GCSE

Combined Science: Trilogy

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

Report on the Exam

Version 1.1 (updated September 2025)

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Contents

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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 six questions.

- Approximately 40% of marks assess AO1; 40% of marks assess AO2; and 20% of marks assess AO3.
- Approximately 60% of marks target Low demand and 40% of marks target Standard demand.

Questions 5 and 6 on this paper and questions 1 and 2 on the Higher Tier paper are common. These questions are identical and are targeted at standard demand.

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

- **Low demand** questions are designed to broadly target grades 1–3.
- **Standard demand** questions are designed to broadly target grades 4–5.

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

Summary of overall performance

Overall, student performance on the paper was mixed. Recall-based questions were generally well attempted, in **01.1** and **01.2**, where most students correctly identified the function of the basic cell structures. However, performance declined on questions that required scientific reasoning, interpretation, or comparison. For example, in **01.8**, where students struggled to use comparative language.

Data-handling and maths-based questions revealed some common misunderstandings, such as confusion between surface area and volume in **03.4**, interpreting diagrams and reading values in **02.3** and from graphs in **04.3**.

Extended writing in **06.5**, which assessed understanding of the immune responses, was particularly challenging. With most students not progressing beyond Level 1 as they struggled to develop their response.

Across the paper, vague phrasing, poor use of comparative terms, and imprecise scientific language frequently limited marks. These patterns suggest that while core knowledge is reasonably secure for many students, further support is needed to develop data interpretation, extended writing, and experimental reasoning skills.

Question 1 (Low and Standard demand)

01.1 70% of students gained 2 marks. The majority of students correctly identified the nucleus, however, identification of the cytoplasm was seen less frequently.

01.2 This question required students to recall the function of the nucleus. It was generally well answered, with the majority of students, 60%, gaining at least one mark.

Answers that referred only to 'genetic information' were not creditworthy unless supported with accurate biological terms such as DNA, genes or chromosomes.

Some students disqualified otherwise correct answers by including incorrect functions.

01.3 This question was generally well attempted, with the majority of students correctly identifying the cell membrane as the part of the cell responsible for controlling what enters and leaves. The most common incorrect answer was cell wall.

01.4 71% of students gained the mark on this question.

01.5 93% of students gained at least one mark, with 57% gaining both marks.

01.6 Only 33% of students gained the mark on this question. The most frequently chosen incorrect answer was embryonic stem cells.

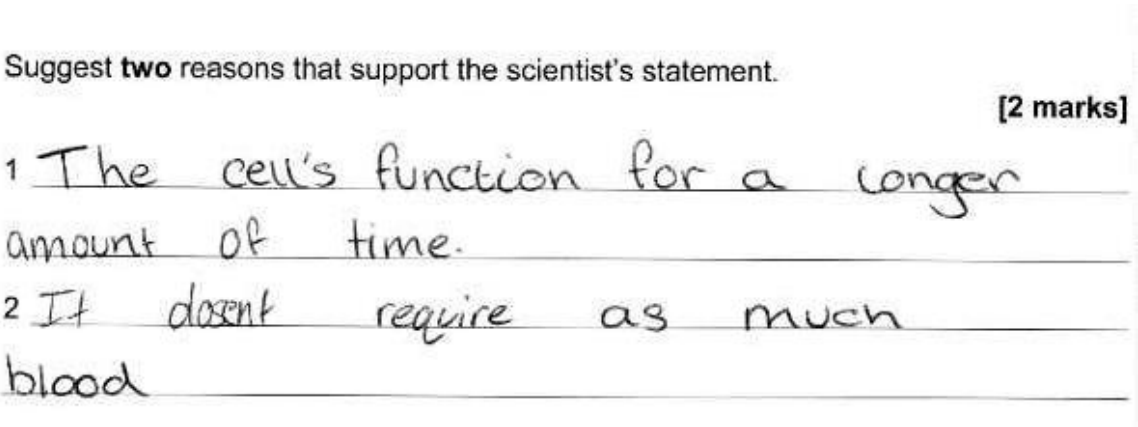
01.7 72% of students gained the mark on this question.

01.8 This question was designed to assess students' ability to interpret and apply data. Many students found this question challenging and only 42% gained 1 mark or more.
Responses that simply restated numerical values or general facts without interpretation were not awarded marks. Students were expected to provide comparative statements—for example, 'more red blood cells are produced from a smaller sample' or 'smaller donations mean fewer donors are needed'— which demonstrated an ability to interpret data and reason effectively.

