
GCSE

BIOLOGY

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Report on the Examination

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General

For the main part, students had been entered for this Foundation tier paper appropriately, with only a very small proportion gaining marks that might have indicated they could achieve above grade 5.

Most students made a good attempt at answering all of the questions to the best of their abilities and there was no evidence that they had run out of time to complete their responses to this longer style of paper.

The quality of writing was only occasionally a problem for examiners; this was often to do with the size of writing, rather than to legibility.

Students should pay careful attention to the instructions. Key command words such as describe and explain are often confused, and these are explained in the material available to schools/colleges on the AQA website. Potential marks lost were also linked to multiple-choice questions, particularly where two answers are required. In these cases, single ticks were not infrequent. The number of responses required for multiple-choice questions are given in bold to guide students.

Levels of 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, however, is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level at which they are working.

Question 1 (low demand)

- 01.1** 78% of students knew that chromosomes are found in the nucleus, with 'cytoplasm' being the most commonly chosen distractor.
- 01.2** A wide range of speculative responses were given here, with 35% of students knowing that genes control characteristics. The alternative 'allele' was very rarely given.
- 01.3** 93% of students were able to determine that the copying of chromosomes took the most time in the cell cycle.
- 01.4** 73% of students indicated that mitochondria provide most of the energy for cellular processes. Of the distractors, chromosomes were the least selected.
- 01.5** 64% of students calculated the correct answer of 15. As with all questions involving maths on the paper, an incorrect final answer could still gain a mark for appropriate working. Students should be encouraged to show the steps in their thinking as they complete these questions so that they maximise the opportunities for credit to be given.
- 01.6** Cell C was selected by just over 50% of students, with cell D being the most commonly selected of the distractors. A small number of students did not read the instruction to 'tick one box' and wrote numbers or letters in all the boxes.
- 01.7** 28% of students achieved this mark. The most common answer was 4, with students perhaps confusing mitosis with meiosis. The other responses, 2 and 16 were also frequently given. It seemed that there was confusion around this topic.
- 01.8** The distractors all proved to be approximately equally attractive, with just fewer than 50% of the students recognising that mitosis is important in tissue repair.

Question 2 (low & standard demand)

- 02.1** Whilst many students achieved at least one mark, only 28% achieved both here. Identifying which plant part was a tissue proved to be difficult for many students.
- 02.2** Of the tissues named, only the palisade mesophyll contains chloroplasts. This was not recognized by a large proportion of students, with more opting for epidermis than for the correct answer. Both phloem and xylem were also selected by many students.
- 02.3** Many students tackled this calculation well and were not daunted by the reference to micrometres. Answers did not have to be rounded to one decimal place, but if they were, then this had to be done correctly.
- 6.0 and 6.2 were not appropriate answers, although students could still pick up a correct working mark if this was evident.
- Students occasionally measured the chloroplast incorrectly or decided to use the number of chloroplasts as a denominator in their calculation. No credit was given in either of these scenarios.
- 02.4** Where students did not achieve a mark here it was invariably because their answers lacked specificity. General references, eg 'to Sun' rather than to light / sunlight, or to the fact that 'it is dark' with no clear idea as to what was intended by 'it'. An answer of 'there is not enough light in the soil' did not to gain a mark, either, as it implied the roots would get some light.
- 02.5** 74% of students had learned that differentiation is needed to specialise cells.
- 02.6** 71% of students knew why cloning of plants might be undertaken by scientists.
- 02.7** 59% of students realised that cloned plants can be produced quickly. However, many believed that no special equipment is needed for this procedure.
- 02.8** 40% of students gained this mark, often for water or sugar. Many other options were available but oxygen, carbon dioxide and non-specific examples such as plant food, fertiliser and nutrients were not credited.

Chemical formulae is unnecessary here, but if given needed to be correct; H²O is incorrect.

Question 3 (low & standard demand)

- 03.1** 46% of students were able to identify all three parts of the digestive system. A number of organs unrelated to this system were named, including lungs and kidneys.
- 03.2** 73% of students achieved at least two marks here.
- 03.3** 70% of students had learned that proteins are broken down into amino acids. Glucose was the most commonly selected of the distractors.
- 03.4** Students referred to growth or repair here. Although biologically incorrect, 'for repair of cells' was allowed at this level. References to health, body-building or strengthening muscles were all considered too vague to gain credit. Although protein can be used to provide energy, this is not why the body needs protein, so this idea was ignored.
- 03.5** 38% of students identified the stomach as the site of protease production. Both the large intestine and the liver proved to be popular distractors and the gall bladder was also selected by a significant minority of students.
- 03.6** Many students seemed to be unfamiliar with the test for proteins and a lot of answers referred to iodine or Benedict's solution instead of Biuret reagent. More were aware that a purple colour indicated a positive result, although credit was not given if an incorrect colour was linked as an alternative so eg 'purple or black' was considered to be confusion with iodine solution.

