 60 °C, or to refer to the use of a water bath without a reference to heat.

With reference to the final colour of the solution indicating a positive test, some students included an incorrect colour along with correct colours. In such cases, 'list principle' applies and the incorrect answer negates the correct one.

01.3 Most students correctly named the test, but the spellings of Biuret were very varied. The most common colours for the positive test were purple and lilac, although some students included an incorrect colour with correct colours, in which case 'list principle' applied and no mark was awarded. An answer of 'blue-purple' for the result was insufficient as it wasn't clear which colour the result was (blue or purple); however, 'blue to purple' was accepted.

01.4 On the Higher tier this question was generally well answered, with just over a third of students gaining 6 marks. This was an 'extended response' style of question. Such questions are marked holistically using overall generic descriptions, in this case, for the two levels of response at the top of the mark scheme, giving a hierarchy of responses. Within each level there are 3 marks.

Students were asked to describe how protein and fat are digested, including the enzymes involved and where these enzymes are produced. To access Level 2 students needed to include information for both fat **and** protein.

Nearly all students could name both enzymes involved and give detailed explanations of how protein and fat are digested. Students who could not name both enzymes limited their response to Level 1.

There were many very good answers that gained full marks. The most common errors seen in responses from the few students who were less confident was to state that lipase is produced in the stomach and to confuse the sites of enzyme production with the sites of digestion. Some students described the whole digestive system instead of focusing on enzymes. There is still a common misconception that hydrochloric acid breaks down food and statements about hydrochloric acid providing the correct pH for the protease to function were less often seen.

0 1 . 4 The human digestive system breaks down protein and fat in the drink.

Describe how **protein** and **fat** are digested.

You should include:

- the enzymes involved protease, lipase
- where the enzymes are produced. pancreas

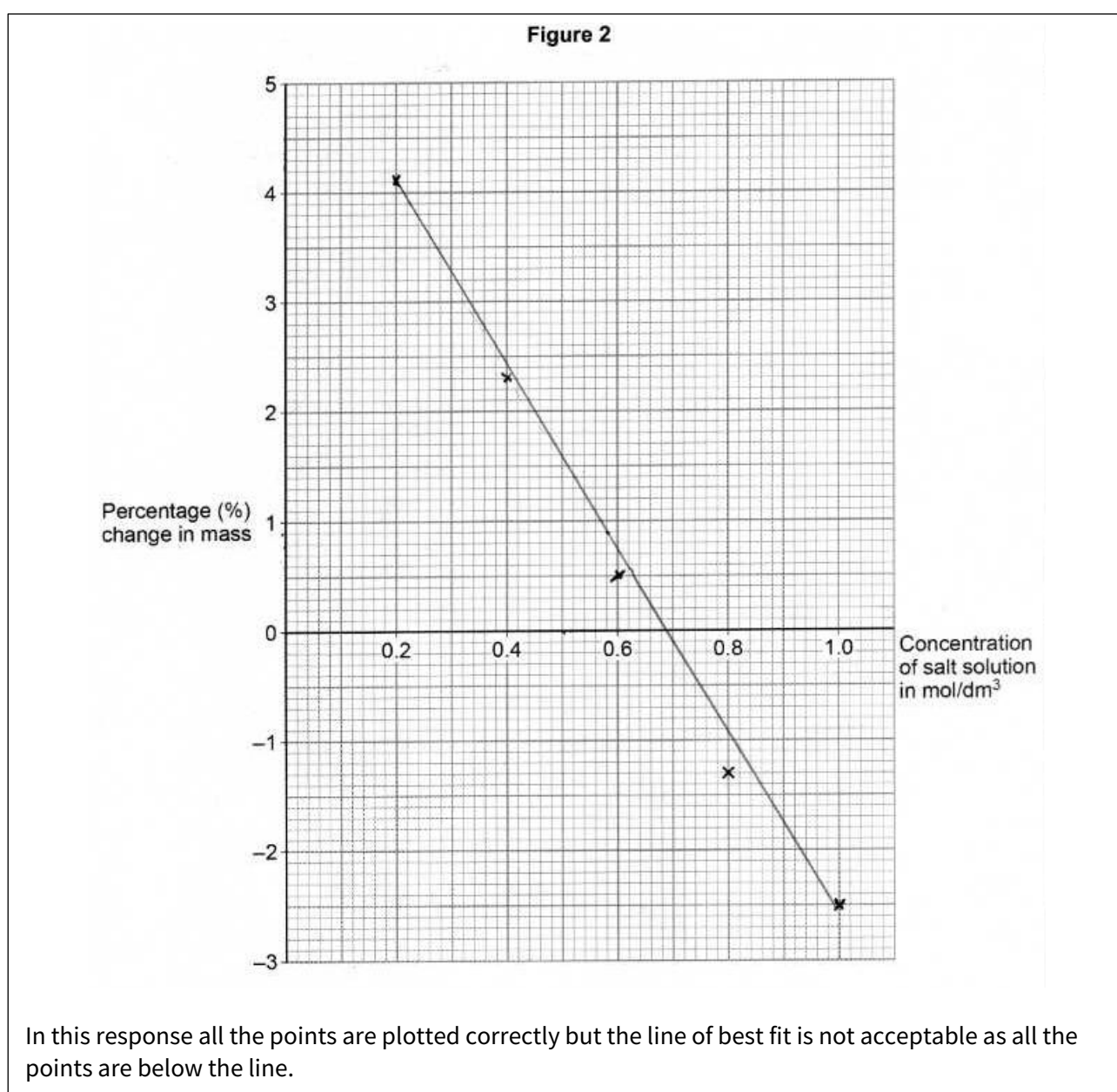
[6 marks]