Statements such as 'less risk of pathogens' were accepted, assuming students were referring to blood-borne infections.

Many students gave vague or generalised responses such as 'safer', 'less risk of disease', or 'fewer side effects'. These phrases were too imprecise and were not credited.

This question highlighted the need for students to develop their data interpretation and scientific reasoning skills, especially in the context of unfamiliar or applied scenarios.


Suggest **two** reasons that support the scientist's statement.

[2 marks]

1 The cell's function for a longer amount of time.

2 It dosent require as much blood

In this example, both points made by the student demonstrate a clear comparison between the two types of blood products. As a result, the response was awarded 2 marks.

The student successfully contrasts relevant features, meeting the requirement for comparative statements rather than simply listing characteristics. This level of comparison was expected for credit and was not always achieved by students. These responses serve as good examples of how to meet the comparative marking criteria clearly and concisely.

Question 2 (Low and Standard demand)

02.1 82% of students gained at least one mark, with 24% achieving both marks.

02.2 This question was generally well answered, with many students correctly identifying that as the distance increased, the volume of oxygen decreased.

However, students who failed to gain credit often gave vague responses such as 'it went down' or 'it decreased', without specifying what changed or how the two variables were related.

Some students attempted to explain the trend instead of describing it—for example, by writing 'as the distance increased, photosynthesis was slower'. While this demonstrated some understanding, it did not directly answer the question and could not be awarded credit.

02.3 The direction of the scale confused many students, most of whom incorrectly gave the value corresponding to the shaded area (representing water) instead. As a result, the most common incorrect responses fell within the range of 4.2 to 4.6, which reflected the volume of water rather than of oxygen.

02.4 78% of students gained the mark on this question.

02.5 This question was generally well attempted, with many students correctly selecting 'greater'. However, some students were not awarded this mark by either not selecting a word from the list or by choosing their own term.

Despite many students recognising that the volume of oxygen collected would increase, few successfully linked this to photosynthesis as the underlying biological process. Instead, a common error was to rephrase the question stem with responses such as 'the warmer it is, the more oxygen is produced', which lacked scientific reasoning.

Some students attempted to explain the increase in oxygen production by referencing energy, but many incorrectly linked this energy increase to the lamp or plant rather than to the particles involved in the reaction.

02.6 49% of students gained the mark on this question. The most frequently chosen incorrect response was spongy mesophyll.

02.7 This question was generally well answered, with most students, 51%, able to provide a recognisable version of the correct answer such as 'chloraphyill' or 'chlorofill'.
However, ambiguous responses such as 'chloroplasm' were not awarded credit.

