AQA

GCSE
BIOLOGY
8461/1F: Paper 1 (Foundation tier)
Report on the Examination

8461
June 2022

Version: 1.0

General

In the fifth year of the new specification for GCSE Biology, and despite the disruption caused by the COVID-19 pandemic, most students coped well with the demands of the paper and there was little evidence to suggest that students were unable to complete all questions within the allotted time.

On occasions, some students wrote excessively and should be reminded that the answer space provided has been specifically designed to fit the responses of most students.
In addition, students should be reminded that when they do use additional pages, all question parts should be numbered accurately. Several students continued their answer to one question part in the space for another, without making this clear to the examiner. In such situations, it is assumed that the writing beneath the question relates to that part and therefore, may not gain credit unless it is made explicitly clear which question part the response refers to.

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. On occasion, despite being given an equation to use, some students used their own method, often failing to complete the calculation and therefore not gaining full marks. In multiple choice questions, particularly where two tick boxes were required, some students only gave one response.

The basic mathematical skills tested in this paper were widely understood by most students, however, a significant number were unable to draw an accurate curve of best fit and therefore, students should be exposed to a variety of graph drawing experiences that involve both curves and straight lines of best fit.

From the required practical activities covered in this paper, it is clear that students continue to struggle understanding the concept of osmosis, frequently confusing water concentration and solute concentration. Many students are unable to determine the control variables in non-specified practicals. It was clear that many students had gained experience using a microscope to prepare or view slides, as assessed in question 4, with many students gaining nearly full marks on most related question parts.

A large proportion of students failed to acknowledge the command word in questions, particularly when the command was 'explain'. A description here is simply not enough.
Some students also failed to adequately 'compare' when required to do so, instead simply quoting figures from data rather than stating whether the values are higher or lower than one another.

In the extended response question on burgers, many students failed to address the additional instruction to 'use your own knowledge' and therefore, despite writing lengthy responses, were unable to move from level 1. The question on adaptations of the lungs was extremely poorly

answered and Centres are encouraged to explore this area of the specification in greater depth so that their students are able to provide linked reasons for the adaptations of the lungs.

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 The majority of students correctly identified sexual intercourse as causing the spread of HIV.

01.2 Many students failed to recognise that there were 2 marks available for this question, and only described the overall trend shown in the table, rather than the increase followed by the decrease. Students are encouraged to check the number of marks available for each question and structure their answer accordingly. Nearly 60% of students were awarded the fallback mark on this question, describing an overall decrease.

01.3 Nearly all students who attempted this question answered correctly.

01.4 Just under half of all students gained full marks in this question. Students would benefit from crossing off the letters they have already used in questions such as these, to prevent the same letter being used twice, as was seen on rare occasions.

01.5 Over 70% of students could identify the next stage in testing a vaccine following testing on live animals.

01.6 Over 80% of students knew that drugs that destroy viruses also damage body tissues.

01.7 Less than a third of students gained full marks in this question, and nearly 40% were awarded zero marks.

Question 2 (Low demand)

02.1 It was clear that many students had not previously had experience of viewing cells in different stages of division under a microscope, with just over a quarter of students gaining the mark in this question.

02.2 Students' understanding of mitosis maintaining the chromosome number was poor, with less than 40% of students gaining the mark in this question. The most common incorrect answer was 5, perhaps because students were confusing the process with meiosis, where the chromosome number is halved.

02.3 Many students struggled to select the correct terms to describe the cell cycle in this question, often confusing the word 'contracts' with 'divides'.

02.4 Nearly all students were able to determine the longest part of the cell cycle from **Figure 2**.

02.5 Over three quarters of students were able to calculate that stage **A** in **Figure 2** represented 10%, with the most common incorrect answer being 15%.

02.6 Over 75% of students were able to correctly identify the heart as being part of the circulatory system, with the most common incorrect answer being the respiratory system.

02.7 Less than half of students were awarded a mark in this question. Common incorrect answers did not relate to the heart, such as diabetes, and students are reminded of the need to read all questions carefully, to avoid such errors. In addition, some students named parts of the heart rather than medical conditions, perhaps indicating that they had not read the question properly. 'Chronical' heart disease was more commonly seen than anticipated and cancer was often given, which was not creditworthy.

02.8 Over 55% of students gained credit in this question, with the most common answers relating to religious or personal beliefs. Occasionally, risk of infection was seen but rejection was a rarity. This is the type of question where many students had the right idea, but articulated themselves poorly and so did not get the mark. Vague descriptions such as 'they don't agree with it' were not given credit.

Question 3 (Low and standard demand)

03.1 When faced with the concept of understanding photosynthesis in a context other than that of the Required Practical Activity, some students faltered. Most students were able to name one control variable in the investigation, with the most common response being light (intensity). Many students gave 'type of tomato plant', despite the stem of the question indicating that the investigation was only carried out on one type of plant. A number of students confused the independent variable and the control variable, stating the percentage of carbon dioxide would be a control variable.