- Protease breaks down proteins into amino acids
- Lipase breaks down fats into fatty acids and glycerol
- They are both produced in the pancreas
- The long chain of protein must be broken down as it's too big to digest. Protease breaks it down into smaller amino acids which are small enough to be absorbed into the blood stream
- Lipase does the same, breaking down large fats into smaller fatty acids and glycerol
- This means that they are small enough to be absorbed into blood

This response clearly describes both fat and protein digestion, so was able to access Level 2. There is sufficient information in the first six lines to merit the award of full marks.

Question 2 (standard demand)

- 02.1** 80% of students correctly identified the independent variable.
- 02.2** Many students talked about accuracy but were unable to say that the extra mass of excess water would affect the end mass. Simply stating 'to remove the excess water' was not quite enough to gain credit.
- 02.3** Nearly three-quarters of students gained full credit for calculating the percentage change in mass.
- 02.4** Nearly all students attempted the graph, with very few plotting incorrect points. Lines of best fit were well attempted, with 50% of students gaining 3 marks. Where students made a mistake, it was usually in placing the line too high, with all points falling below the line. 40% of students gained 2 marks.



- 02.5** Most students attempted this question, and a high number (44%) were able to read correctly from the graph. Some misread the scale on the *x*-axis, incorrectly reading each small box as 0.1 mol/dm³.

Question 3 (standard & standard/high demand)

- 03.1** 62% got this question correct. Common incorrect answers were bacteria, mosquitos and pathogen.
- 03.2** Many students mixed up measles with malaria, with answers such as ‘use a bed net’ or ‘drain swamps’ seen frequently. A common mistake was missing out the idea of cells and being more generic with the use of the word ‘body’, which was not creditworthy. References to poor hygiene and handwashing alone were insufficient to gain credit but were seen very often. Students very often gave the same marking point twice, such as ‘cover your face when sneezing’ and ‘wear a face mask’, which only gained 1 mark.

The most common correct answer was ‘isolation’; students who gained 2 marks often gave ‘wearing a mask’ as their second answer. Some students referred to sneezing into elbows which was synonymous with covering your mouth when sneezing.