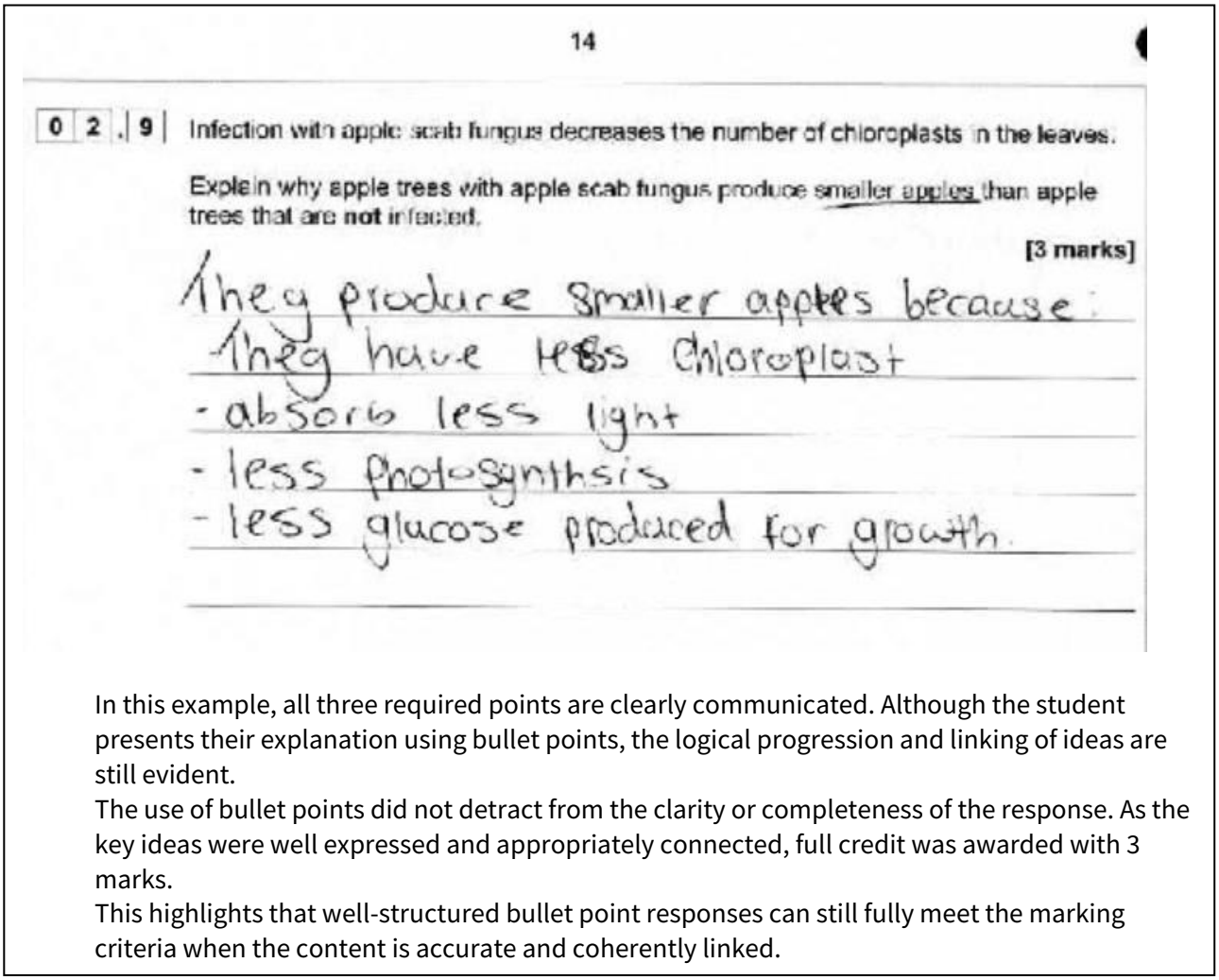
02.8 42% of students gained the mark on this question. The most frequently chosen incorrect response was the use of an antitoxin on the affected leaves.

02.9 Very few students, only 8%, gained two or more marks on this question. Some students misinterpreted the question, assuming that all leaves had been infected or removed. In these cases, responses that stated no light absorbed, no photosynthesis, or no glucose/protein production were accepted for each respective marking point, as this was a reasonable interpretation.

Many students correctly identified that less photosynthesis would occur. Some students were credited for recognising that less light is absorbed. Acceptable alternatives included less light is taken in, but responses such as 'less light is attracted to the leaf' were not creditworthy.

A number of students made the connection between smaller apples and glucose production or referred to complex substances such as starch. cellulose, fat or protein, all of which were acceptable.

Answers that referred to less energy, but without qualifying this in terms of glucose or product synthesis, could not be credited.



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0 2 . 9 Infection with apple scab fungus decreases the number of chloroplasts in the leaves.

Explain why apple trees with apple scab fungus produce smaller apples than apple trees that are **not** infected.

[3 marks]

They produce smaller apples because:
They have less chloroplast
- absorb less light
- less photosynthsis
- less glucose produced for growth.

In this example, all three required points are clearly communicated. Although the student presents their explanation using bullet points, the logical progression and linking of ideas are still evident.
The use of bullet points did not detract from the clarity or completeness of the response. As the key ideas were well expressed and appropriately connected, full credit was awarded with 3 marks.
This highlights that well-structured bullet point responses can still fully meet the marking criteria when the content is accurate and coherently linked.

Question 3 (Low and Standard demand)

03.1 Many students understood the importance of controlling variables in practical work, however more precision in the language used was required particularly around quantities and control methods to access full marks.

When describing the potato samples, the use of vague terms such as ‘similar’ or ‘about the same size’ were not sufficient to gain credit. Students often failed to describe how these would be standardised in size or mass.

A similar lack of precision was where students were expected to describe how to control the volume of the solution. Phrases like ‘measure the volume’ or ‘record the volume’ were insufficient.

03.2 48% of students gained the mark on this question.

03.3 68% of students gained the mark on this question.

03.4 This question proved challenging to most students where only 13% of students gained full marks for this calculation.