03.2 Over 80% of students were able to identify where the greatest change in rate occurred.

03.3 Over 85% of students understood that repeating readings would improve the validity of the results.

03.4 Very few students appeared to understand that the command word 'explain' required them to do just that. A number of students gave the values for the rate of photosynthesis at 0.00% and 0.08% carbon dioxide, but did not get credit for their answer as they did not go on to describe the increase. Very few students made the link between the increased rate and carbon dioxide being needed for the reaction, with less than 10% of students achieving both marks. It is worth noting here that a significant proportion of students continue to give the formula molecules such as carbon dioxide; if they do, the formula must be correct. $CO2$, CO^2 and Co2 are all incorrect.

03.5 Many students were able to articulate the idea that the rate of photosynthesis would not increase beyond 0.08% carbon dioxide, but making further links as to why this would influence the famer's decision were rarely seen, with less than 10% of students achieving both mark points. Occasionally, reference to global warming was seen, but often this was not linked to the increased concentration of carbon dioxide. This question was another example of where poor articulation and lack of explanatory detail cost some students marks; for example, phrases such as 'he would get the same result' was not enough to gain the mark.

Question 4 (Low and standard demand)

04.1 Over 70% of students gained full marks in this question, correctly identifying the parts of the microscope and their functions.

04.2 Nearly 80% of students were able to identify that iodine solution was used to stain the cells.

04.3 Over 90% of students were able to identify that a thin layer of onion allowed light to pass through the cells.

04.4 Over two thirds of students gained full marks in this question. Of those that did not, the most common error was calling a first aider for the plan to minimise the risk.

04.5 Inaccurate measurements of line A-B resulted in some incorrect final lengths of cell Z. However, in the main, most students used the scaffolding provided well and scored well in this question part. Errors in measurement from the line given were largely due to students attempting conversions or calculations on their measurement before completing the answer line. Some responses contained a final solution that was incorrect and would indicate that a calculator was not used in the examination.

04.6 It was common to see only one box ticked in this question, and in **04.7**; students are reminded to read the instructions given in the question carefully. Nearly 50% of students scored full marks and just under 50% scored 1 mark in this question.

04.7 Over 70% of students gained both marks in this question with the most common incorrect answers being to 'use a ruler to draw the cells' and to 'add colour'.

Question 5 (Low and standard demand)

05.1 Over 90% of students were able to recall the equation for photosynthesis, however, there were still some unusual spellings of oxygen seen, despite the word being provided.

05.2 The structure of plant parts is still a difficult concept for many students, particularly at Foundation tier. Less than 20% of students gained full marks in this question, with over 35% gaining no marks at all.

05.3 For those students who performed the correct calculation in this question, many were not credited with MP3 as they mistakenly thought that 1.22 (2 decimal places) was the same as 2 significant figures. Other common errors included reversing the numerator and denominator in the calculation and simply subtracting the two values from the table, rather than dividing them.

05.4 Nearly 60% of students answered correctly.

05.6 Only 45% of students were able to identify that increased temperature would increase the rate of transpiration. The most common incorrect answer was increased humidity, a concept that many students continue to find difficult.

05.7 Nearly 85% of students correctly identified plant **C** as most likely to live in a desert.

05.8 Over 60% of students were able to describe that the spines on the gorse plant would stop the plant from being eaten, but there were many vague and uncreditworthy answers seen also, such as 'they defend / protect the plant' or 'they warn things off'. Answers relating to water loss were rarely, if ever, seen.

05.9 When faced with the context of mimicry in this question, many students struggled, often coming up with ideas about the similarity of the colours of both insects, that the hornet moth possessed poisons / venom / toxins, carried bacteria or diseases or that they possessed an internal 'stinger' which would harm predators. None of these ideas could be ascertained from the figure provided and therefore were not creditworthy. Over 50% of students scored zero marks on this question.

Question 6 (Low and standard demand)

06.1 77% of students gained full marks in this question.

06.2 Nearly 60% of students scored zero marks on this question. Many confused the idea of surface area to volume ratio with surface area or volume, therefore making their explanations contradictory.

06.3 Over 70% of students were able to name one substance that enters cells by diffusion with the most popular answers being carbon dioxide and water. Nitrogen was occasionally seen but was not credited.

06.4 Less than 10% of students gained both marks in this question and lots of responses about size were seen, which was not enough to gain the mark. Some students wrote about the concentration of oxygen in the water but failed to go on to mention the concentration gradient. The most common correct responses were temperature and surface area.

06.5 Nearly 70% of students were able to name the gills as the was exchange organs in fish. Common incorrect answers included lungs, heart, fins and scales.

06.7 Over 40% of students scored zero marks in this question and the most common score after zero was one mark. In this levelled response question, students were asked to explain how the breathing system is adapted to maximise the rate of gas exchange. Logical linking was required to reach both levels 2 and 3 of the mark scheme, and this is where most students fell down. A minority of students were able to describe some feature of the lungs, but many failed to even state that the lungs have a large surface area. Very few students were able to make the link between gas exchange and diffusion. Many students wrote lengthy responses about the journey of oxygen or the mechanism of breathing, neither of which were asked about in the question.