Spelling of 'Biuret' was immensely varied but as long as the version used approached a phonetic equivalent it was acceptable.

For a student's answer to match a level 2 response it had to acknowledge all aspects of the question and, therefore, include a reference to Biuret, the correct positive outcome and a reason for a safety procedure.

Students sometimes failed to access level 2 because of insufficient attention to the safety aspect. An answer that simply said goggles should be worn was not enough as no clear reason for this eg 'to protect the eyes' was offered. Neither wear a lab coat nor tie hair back were considered relevant safety measures in this context.

Relatively few students picked up on the fact that Biuret is an irritant, is corrosive or is toxic. An answer worthy of the higher mark within level 2 may have given this detail or may have added some further description such as a reference to grinding up food before testing.

Level 1 responses gave only part of the picture eg no mention of Biuret but the correct positive result and a suitable reference to safety. A significant number of students did not attempt this question.

- 03.7** 94% of students knew that a diet high in fat is the cause of obesity.
- 03.8** 76% of students correctly identified type 2 diabetes, with most of the others selecting type 1 diabetes.

Question 4 (low & standard demand)

- 04.1** Although 59% of students achieved all three marks here, once an error had been made it was likely that further errors would be made, so the award of one or two marks only was much less common.

A small number of students drew multiple lines from each blood component, despite the instruction.

- 04.2** 45% of students correctly identified C as the vessel with the smallest diameter. Very many chose B, perhaps believing the question referred to lumen diameter and missing the references to scale.

- 04.3** The choice of blood vessel and the reason for this were marked independently but, commonly, students either scored both marks (37%) or none (45%).

Incorrect understanding of scale and magnification led some to select C as '×7500' made it seem larger than the others. The choice of A tended to be linked to the bigger lumen being able to accommodate the 'large amounts of blood' carried by arteries.

The reason for B being the correct choice hinged on either the small(er) lumen (or appropriate synonym) or the thick(er) walls. Students more frequently referred to the wall but answers that were too vague eg 'it is thickest' or 'because of the depth of muscle and elastic tissue', without qualification of what was 'thickest' or 'how deep' the tissue was, could not be given credit.

Very few students referred to the labelled elastic or muscle tissues. Some students referred to 'cell walls' which is clearly incorrect.

- 04.4** 91% of students were able to complete this calculation correctly. Incorrect attempts usually used inappropriate calculations, such as adding the values or determining the mean of the two figures.

- 04.5** The inclusion of 'lower' in the question showed that some clear comparative difference was required to achieve the mark. An answer which just stated that they were narrow or thin did not match this as it could apply to all coronary arteries.

If students referred to the arteries being blocked this was accepted unless qualified incorrectly. Some answers were too vague to credit, such as 'they are weaker' or 'it's harder for blood to flow through them'

- 04.6** A correct answer of 15 here gained both marks, provided that working, if given, was appropriate. The majority of students realised that the figure for blood flow per minute in Table 1 needed to be multiplied by 60 to get the volume in 1 hour. If this was evident, then they were credited for working even if the final answer was incorrect.

Many students only gained one mark here for 15 000. Students either forgot to convert this to dm^3 or converted it incorrectly.

- 04.7** This question was quite straightforward for students who compared the two procedures. This entailed the use of directly comparative descriptors, eg shorter, or by implication by using appropriate conjunctions, eg however. Answers which were not specific enough such as 'it is safer', or 'it is quicker' did not gain credit.

Those students who inferred that there was a greater risk of a heart attack at a later stage rather than during the operation had misinterpreted the information in the table. Similarly, those who said that the procedure only lasted 2–3 hours gained no credit as they had not been given any information about the length of time of the operation.

Very occasionally a student misread this question (and the subsequent one) and gave, instead, the advantages of CABG over the use of a stent.

- 04.8** Provided the answers were comparative, 82% of students picked up the first marking point here. The second idea was more difficult. It was quite common to just see reference to it being better for multiple blockages but this was insufficient. To gain the mark a student had to appreciate that only one operation was required to treat these multiple blockages when CABG was used.

Question 5 (low & standard demand)

- 05.1** The correct answer was selected by 42% of students. The three distractors were each frequently selected, with stomata being the most common of these.
- 05.2** 42% of students selected the correct answer. Transpiration proved to be a very attractive distractor, although the other two distractors were chosen by a significant minority of students.
- 05.3** This question involved some quite difficult concepts and very few students managed to tackle it well. Some students focused on sugars and referred incorrectly to photosynthesis, going on to say answers such as 'fewer sugars for photosynthesis'.

Other answers that did not gain credit included:

- answers relating to nitrate ion deficiency eg fewer nitrate ions absorbed
- repeating the question
- answers which stated less energy will be produced.

Some students managed to gain credit for correct references to less respiration or less energy release but very few matched either the second or third alternative routes to marks.

- 05.4** 82% of students showed understanding here and achieved at least one mark. Some just focused on increased speed of movement or said that the aphid could go anywhere with no further qualification and did not gain credit. Many went down the route of escaping predation for the second point. Some lower-attaining students referred to the aphid being able to spread more disease, as if that were the role of aphids.
- 05.5** Ideas that were acceptable here included that:
- it would be harder for the aphid to attach to the leaf
 - the oil might be harmful to the aphid
 - it would taste or smell unpleasant to the aphid.

No credit was given for statements such as 'the aphid would not be able to land on the leaf' or that 'the oil was too slippery' or that 'it would create a barrier to feeding'.

Inventive answers such as the oil would trap the aphid were not credited.

05.6 This was a very straightforward question where 84% of students achieved a mark. Alternative ways of naming or describing thorns were allowed but any reference to stinging was ignored. If the thorns were described as being on the leaves, then no mark was given. Similarly, those students who went further by incorrectly saying that the thorns served to deter predators or prey negated the mark.

05.7 To access both marks in this question it was necessary for the student to select plant C at the start. The reason for plant C being correct was either that the wind was blowing towards it or that it was the closest plant to A.

Although not needing to, if students mentioned anything other than fungi, spores, black spot or the disease being blown by the wind, then the second mark could not be given. Some answers incorrectly suggested that bacteria, viruses or pollen were being transmitted.

05.8 Spreading the roses further apart or isolating the infected rose plants were creditworthy statements.

An answer, however, which simply said that the plants could be separated or moved, was insufficient as no clear idea of increasing distance between the plants was given.

Other suitable points included removal or destruction of any infected plant and the use of a fungicide. References to using a pesticide alone or to simply treating the infected plant were insufficient.

Question 6 (low & standard demand)

06.1 43% of students selected the correct answer. All of the distractors proved to be attractive, although osmosis was selected by the fewest students.

06.2 88% of students selected the correct response.

06.3 The most frequently selected answer was D, the cell which oxygen would move out of the fastest, being the direct opposite of what was required.

The other distractors also proved to be attractive as students appeared to struggle with the concept of concentration gradient.

06.4 Students had to give the idea of increased absorption of oxygen or gas exchange to access the mark here. Less specific references to the process being easier or unqualified comments such as for absorbing oxygen gained no credit.

The distinction between respiration and gas exchange continues to confuse students.

06.5 This was a recall question where phonetic spelling allowed. Some students made no attempt whilst others gave a vast range of incorrect answers including other digestive enzymes.

06.6 Very few students managed to answer this question well, with only 29% achieving at least one mark.

For the first marking point there needed to be an understanding of more oxygen being present in the soil. The second point referred to there being more respiration (as a result). Although the comparative idea of 'more' was required for each of these points, if the student used it only once and wrote that there would be, for example more oxygen for respiration, the context of 'more' here clearly covered both so two marks could be awarded.

The final marking point was for an understanding that decay was carried out by microorganisms. There were many misconceptions seen here. The most common one was the idea that decay requires carbon dioxide or an absence of oxygen.

Some students thought that the worms contained enzymes or bacteria for the decay process. Students who struggled with this question appeared to simply fall back on the question wording, stating that the worms brought more air in for decay to take place.

06.7 46% of students recognised that the process described in the question was fertilisation.

06.8 This was known by 455 of students. A range of different types of reproduction along with processes that were unrelated to reproduction were suggested.

Question 7 (standard demand)

07.1 10% of students knew that the symptoms are caused by toxins. The most common suggestion was that the bacteria were being removed by the body.