A wide range of responses was seen, with many students making errors with the method or units. The majority of incorrect answers were due to only calculating part of the surface area or confusing surface area with volume. Many students did not gain the unit mark by giving the final answer in cm^3. instead of cm^2. A common incorrect answer was 9, where students had calculated the area of only one face of the cube (i.e. $3 \times 3 = 9$)

03.5 Many students failed to gain credit due to either misinterpreting the question or using imprecise language. Less than 10% of students gained the mark.

Successful responses simply stated, ‘cut it’ or ‘cut the potato’. Other valid suggestions included ‘cutting off the edges’, ‘cutting it into smaller pieces’, or ‘cutting a hole in the cube’.

The most common incorrect response was ‘cut the potato into larger pieces’ or ‘use a bigger cube’. While these actions would increase surface area, they would also alter the volume and invalidate the investigation.

Question 4 (Low and Standard demand)

04.1 97% of students gained at least one mark, with 57% gaining both marks.

04.2 Some students correctly identified the region of the graph where the heart rate was elevated and sustained and used this to accurately calculate the exercise duration.

A significant number of students misinterpreted the graph. The most common error was to select the point where the heart rate had returned to its resting level and take that as the end of exercise, resulting in an incorrect answer of 35 minutes.

Others assumed that only the rising and falling sections of the graph indicated exercise or incorrectly believed that the period of maximum heart rate represented rest.

04.3 Most students completed the calculation correctly and rounded appropriately to two significant figures.

Most accurately identified both the maximum and resting heart rates from the graph and substituted these values into the correct formula. However, some students struggled with interpreting the *y*-axis scale, leading to the use of incorrect values.

The most commonly error was using 102 instead of 104 for person B's maximum heart rate. Similarly, some students incorrectly used person A's data. Both of these were able to gain compensatory marks. Only those alternative responses listed in the mark scheme were credited.

04.4 This question had good discrimination, over 66% of students gained 1 mark and over 27% gained both marking points.

To gain credit, students needed to make comparative statements using data from the graph. For example, 'Person A has a resting heart rate of 86, but Person B's resting heart rate is lower at only 60' would be awarded 1 mark as it is clearly comparative.
In general, 'lower resting heart rate' and 'lower maximum heart rate' for person B were the most common correct answers. The converse was also acceptable, such as 'Person A has a higher resting heart rate'.

Responses such as 'the heart rate came down faster' or 'went up slower' were too vague unless they clearly referenced before and after exercise or specified resting or maximum heart rate. Similarly, references to the time spent exercising or time taken to reach maximum heart rate did not gain credit.

The strongest responses used clear, comparative language and focused on key measures of fitness such as resting heart rate, maximum heart rate or recovery time — phrased with reference to either before or after exercise.

0 4 . 4 A student stated:

'Person **B** is fitter than person **A**.'

Give **two** pieces of evidence to support the student's statement.

Use **Figure 8**.

[2 marks]

1 Their heart rate goes upto 104 maximum whereas Person A goes upto 136 bpm

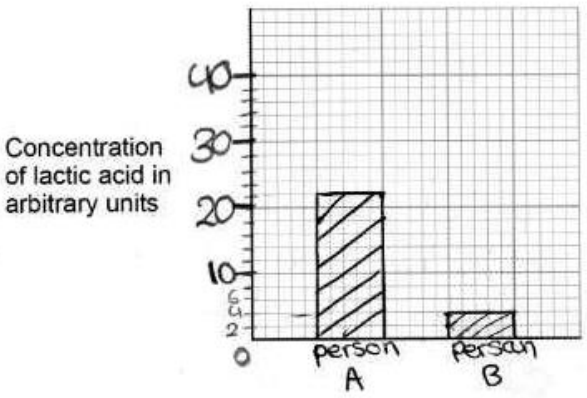
2 Person B's resting heart rate is 60 whereas person A's is 86 bpm

This response was awarded 0 marks. The student simply quotes data taken directly from the graph without making any comparative statements.
To gain credit, the response needed to go beyond quoting figures and make a clear comparison—for example, stating that 'Person A's heart rate increases to a maximum of 104 bpm, whereas Person B's goes up to a higher rate of 136 bpm.'
This was a common issue across responses, where students showed they could extract relevant data but did not develop their answers to include the comparative language required by the question.

04.5 73% of students gained more than two marks on this question. Students who chose a suitable linear scale generally went on to plot and label their bars correctly.