- 03.3** Often students missed the first marking point by stating that the vaccine contains dead measles, which was insufficient at this level. Students also missed out on the final marking point by saying that the white blood cells respond rapidly but did not say that it was quicker at producing antibodies. The most awarded marks were for ‘white blood cells make antibodies’ and correct references to memory cells.

There was a lot of confusion with antibodies surrounding and engulfing pathogens which was seen several times. Many students confused the words antigen and antibody when talking about the specificity.

- 03.4** Most students were able to articulate that viruses entered cells and damaged them for 2 marks. Several students incorrectly stated that viruses released toxins, which damaged cells and in this case only 1 mark was awarded for the damage to cells. Many stated that viruses specifically infect white blood cells, which is incorrect.
- 03.5** For this question, many students gave answers that matched the same marking point (‘check to see if it’s harmful’ and ‘to see if there are side effects’ are equivalent to ‘check the drugs are not toxic’), which would only be credited with 1 mark. We are seeing an increase in students writing simple one-word answers (such as ‘side-effects’ or ‘toxicity’) that don’t answer the question. Answering the question ‘Why are clinical trials needed?’ simply with ‘side effects’ doesn’t tell the examiner if the student understands that the drug must be tested to see if it will give side effects or prevent them. It’s not clear enough to answer the question and therefore not creditworthy.

0 3 . 5

Drugs can help to reduce the symptoms of the norovirus infection.

New drugs must go through clinical trials before being licensed for use.

Give **three** reasons why clinical trials are needed.

[3 marks]

- 1 To understand the side effects.
- 2 So you know the correct volume or concentration of the medicine to take.
- 3 to ensure it is safe for people with the infection.

This student gained 2 marks because responses 1 and 3 were repeats of the same marking point. The description of correct dosage is enough to be awarded a second mark.

Question 4 (standard, standard/high & high demand)

04.1 Most students correctly selected the equation for photosynthesis.

04.2 This question proved very demanding, with 45% gaining 1 or more marks and 8% 2 or more. Students mostly commented on the volume of gas produced and not the rate of photosynthesis, which limited their ability to gain credit resulting in a maximum award of 1 mark. The most frequently awarded mark was for the optimum temperature between 30 °C and 35 °C. Many students only gave individual temperatures, eg 'the optimum temperature was at 30 °C', and therefore did not recognise that the fastest rate or optimum must have fallen between the two values given in the table. Comments about the rate doubling every 5 °C increase were rarely seen, so it was rare to see a 3-mark answer.

Many students attempted to explain why the rate changed due to enzymes, which did not answer the question and so did not gain any marks.

04.3 This question also proved challenging, with 38% gaining 1 or more marks. Responses that gained credit were usually for stating the enzyme was denatured and missing that the active site changed shape.

04.4 40% of students could select the correct way to improve the accuracy of the experiment.

04.5 This question was not answered well: 70% of students gained no credit, and students appear to have struggled to grasp the context. Many responses talked about enzymes being denatured, despite the temperature given as 25 °C. Students who gained 1 mark usually did so for stating the optimum temperature may be higher or lower, or that there may be another limiting factor.

Many students made generic comments about use of a heater being 'bad for the environment' or 'uses lots of energy'. These comments did not go far enough with a link to global warming or climate change and so did not gain credit.

04.6 Three-quarters of students picked meristem as cells that can differentiate in plant cells.

Question 5 (standard/high & high demand)

05.1 This question required students to make the link between the size of bacteria and the requirement for a high magnification or resolution. Therefore, an electron microscope is needed. Many students referred to an 'electronic microscope', which was insufficient. References to black and white images were also insufficient. 40% of students correctly linked electron microscope and the reason why it was used.

