AQA

AS
BIOLOGY

7401/1: Paper 1
Report on the Examination

7401
June 2019

Version: 1.0

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General Comments

Many students struggled to express their ideas in clear, concise, scientific English. This is reflected in the mean score on this paper being less than half marks, with the highest score being 67, both slightly lower than in 2018.

Students are reminded to follow the command words in the question and give answers appropriate to AS level. Furthermore, many marking points may include more than one part and answers to all the parts are needed in order to achieve the mark. Students who write only part of an answer will not gain credit and students need to practise writing full answers as seen in 07.1. The mathematical aspects of this paper were better attempted than previously.

Question 1

Students are getting better at giving contrasts and more effective answers to question 01.1 gave clear contrasting statements between the two types of DNA. Students are required to answer the question in terms of both types of DNA and not just give one statement leaving the other by implication. A few students erroneously stated that DNA in a chloroplast is single-stranded whereas the DNA in the nucleus is double-stranded.

Overall, question 01.2 was very well answered. Many students could correctly state the different types of sugar in DNA and RNA nucleotides.

Many students were not able to correctly name both parts of the tRNA molecule in order to gain the mark point in question 01.3. Few students could state that structure **W** was the part of the tRNA molecule where the amino acid binds, many just labelling **W** as the amino acid itself.

In question 01.4, students often confused RNA codons with DNA triplets. This question referred to the nucleotide sequence of a gene and so answers needed to be in the context of DNA, not RNA. Students often referred to degeneracy, but again this needed to be in the context of DNA.

Question 2

Students found 02.1 very difficult and most were unable to give a clear definition of a monoclonal antibody. The most common misconception was that a monoclonal antibody is a clone of an antibody, rather than an antibody produced by a clone of a plasma cell.

In question 02.2, some students were correctly able to give a suitable example of a monoclonal antibody, but many did not give a medical use or did not give a full enough answer to gain the mark. There were many unqualified treatments, for example ‘cancer’, which is not enough to gain a mark on its own.

It was really pleasing to see so many successful answers to question 02.3. Students were able to give full accounts of how an ELISA test is performed and many were able to score 3 or 4 marks. Students were able to discuss direct or indirect ELISA tests.

Question 3

Around two-thirds of students were unable to identify the chemical group in each glucose molecule used to form a glycosidic bond in 03.1. In the most common error, students circled an H that was not part of an OH group in one of the glucose molecules.

Some students described details of the Benedict's test rather than explain a method to measure the quantity of reducing sugar in a solution in question 03.2. Many students understood the need to find the mass of the precipitate after filtering it, but not to dry it before weighing it.

Although almost three-quarters of students were able to score at least one mark in question 03.3, they were unable to obtain the second mark as they failed to give clear answers to explain why beaker B contained maltose. They failed to realise that the action of maltase on the maltose would result in more precipitate.

03.4 was a well answered question. Students are familiar with the terms quantitative and subjective.

Percentage error is a fairly new concept in the specification. It was pleasing that question 03.5 was successfully answered by many students and these two maths marks were accessible.

Question 4

Many students were able to use the index of diversity formula in question 04.1. However, Table 2 included the total number of organisms caught, and the most common error was that students used this value as an insect species. These students then used this to work out a new, incorrect total number of organisms caught.

Similarly, many students knew that an index of diversity measures the population of each species, unlike species richness in question 04.2, but few were able to explain why the index of diversity is a more useful measure.

Question 04.3 gave rise to a variety of different attempts as to how a scientist could measure the rate of water flow in a river, but not many gave sensible suggestions. A common answer was for the scientist to measure the volume of water passing a particular point with no reference to how this might be done. Many answers were poorly expressed with little attention to detail. Answers that achieved higher marks discussed calculating the speed of a floating object and referred to a distance and a time.

Students did not score well on question 04.4, due to not giving either a suggestion or an explanation for the difference in mayfly larvae at the two sites. Many simply stated that there was a difference in the rate of water flow, without relating this to a difference in a biotic or abiotic factor and then how this factor might affect the larvae. Generalised answers, such as the larvae were more adapted to fast flowing water, were not creditworthy at AS. Furthermore, some students did not make it clear whether they were writing about site 1 or site 2. Students are reminded that they need to be very clear in their answers; if they are asked to explain the difference between two sites in a river they should be clear about which site they are referring to.

Generalised answers were commonly seen in question 04.5. Just stating 'samples should be random', without referring to the details of this investigation and how the method should be standardised, was not sufficient to gain a mark.

Question 5

Students seem to find order of magnitude a challenging concept, with only about 40% of students choosing the correct option of row 2.

Figure 3 was clearly stated to be a chloroplast in the question stem of 05.2. Many students were able to label structure **D** but very few could label structure **E**. The most common incorrect answer was nucleus, which shows a major misconception since, being organelles, chloroplasts could not possibly contain nuclei.

Question 05.3 was more successfully answered; approximately 76% of students scored at least one mark out of the two. Many students stated that an optical microscope has a lower resolution or could state correct values for the resolution of an optical microscope. Fewer then went on to relate this to the wavelength of light.

Question 05.4 was pretty straightforward, but only around 28% of students could correctly identify a ribosome as an organelle of both a chloroplast and prokaryotic cell. Many students did not state an organelle but instead a biomolecule such as DNA.

Just under three-quarters of students scored two marks on 05.5. Many students deducted 262.5 from the volume of a plant cell so were able to score at least one mark.

Students found question 05.6 very challenging, as only around 6% of students scored all three marks. Although many students could identify three correct properties, they could not explain how each property prevented damage to the organelle. Many referred to cells rather than organelles and so failed to gain marks. Once again, students gave very generalised answers. For example, some stated ‘a buffer maintains a constant pH’, but failed to link that to how it would prevent damage to an organelle. Others just gave a property of the solution and then went on to write ‘it prevents damage to the organelle’, without giving a specific reason as to how. Other students stated that organelles, rather than enzymes or proteins, denature. Students should be reminded to answer the question and not give generalised rote-learnt answers as these are seldom creditworthy.

Question 6

Over 50% of students could correctly label both parts of the image in question 06.1.

Answers to 06.2 showed good knowledge of the counter-current principle in fish gills. Over 54% of students gained at least 2 marks out of 3. While many students correctly stated that water and blood flow in opposite directions, the most common incorrect answer was that blood and oxygen flowed in opposite directions. Generally, students could correctly discuss differences in gradients but fewer went on to link this to the length of the filaments, with only around 14% getting the full 3 marks.

The data in question 6 confused many students. Students are reminded to give more detailed descriptions of a trend such as the one shown in Figure 5. The most common incorrect answer in 06.3 was ‘oxygen concentration decreases to 800 m then increases’, as 800 m is not the correct depth for the lowest oxygen concentration. The correct range was between 750-790 m and students are reminded to be more careful when reading values from a graph. More students could identify with the presence of *Anoplopoma fimbria* in low oxygen concentrations.

In question 06.4, surface area to volume ratio was written instead of gill surface area to body mass in many students' answers. