Questions matter

# GCSE

# Biology

## 8461/1F Paper 1 Foundation Tier

## Report on the Examination

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**General comments**

The basic mathematical skills tested in this paper were widely understood by most students, and students did particularly well when provided with scaffolding or the equation needed to answer a question. A number of students erroneously mix up the numerator and denominator in fraction questions, despite the equation being provided. The conversion of units, for example from millimetres to micrometres, is a skill that many students find difficult at this level, despite the conversion factor being provided. In this paper, students' graph drawing skills were particularly strong and many students were able to accurately and succinctly describe a trend from a graph.

From the Required Practical Activities covered in this paper, it is clear that many students confuse the variety of food tests available. An increased number of students were able to identify control variables in a given method, however, the scientific names of apparatus were unknown to many.

A large proportion of students failed to acknowledge the command word in questions; when the command is 'explain', a description is simply not enough and when the command is 'describe', explanations are unnecessary and will not lead to credit. Some students also did not adequately 'compare' when required to do so. For example, with three pieces of data, one is 'lower' than the rest, but failing to use the description 'lowest'.

The question on digestive enzymes was not answered well. Exploring this area of the specification in different contexts will help students have greater opportunities to apply their knowledge to unfamiliar situations.

On occasions, some students wrote excessively; the answer space provided has been specifically designed to fit the responses of most students. In addition, when students use additional pages, all question parts should be numbered accurately. Students who use a word processor for all or part of their answers should ensure each item has been numbered correctly.

In a number of cases, the use of poorly phrased sentences and imprecise language lead to a lack of clarity in some responses. Students should be encouraged to read back over longer written responses to check for errors and ensure that their meaning is clear. There were several instances of students not reading the question carefully enough or in calculations, not checking all of the instructions had been followed at the end of the answer. In multiple choice questions, particularly where two tick boxes were required, some students did not read the instructions fully and gave only one response. In addition, some students drew more than one line from a box on the left in link box questions, meaning that no marks could be scored for that box.

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**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.

Questions 7 and 8 are common with questions 1 and 2 on the Higher Tier. These questions are identical with each other and are targeted at standard demand.

**Question 1 (low and standard demand)**

**01.1** Just over half of students selected the correct response in this question.

**01.2** 80% of students scored both marks in this question. Of those that did not gain credit, several drew more than one line from each box on the left.

**01.3** Nearly three quarters of students knew that transpiration described the loss of water from the leaves.

**01.4** Just under half of students correctly identified lignin as being the substance that strengthens xylem tissue, with the most common incorrect response being starch.

**01.5** Less than 20% of students achieved two marks in this question, and just over 40% achieved one mark (usually the second marking point). A lack of specificity in terms of where the light needed to go for the first marking point meant that many responses were not creditworthy. Some students confused the idea of transparency with impermeability, linking this incorrectly to the prevention of water loss.

**01.6** Just under half of students gained two marks in this question. The most common correct response for one mark was 'guard cells' in the second sentence. However, the two terms were commonly confused by a significant proportion of students, with many thinking that the pores are called guard cells, which are controlled by the stomata.

**01.7** Just under half of students were able to correctly identify the vacuole from the electron micrograph in Figure 2. A number of students incorrectly identified it as the nucleus, despite being given the information that the part contained cell sap.

**01.8** Nearly 70% of students identified active transport as the process that moves sugars against the concentration gradient.

**01.9** Just over 70% of students correctly selected the mitochondria as the cell structures needed to provide energy.

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**Question 2 (low demand)**

**02.1** This question specifically asked how the skin protects against pathogens and not how the human body in general is able to defend itself. References to white blood cells, antibodies, mucus and stomach acid were therefore, not creditworthy. Some students made incorrect suggestions such as 'the hairs on the skin catch pathogens' or 'the pores are small so that pathogens cannot pass through them'. Others used descriptions that lacked specificity such as 'it has many layers' or 'it is thick and strong'. Nearly 60% of students gave the correct idea of the skin being a barrier or stopping pathogens from entering.

**02.2** Just over 40% of students were awarded full marks in this question, with nearly 60% gaining the first marking point for a correct fraction but an incorrect simplification. A number of students found the fraction that killed rather than the fraction surviving, and therefore gained no credit.

**02.3** Nearly 73% of students gained full marks in this question, and most made good use of the scaffolding provided. A number of students missed out on the third marking point due to not accurately copying their answer from parts 1 and/or 2 correctly and to complete the correct subtraction.

**02.4** Students' ability to express themselves clearly, frequently limited their access to the marks available in this question. As a result, just under 27% of students achieved both marks. Some students found explanations difficult and gave answers that lacked clarity, such as 'it just fitted the pattern'. A frequent confused use of mean, mode, median and average was also seen.

**Question 3 (low and standard demand)**

**03.1** 85% of students gained at least one mark in this question. As with other linking questions, some students drew more than one line from each box on the left, meaning no marks could be awarded for that box.

**03.2** Over 70% of students were awarded the mark for this question, with the most common incorrect answers being 1945 and 1970. A minority of students gave a range of years.

**03.3** Students found this question relatively easy to access, with nearly half being awarded full marks. The command word in this question was 'describe' and no credit was given for added explanatory detail, which a number of students provided. A number of students did not acknowledge the period where the number of people remained the same. A number of students who did acknowledge it used inappropriate terminology that was not creditworthy, such as the graph being 'consistent' or references to 'nothing happening' or there being 'no new cases' at the time, which were incorrect. A small number of students described the number of cases rather than the trend and linked the number of cases to the vaccination rate or vaccine introduction, which was not relevant here.

**03.4** Nearly 64% of students achieved the mark in this question.

**03.5** 88% of students answered this question correctly.

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**03.6** 76% of students answered this question correctly.

**03.7** Nearly 36% of students gave a creditworthy response to this question, with many articulating the idea of bias. A large proportion of students repeated the stem of question by saying simply 'because he was paid' and many were unable to express their answer succinctly or precisely enough for the mark to be awarded. A variety of different responses were given credit here but those such as 'it was not proper research', 'the person might not have been a scientist' or 'it was not proven' were insufficient.

**Question 4 (low and standard demand)**

**04.1** This extended response question on the Required Practical Activity about food tests was not answered well. Many students confused the tests for starch and sugar either with one another, or with other tests such as that for protein. It is clear that some students have knowledge of food tests that are not covered in the specification, and for some, this led to further confusion about which chemical should be used to test for which food group. The most common correct test given as an answer was the use of iodine solution for starch and whilst many students gave a correct end colour, blue and purple as incorrect colours were seen frequently. A large proportion of responses lacked an attempt at both the positive and negative tests for each food.

Students who only recalled details of one test could achieve a mark in Level 1, whilst to reach Level 2, both tests needed to be correctly described. The higher mark within this level could only be matched if both the tests, together with the correct expected positive and negative results, were given. Very few students could recall that Benedict's reagent needed to be heated or boiled.

**04.2** 46% of students gained two marks in this question. The most common error was in the first sentence, where students had to name the enzyme that breaks down starch.

**04.3** 68% of students answered this question correctly.

**04.4** This question was not well answered because many students did not appreciate exactly how to make conclusions from results. 47% of students did not score any marks and 35% achieved both marks. The results showed comparative times taken for different types of bread to taste sweet and by far the biggest error made by students was that they were not comparative in their answers. Many simply reiterated the results in the table by quoting data while others, instead, tried to explain the results by referring to amylase action. Neither of these routes actually compared the times taken and failed to gain credit. Several students incorrectly implied that the results reflected the sugar content or health value of the different breads. Of those who did attempt conclusions based on comparisons, some seemed to wrongly think that brown bread, at the top of the table, was the quickest to taste sweet.

**04.5** Students were clearly familiar with the idea assessed in this question of how an investigation could be improved, and most answers correctly identified the need to repeat the test and find a mean. 64% of students achieved full marks in this question, and in the 27% of responses achieving one mark, the idea of calculating a mean was the more frequently omitted point, with answers sometimes mentioning increased accuracy instead.

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**04.6** 81% of students scored both marks in this question. In all calculation questions, students should be encouraged to show their working as some incorrect final responses may well have gained one mark for working, had this been evident.

**04.7** 85% of students gained credit in this question.

**Question 5 (low and standard demand)**

**05.1** 73% of students scored one mark in this question, in comparison to 24% who scored two marks. The most common incorrect response was the selection of monoclonal antibodies rather than viruses. Students should be reminded to check the instructions given at the start of the question, as a minority only ticked one box, rather than two.

**05.2** 48% of students correctly identified mitosis as being the type of cell division occurring in cancer cells. The majority of incorrect responses were for binary fission.

**05.3** 69% of students achieved two marks in this question, but it was clear from the number of answer changes that many had deliberated over their responses to this question. Students should be reminded that if they change their minds in any question, they should clearly cross out and rewrite their answers rather than relying on unclear arrows which may possibly be misinterpreted.

**05.4** 86% of students answered this question correctly.

**05.5** 66% of students answered this question correctly.

**05.6** 53% of students gave the correct answer. Many students found identifying the cell membrane from a cell photograph more difficult than from a diagram. The context of cell division led some to give 'egg cell' or 'zygote' and others to suggest the 'nucleus' in their answer. Other incorrect responses included 'cell wall' despite the fact that the picture was of an animal cell.

**05.7** In this calculation, which was well answered, nearly two thirds of students achieved full marks. Students were asked to calculate the real width of a cell using figures and an equation given in the question. Most students managed to complete the substitution step correctly although some used the figures the wrong way round. The further requirement to convert the answer obtained in millimetres into micrometres proved more difficult for some.

**05.8** Students were often uncertain about the correct choice of words in this question. Many believed that preclinical testing of cancer drugs should be carried out on people and that safety checks should be completed using plants. 28% of students achieved both marks in this question, and 34% achieved one mark.

**05.9** 54% of students were able to identify a placebo as being a tablet that does not contain an active drug. This question elicited a variety of responses including 'paracetamol', 'aspirin' and 'antibiotics' and no credit was given for descriptions alone. Phonetic spellings of the term were credited and seen frequently.

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**Question 6 (low and standard demand)**

**06.1** Less than 20% of students were able to correctly identify two control variables the student used in the investigation in the question, with 43% managing one. Any variable which might have been controlled but which had not been referred to in the method, such as temperature, was, therefore, inappropriate. Students should be encouraged to qualify their suggestions in answers to questions of this nature. Credit was not given, for example for time, unless this was clearly associated with time 'in the solution or beaker'. Similarly, volume had to be linked with the 'salt solution' and size to the actual 'pieces' of potato. Several answers referred to 'mass' but this was clearly not controlled.

**06.2** 62% of students understood the need for drying the pieces of potato in this question, but answers such as 'let it dry out' were not credited as they implied possible complete desiccation. Similarly, marks were not awarded for other suggestions such as the piece should be 'washed and cleaned' or its 'length and width should be measured'. Those responses which mentioned taring or zeroing the balance before weighing gained no credit as the question asked for what should be done to each 'piece of potato'.

**06.3** 36% of students were able to name the correct piece of apparatus in this question, with many giving the uncreditworthy answer of 'scale'.

**06.4** 61% of students achieved the mark in this question.

**06.5** 57% of students achieved the mark in this question.

**06.6** 60% of students achieved full marks in this calculation question. Those who did not often made simple transfer errors from the table of results or reversed the numerator and denominator in the equation. The final marking point was given for a correct conversion to 1 decimal place. Students who wrote 18.3 with a dot over the 3 did not gain credit as it clearly suggested an answer of 18.3 recurring.

**06.7** 58% of students achieved the mark in this question, with the most common incorrect answer being 'bar chart'.

**06.8** Despite this being a 'sentence completion' question, as the words were not provided, some students found it difficult to access. 25% of students gained three marks, with just over 20% gaining two marks and another 20% gaining one mark. Common incorrect answers for the first marking point included 'salt', 'starch', 'mass', 'moisture' and 'solution'. Incorrect answers for the second marking point included 'transpiration', 'translocation' and 'respiration'. For the third marking point, a frequently seen wrong suggestion was 'broken' or 'damaged'.

**06.9** 42% of students were able to offer a response within the creditworthy range.

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**Question 7 (standard demand)**

**07.1** 74% of students answered this question correctly.

**07.2** Half of the students achieved one mark in this question, with 12% gaining full marks. Many students believed that the principle reason for putting pressure on the heart was to restart the heart first and then to get the blood flowing generally to the lungs to get rid of carbon dioxide and to collect oxygen.

**07.3** As was evident in answers to question 07.2, it was clear that many students are confused about the relationship between the heart moving blood through the body and the mechanism of breathing, and many believe that there is a direct dependency of one on the other. As a result, just over half of students gained the mark in this question. Responses were seen that suggested the inflation of the lungs started the heart beating again. Other answers which gained no credit simply repeated the question wording and added no value, by saying that the person's lungs would then 'get air'.

**07.4** 18% of students were able to recall the term 'statins' from the specification with a number giving answers such as 'blood thinners' or 'anti-cholesterol drugs'. 18% of students left this question blank.

**07.5** A third of students achieved full marks in this question, with just over 20% achieving one mark. For the award of the first marking point, the name of the type of blood vessel was ignored as this had already been asked for in question 07.1. Various descriptions of the vessel being opened were acceptable such as it was 'expanded' or the fat was 'pushed to the sides'. Answers referring to 'unblocking' or 'clearing' the vessels, however, were not credited. A few students incorrectly suggested that stents kept the 'valves' or 'heart chambers' open. References to stents 'stopping blood clotting' or to 'keeping the heart beating' were not credited for the second marking point, but were commonly seen.