The most common issue was selecting an appropriate scale for the *y*-axis. A significant number of students used non-linear scales, such as 0, 5, 10, 20, 30, which made it difficult to plot accurate bars. Others chose unsuitable interval sizes, such as attempting to scale by 4.4 arbitrary units per centimetre, which led to considerable difficulty in producing consistent or readable graphs.
Some students also used overly simplistic scales, such as intervals of 10, which did not allow for appropriately sized or well-distributed bars.

In addition to scale errors, a number of students mislabelled their bars, mixing up categories or omitting labels entirely. A fairly large proportion also used incorrect graph types, such as scatter graphs or line graphs, instead of the required bar chart.



This response was awarded 2 marks and is a typical example of a student who selected a scale that was too small to make full use of the graph space. Despite this, the student correctly plotted the bars according to their chosen scale and accurately labelled each bar.

While the scale limited the clarity and precision of the graph, the technical accuracy of the plotting and labelling met the requirements for 2 marks. This was a common pattern across responses where students demonstrated sound graphing skills but lost marks due to poor scale selection.

Question 5 (Standard demand)

05.1 Credit was given where students had only annotated the diagram. A number of students incorrectly drew multiple lines from the same blood vessel.

05.2 27% of student gained the mark on this question. The most common incorrect response was the left ventricle, D.

05.3 Most students were familiar with the link between mitochondria and respiration, fewer could clearly explain the purpose of the energy released, or the role of contraction in the functioning of heart muscle. Only 6% of students gained two or more marks, 32% gained one mark.

Many students correctly identified that mitochondria are involved in respiration. Responses such as 'to provide energy for respiration' gained a mark for the link to energy but could not be awarded further marks unless the student clearly described the correct use of that energy. This could be explicitly stated or inferred from phrases such as 'more respiration for energy release'. However, responses that said 'energy is made' or 'energy is produced' did not gain the marks.

Many students used vague language like 'the muscle works' or 'pumps blood' without explicitly referencing contraction.

05.4 Many students demonstrated a good understanding of the condition of a hole in the heart, with 50% gaining at least one mark. However, a number of common misconceptions and vague responses limited access to full marks.

Students were credited if they referenced an irregular heartbeat, heart murmur or palpitations.
Many students used vague terms such as 'difficulty breathing', 'struggling to breathe', or 'heavy breathing', which were not sufficient. Many students were credited for using terms like 'tiredness', 'lack of energy', 'light-headedness', or 'dizziness'.
While 'heart burn' was not accepted, terms such as 'heart ache' or 'heart pain' were just sufficient for credit.

05.5 Many students demonstrated an understanding of general surgical complications; however, several common misconceptions or vague responses prevented them from accessing all available marks.

Creditworthy responses included statements concerning infection and references to heart damage. Descriptions such as 'heart stopping' or 'heart being punctured' were considered synonymous with damaging the heart.

Vague responses such as 'bleeding' or 'blood loss' alone were insufficient, as they lacked the necessary context linking them to the surgical procedure. Similarly, statements like 'harming the heart' or 'death' without further qualification were not sufficient.

Additionally, references to the operation not working, failing, or long-term tissue growth issues were considered long-term effects and therefore not acceptable in the context of immediate surgical risks.

0 5 . 5 In an operation to repair a hole in the heart:

- a flexible tube is inserted into a blood vessel and guided to the heart
- a mesh patch is passed down the tube
- the mesh patch covers the hole.

Heart tissue grows around the mesh and closes the hole.

Suggest **two** possible risks of this operation to repair a hole in the heart.

[2 marks]

1 body rejecting the mesh

2 mesh patch gets stuck in the tube.

This response was awarded 1 mark for correctly identifying the idea of rejection, which meets one of the marking points.

However, the second point—referring to things 'getting stuck in the tube' was a commonly seen but was an insufficient answer. While it suggests a risk, it lacks the necessary explanation that this could lead to damage to the heart or blood vessels. As a result, no further credit could be given.

Question 6 (Standard demand)

06.1 Many students, 83%, correctly identified one or both main transmission routes: direct contact and droplet spread for chickenpox.
Acceptable terms included 'physical contact', 'direct contact' or 'close contact'. Examples such as 'kissing' or 'high fives' were also credited, as they clearly indicated skin-to-skin or direct transmission.

However, some students used vague descriptions such as 'hugging' or 'playing together', which were not sufficient, as they did not clearly indicate direct contact. Similarly, statements like 'being near someone with chickenpox' or 'being in the same room' were too imprecise and did not gain credit.