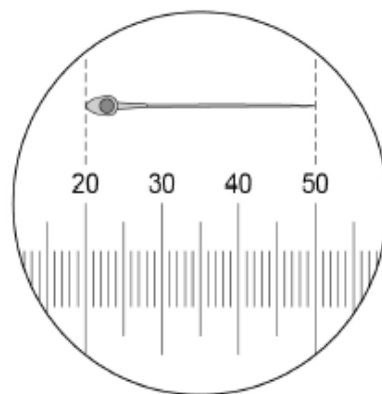
05.2 Just under a quarter of students understood this concept well and gained all 3 marks. A common mistake was to confuse a single loop of DNA with rings of DNA called plasmids.

05.3 This proved to be a very challenging question, with students often unable to work the calculation through and making mistakes at many of the different stages: 41% of students were only awarded 1 mark. Many students did not realise they needed to measure the diagram of a cell using a ruler, instead giving the image size as 30 mm. Many managed to calculate the real size as 45 µm; however, many were weak in correctly converting the units with frequent mistakes in converting 45 µm in 45 nm. Some students did not seem to think about whether their final answer made mathematical sense, giving a result that was unreasonably large or small.

0 5 3

Figure 4 shows a special slide used to determine the size of a cell viewed using a microscope.

Figure 4



Each small division on the scale is 1.5 μm

Calculate the magnification of the cell shown in Figure 4.

[5 marks]

Calculate the magnification of the cell shown in Figure 4.

[5 marks]

$$\text{magnification} = \frac{\text{image size}}{\text{actual size}}$$

$$30 \div 1000 = 0.03$$

$$\text{magnification} = 3.6 / 0.03 = 120$$

$$\text{Magnification} = \times 120$$

This was a common response, with a correct equation given for the fallback mark. The student has correctly measured the cell size at 3.6 μm and this is still awarded even if it is marked on the diagram.

The student cannot correctly work out the actual size of the cell instead giving 30 μm . They also incorrectly divide the 30 μm by 1000 giving an incorrect actual size. Although they correctly substitute in their numbers these are too far from the correct calculation to be awarded anything other than 1 mark for measuring the size of the cell correctly.

Question 6 (standard/high & high demand)

06.1 Many students were only able to gain the single fall-back mark of 'mitosis' for this high-demand question: 62% were only awarded 1 mark, and less than 1% gained all 4 marks.

Use of appropriate terminology proved challenging. It was common to see references to:

- DNA being copied
- genetic information duplicating
- chromosomes duplicating
- 'everything' replicating
- chromosomes doubling
- nucleus replicating.

None of these were sufficient for the first marking point.

Students rarely made any reference to one *set* of chromosomes in their answers, so this mark was rarely awarded.

There were some good descriptions beyond the specification of spindle fibre formation, although it was also common for any description attempted to infer that the chromosomes moved themselves to the poles rather than being pulled.

Students often referred to the nucleus being split, rather than using the term 'divide'; this was not enough to gain the third mark.

Although some good descriptions of cytokinesis were seen, as well as the term itself, marking point 4 was often not credited due to lack of reference to the cells being 'genetically' identical.

Describe the process of the cell cycle shown in Figure 5.

[4 marks]

- 1) The cell's genetic material duplicates as well as its sub-cellular structures such as mitochondria. This causes the cell to swell in size.
 - 2) When mitosis occurs. One set of chromosomes is pulled to each end of the cell. **
 - 3) The cell splits into two 'daughter' cells which are genetically identical to the original lung cell.
- ** The cell membrane and cytoplasm also split in half.

This response gained 3 marks: 1 mark for 'genetic material duplicates' ('genetic information' would not have gained credit), 1 mark for the set of chromosomes being pulled to each end of the cell, and 1 mark for cytoplasm splitting in half (synonymous with dividing) and forming two genetically identical cells. There is no mention of the nucleus dividing.