Question 7 (Standard demand)

07.1 Students' knowledge of sub-cellular structures was generally well evidenced in this question, however, the common error of referring to energy production / creation in the mitochondria was still seen. In addition, students often referred to energy being released 'for respiration', which is not creditworthy. There was also frequent confusion between cell membranes and cell walls. Just under a third of students gained 2 marks in this question.

07.2 Less than 45% of students were able to correctly reference the function of chloroplasts. Of those that did, most referred to the role in absorbing sunlight, rather than referencing photosynthesis. A few students simply stated that the role was to make the cell or plant green, which was insufficient.

07.3 Only 15% of students were able to name a plant cell that was lacking in chloroplasts, with the majority often giving other types of cell (such as a bacterium), or other sub-cellular structures, as an answer.

07.4 Just under 45% of students were able to correctly identify the independent variable in the investigation.

07.5 It was clear that many students had carried out the required practical on osmosis assessed in this question. However, this did not always translate to an articulate answer regarding blotting. The 45% of students who gained credit in this question were able to articulate the need to remove excess water, or that any extra water would add to the mass recorded, rather than just repeat the stem of the question, as was commonly seen.

07.6 The majority of students were able to use the equation provided to correctly calculate the percentage increase. Some students used an alternative method which would have led to a correct value if they had remembered to subtract 100 from their final answer. Students should therefore be reminded that, in questions where they are given an equation to use, they should use that equation to avoid missing out on vital marks.

07.7 Graph drawing skills still prove difficult for some students, and many make their lives more difficult by using unusual scales or, as often seen in this question, by shifting their x-axis scale. These ideas in themselves are acceptable, but only when the scales remain even and

the zero is clearly identified, which often, they were not. While many students were able to plot accurately, a number incorrectly transcribed the reading of (0.3, 0.4) from the table, instead plotting the x-value at 4.0. Many students were unable to draw a correct curve of best fit, either drawing a straight line, or a curve that did not hit all of the points, or that was broken or 'feathered'. Curves of best fit should fall within ½ a small square of all of the points and should be a single, unbroken line. Students should also be reminded that their scale should take up at least 50% of the grid space provided.

07.8 Very few students understood the idea that where the curve crosses the x-axis is where there is no net loss or gain of water in osmosis, and those that did often did not gain credit because of inaccurate readings. Again, readings must be within ½ a small square to be creditworthy. 76% of students scored zero in this question.

07.9 As in previous years, many students continue to make the same error when describing 'concentration' in osmosis explanations. If water concentration is not specified, it is assumed that solute concentration is being described and this often results in an incorrect answer (for example, 'water moves from an area of high concentration to an area of low concentration' is **not** correct). Some students correctly articulate themselves in terms of water concentration, but then go on to contradict themselves with incorrect references to concentration gradients (again, solute is assumed unless water is specifically quoted). A number of students did not make the link to osmosis, instead describing how the salt absorbed the water, dissolved the potato pieces or dried them up. Over two thirds of students scored zero in this question.

Question 8 (Standard demand)

08.1 Most students correctly identified 'vacuole' or 'cell wall' as features found in plant and fungal cells but not in animal cells. The most common error was to give 'membrane' or 'nucleus', though such answers were fairly rare.

08.2 Over 70% of students were able to identify the fungal disease rose black spot, but a significant number of students gave the incorrect response of gonorrhoea.

08.3 While many students were able to carry out a simple calculation to find the number of times a fungal cell would divide in 24 hours, some students made errors, including stating that one and half hours is 1.3 hours or reversing the numerator and denominator in their calculation. A small but significant proportion of students went further, perhaps deciding that the sum they had completed had not been sufficient to gain the 2 marks or had simply misread the question. These students attempted to determine the total number of cells there would be in 24 hours and frequently calculated 2^{16}.

08.4 Less than 45% of students correctly identified the stomach as the site where protein was digested in the human digestive system**.** A significant number of students selected the large intestine, indicating a misconception about enzyme action in the digestive system.

08.5 A significant proportion of students identified Benedict's reagent as the chemical which could be used to test for protein rather than selecting the correct answer of Biuret reagent. Just over 40% of students selected the correct answer.

08.6 The extended response question was well attempted by most students. However, some failed to acknowledge the instruction to 'use your own knowledge', and gave lengthy comparisons about the nutrient content of both burgers, without referring to why this did, or did not, contribute to a balanced diet, thus limiting these students to level 1. Some students did not make effective comparisons, using statements such as 'high in fat' rather than 'higher in fat' or simply repeated figures from the table, therefore, gaining no credit. Some students who did go on to attempt to use their own knowledge gave only vague statements about the burger being 'better for the body' and many confused the significance of each food component, stating that fat is needed for muscle growth and that excess cholesterol causes obesity, for example. Many students understood that protein is needed for muscle development but failed to go on to use the term 'growth' to gain credit. A few students wasted time by giving fairly detailed, (but irrelevant in terms of the question) accounts of enzymic digestion of carbohydrates, fats and proteins in the digestive system. A small number of students offered a valued judgement as to which type of burger might be 'better overall'. However; as the evaluation was taken to be the comparison between the nutritional content of the two burgers, this was not required and so was ignored.

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.