A number of students correctly described airborne transmission via droplets, including references to coughing, sneezing, or spread through the air. These responses were awarded marks under the second valid transmission route.
Credit was also given for mention of contaminated surfaces, for example, shared towels or cups, as this reflects indirect contact with the virus.

06.2 Many students had the correct understanding that chickenpox is caused by a virus and were able to clearly state that antibiotics only work on bacteria, successfully achieving the marking point.
A number of misconceptions were seen such as:

- chickenpox is not caused by a virus
- chickenpox cannot be cured
- antibiotics only treat symptoms
- chickenpox is resistant to antibiotics.

Some students incorrectly believed that chickenpox affects the skin, and therefore antibiotics, which they assumed work inside the body, would not be effective.
Additionally, references to antibiotic resistance were not awarded unless clearly qualified with reference to bacteria, as resistance is irrelevant in the context of a viral infection.

06.3 Many students found this question challenging, 68% failed to gain credit, and a significant number left it blank. Where students did gain the mark, they clearly stated that the vaccine contains a dead or weakened pathogen, or used synonymous terms such as inactive, inert, or dormant pathogen.

A common mistake was stating that the vaccine contained 'the pathogen' or a 'small amount' of something, without any further qualification. These responses were too vague.

Another frequent error was referring to the vaccine containing the disease, or a 'dead version of the disease' which were insufficient for credit, as the mark specifically required mention of the pathogen or virus in a weakened or inactive state.

Some students used vague or incorrect terminology, such as suggesting the vaccine contained a treatment rather than a preparation to stimulate immunity.

06.4 Overall, this question was well answered. Most students recognised the importance of testing for toxicity and effectiveness. There was a good spread of responses, and many students were able to access at least one mark.

Responses that described 'allergic reactions' were accepted as equivalent to side effects. However, many students repeated the same idea by stating the drug is 'tested for side effects', 'to see if it is toxic' or 'to check it is safe', these are all based on the same idea and could only be credited once.

Correct responses concerned efficacy, or whether the drug works. Acceptable alternatives included efficient or effective. However, terms such as 'accurate' or 'reliable' were too vague and did not gain credit.

Only a fairly small number of students gained credit for making any mention of dose or quantity.

06.5 This extended response question required an explanation of the body's immune response, addressing both the primary and secondary responses. Students often showed a basic awareness of immune processes, few could explain them with sufficient detail, precision or sequencing to access higher levels. Less than 5% of students accessed Level 2 or higher.

A significant number of students struggled with this question. Most responses lacked a coherent structure and often contained confused language or a disordered sequence of events. The majority of students only accessed Level 1, most frequently by stating that white blood cells are involved in the response.

While some students correctly mentioned antibodies, this did not always gain credit unless it was clear that the antibodies were being produced. Some confusion was evident in responses that stated 'the vaccine contains antibodies', rather than triggering their production. Similarly, while a number of students mentioned 'memory cells', few were able to clearly explain their role or link this to the specificity of antibody production.

Very few students reached Level 2, and only a small number accessed Level 3. Those who did often described the role of white blood cells in the primary response, followed by clear references to the secondary immune response, such as 'faster production of complementary antibodies'. However, students who attempted to use comparative language often failed to apply it accurately or made vague claims such as the pathogen being 'fought off quickly'.

Many responses also focused too heavily on the contents of the vaccine rather than how the body responds, limiting their ability to move beyond Level 1.

0 6 . 5 Explain how a vaccine for chickenpox gives immunity against the disease.

You should refer to how the body responds to:

- the vaccine
- chickenpox pathogens that enter the body after vaccination.

[6 marks]

- the vaccine contains a dead/unactive pathogen.
- the body's first line of defense is the immune system.
- the ~~harm~~ white blood cells will produce anti-bodies and anti-toxins
- the pathogen will be engulfed through phagocitus.
- Chicken pox pathogens that enter the body after then don't affect the human, due to the vaccine.

This response is representative of many seen in the cohort. The student successfully links the idea of white blood cells producing antibodies, showing an understanding of part of the primary immune response.

While the explanation demonstrates the connection between two key ideas, it is limited to content from the primary response only. As a result, the response meets the criteria for 3 marks.

This example highlights a common pattern where students understood the basic process but did not extend their answers to include secondary response features or additional detail needed to access higher levels.

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