**07.6** 80% of students gained no credit in this question and found making conclusions based on the results in Table 5 very difficult. The data showed to what extent the percentage risk of getting four different cardiovascular diseases increased as a result of smoking when compared with people who had never smoked. As a result, all conclusions had to reflect both the increased risk and its association with smoking. They also needed to be comparative, either on the basis of one disease over all others, by using words such as 'most' or 'least', or on the basis of one disease over one other by using words such as 'more' or 'less'. Answers invariably failed to match all of these requirements. Some students also mistakenly believed that the results reflected the 'risk' or 'danger' of the diseases rather than the risk of 'developing' them. Other answers revealed the misconception by some that the letters E to H referred to individual people rather than to the different diseases.

**07.7** Students' graph drawing skills were generally good, with 54% of students achieving full marks and 28% achieving three marks. Just 1% of students gained no credit at all. The most commonly omitted feature was the *y*-axis label, and some students truncated their label so much as to omit the reference to 'risk', which was not creditworthy. When marking on their scale, a few students lost track with the middle numbers on the scale they gave.

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**07.8** 53% of students gained credit in this question. The most common incorrect answers were those that lacked qualification, such as references to 'drinking alcohol' or to 'eating fatty foods' which needed the added idea of consumption of these being 'high'. Obesity was a common incorrect answer, as it is not a lifestyle factor.

**Question 8 (standard demand)**

**08.1** 57% of students gained credit in this question.

**08.2** 88% of students selected the correct answer in this question.

**08.3** This extended response question was not answered well. Most students found it very difficult to access and the majority of responses simply restated the information given in the question or detailed everything the student knew about cystic fibrosis (CF) and the lungs. Less than 13% of students achieved anything more than one mark, with 57% achieving zero.

Students achieving Level 1 gave one or more simple, unconnected, but appropriate statements which reflected the difficulties encountered. To enter Level 2, there had to be at least the attempted linking of one idea with another, which reflected either the difficulty in digesting food or the difficulty in gaining body mass. To enter Level 3 students had to show at least some attempted linking of two or more ideas and they had to address, even if only minimally, both difficulties in digesting food and gaining body mass.

Responses invariably focused only on difficulties with digestion, as the context of this topic probably seemed more familiar. General comments which simply reworded what had been given in the question such as 'people with CF have fewer enzymes so will find it hard to breakdown food' or 'the gut will find it difficult to function' were repeated time and again in paragraphs but added nothing of value to answers. Some students gravitated towards the familiarity of 'enzymes' and proceeded to give unnecessary details of enzyme action in general and of possible denaturation. Others followed on from the mention of CF by inappropriately referring to breathing difficulties or by suggesting that excess mucus might 'block the gut'. When ideas were successfully linked, these were most often in relation to individual digestive enzymes and their substrates. Occasional additional points were given such as 'reduced absorption' or 'less fat could be stored' but these were not often considered at this level.

The statements students make in these extended response questions do not need to be long or complex and it is never necessary to include all the points listed in the indicative content on the mark scheme to achieve the highest level. Neither do responses have to be written in complete sentences - succinct bullet points often suffice and may even help students to organise their ideas more effectively. As is always the case with extended response questions, however, answers are considered holistically and always in a positive framework.

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**08.4** 3% of students achieved full marks in this question, with 13% achieving two marks and 31% achieving one mark. This question asked for a description of the features of the (individual) alveoli that help maximise gas exchange rather than the lungs in general. Most students struggled to describe three features, often missing out on marks due to their responses lacking specificity. An answer such as they are 'one cell thick' or 'thin' had to be related to the alveolar walls to be given credit. Some students referred to there being a 'short diffusion distance' but as this is a consequence of the thin walls and not a described feature, they could not gain the mark. Students should be reminded to double check the command word given in each question; explanatory detail in 'describe' questions is not required, nor creditworthy.

**08.5** Fewer than 20% of students scored any credit in this question, despite many making lengthy attempts. Answers were usually too general and invariably did not offer any clear explanations. Two routes were available in the mark scheme – one which reflected there being less oxygen for aerobic respiration and the other which reflected the inevitable increase in anaerobic respiration. The variety of answers which did not gain credit included vague suggestions such as 'tiredness', it being 'hard to breathe', the 'heart rate is affected' or 'weak muscles' as well as incorrect ones such as 'blood stops flowing' or there is 'no respiration'.

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**Mark Ranges and Award of Grades**

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

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