07.2 Many students achieved one mark for suggesting that a person with the infection should be isolated in some way. However, it was rare for a second mark to be awarded, as simply washing was insufficiently qualified; an indication of when this should be done was needed.

07.3 80% of students knew that antibiotics would be an appropriate treatment for salmonella poisoning. A few students gave the name of an antibiotic, usually penicillin, which was accepted.

- 07.4** Those students who gained one mark almost always referred to the weakening of the immune system. Only a very small proportion of students (3%) gained a second mark for explaining why this would mean that it would take longer to recover from a second infection.

It was very common for students to suggest that the body could only deal with one infection at a time.

- 07.5** 24% of students were able to suggest a suitable method of preventing transmission of the bacteria. Many focused on the quality of cooking of the chicken, which did not relate to the question which asked what farmers could do.

- 07.6** This question proved to be very tricky for most students. The answer required not only the identification of the correct liquid but also details of its effect on the bacteria on both surfaces.

Simple reference to the number of bacteria remaining was insufficient; instead the extent of their reduction was needed.

- 07.7** Students who had carried out similar investigations would have been advantaged here. These students might have measured the diameter of zones of inhibition and remembered what they did. However, there were many references to simply measuring the area with no explanation of how this could be done or deducting the diameter of the clear area from that of the dish.

There were almost no references to the alternative technique using squared paper. A few students gave the formula for calculating area but hadn't identified the need to determine the radius.

- 07.8** Simply repeating the investigation was insufficient; it was also necessary to refer to the need to check whether the sets of results were similar. Hence 3% of students achieved this mark.

- 07.9** The information stated that the liquids cost the same to indicate to suggest a different factor. However, many students referred to price or the extent to which *Salmonella* was killed. The most common correct answers referred to potential toxicity or allergies caused by the cleaners or to their odours.

Question 8 (standard demand)

- 08.1** By far the most common metabolic reaction given was respiration; fewer students gave other acceptable responses and it was rare for examiners to see an answer referring to plant metabolism.

References to digestion were not allowed as this occurs outside cells.

- 08.2** A very high proportion of students recognised that the second conclusion was correct and achieved at least one mark. Fewer students realised that the third conclusion was also correct. However 62% of students selected both of these correct answers.

A small but significant number of students did not follow the instructions, giving only one or more than two answers.

- 08.3** Lack of correct rounding and not understanding the relevance of the instruction to give an answer to three significant figures cost a number of students' marks.

Most students correctly substituted the values in the equation given, but did not give accurate answers to this calculation. Students who used the incorrect values in the calculation could still gain the third mark for conversion of their answer they arrived at to the required number of significant figures.

It appeared that some students did not realise that the first zero after the decimal point counts as a significant figure, leaving them with answers such as 32.08.

- 08.4** Many students missed the idea that the question referred to responses to exercise and described differences between resting heart rates. Others just described the response of one of the people, instead of comparing them. Consequently 6% of students achieved both marks and 34% of students managed to achieve one mark. Lower-attaining students attempted to explain why differences might have existed, referring to fitness levels or one person being overweight or out of condition.

- 08.5** A significant minority of students only added a scale and label, ie answering the bulleted instructions but not the first line, to 'complete the line graph for person S'. These students could achieve no more than one mark.

On the whole, points were plotted reasonably accurately. The tolerance of a half-square was sufficient to allow those who had plotted the fourth and fifth points at 118 and 128 to not be penalised. The most commonly incorrect plot was that at 78; with plotting at 76 being outside the tolerance.

Axes were almost always scaled correctly, although labels were sometimes incomplete; usually with the omission of a unit or an incorrect unit, such as 'm'.

- 08.6** 36% of students arrived at the correct answer, by one of the two methods shown in the mark scheme.

A number of students, usually using the sequential deduction of 12 route, arrived at an answer of 5, but could still gain the one mark for the method. These students had not recognised the need for the deduction of just 6, for the last portion. Lower-attaining students gave a final answer of 11, which would take the resting heart rate to zero.

- 08.7** The need to design an investigation that would give valid results was critical in determining the level a student could reach.

Investigations that just used a single smoker and non-smoker did not satisfy this requirement and could not get beyond level 1. To reach level 3 it was necessary to use large numbers of (or at least 5) smokers and non-smokers and to control appropriate variables while measuring heart rates.

There were some good answers by students who identified a wide range of control variables, in investigations this would give valid results, but these answers were relatively rare.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.