- 06.2** Students occasionally referred to uncontrolled division or growth in their answer, which gained them 1 mark. However, many students simply repeated the stem of the question, talking about cancer being malignant, which gained no credit. Many responses stated that the tumour itself spreads through the blood rather than the *cells* spreading or did not make a reference to how the cells were spreading (ie through the blood). It was common to see responses stating that the tumour invades cells rather than tissues. It was rare to see students using the term metastasise. 67% gained no credit on this question.

06.3 28% of students were not able to access this question, often giving simple statements rather than being comparative. Some responses did not relate to the question at all: they simply referred to the adaptations of the alveoli for efficient gas exchange.

Marks were most commonly awarded for comparison of surface area, and why the person breathes faster to gain more oxygen.

A very common misconception was that B had a larger surface area than A. Although the general idea of the smaller surface area allowing less oxygen was often seen, many students did not qualify this with there being less oxygen in the blood so could not gain the mark.

Where students correctly identified B as having a smaller surface area, accurate descriptions of how this affected breathing in terms of lactic acid production and oxygen debt were more commonly seen than less respiration.

Many responses still refer to the 'production of' energy.

Question 7 (standard/high & high demand)

07 This was an 'extended response' style of question and is marked holistically. There are overall generic descriptions for the three levels of response at the top of the mark scheme, giving a hierarchy of responses. Within each level there are 2 marks.

This question was generally not well answered although 98% of students made an attempt, there were some very good responses, with 39% gaining 3 or more marks. However, many students only gave part of the story and therefore were limited in the level they could achieve with less than 3% giving a Level 3 response.

The question was in the context of angina and reduced blood flow to the heart. Some students referred to complete blockages rather than a narrowing of the coronary artery, which was incorrect for this context and the level of demand of the question.

For Level 1 students needed to give an explanation of the effects of angina. Many students *only* referred to the causes of angina, which was insufficient at this level and so gained no marks; however, where students gave an explanation linked to the causes this was then given credit.

To enter Level 2 students needed to link two of their ideas together: for example, 'fatty deposits in the coronary artery lead to reduced blood flow to the heart'. However, many students were not able to articulate where the reduced blood flow was to, limiting their response to Level 1. Some students gave excellent explanations of angina and how the treatment worked but then did not give any causes of angina, which limited their response to Level 2.

Some students stated that GTN spray acted as a stent despite being told in the stem that it widens the coronary arteries. Others just repeated the stem of the question without explaining how widened arteries would help reduce the symptoms.

Very few students could link the idea that the coronary arteries supply the heart with blood/oxygen which results in less respiration ultimately reducing blood flow around the body leading to muscle fatigue.

0 7

Angina is a condition many people get as coronary heart disease (CHD) develops.

Angina can cause chest pain and tiredness.

People with angina are sometimes treated with a drug called GTN.

GTN widens the coronary arteries.

Explain:

- the causes and symptoms of angina
- how GTN reduces the symptoms of angina.

[6 marks]

people who eat more saturated fatty foods, allows more plaque to build up in the ^{coronary} arteries, this causes the blood to clot, so less oxygenated blood carried to the heart, so less respiration can occur in cells resulting in more anaerobic respiration causing muscle fatigue, ~~so~~ less oxygenated blood pumped around the body so less blood to cells causing tiredness. Another cause is ~~excessive~~ ^{excessive} ~~of exercise~~ alcohol use, which results in high blood pressure so more clots due to plaque build up. By taking GTN, the arteries are widened to allow more oxygenated blood carried ~~to the~~ ^{to the} heart so more diffusion occurs, so more respiration occurs, so less fatigue as less anaerobic respiration takes place, and more oxygenated blood carried to body cells for growth and repair and to carry more energy to cells.

In this response, the student clearly gives symptoms of angina, an excellent explanation of the cause of angina and an excellent explanation how GTN reduces these symptoms. This is a top Level 3 answer and gained 6 marks.

Contact us

Our friendly team will be happy to support you between 8am and 5pm, Monday to Friday.

Tel: 01483 477756

Email: gcsescience@aqa.org.uk

aqa.org.uk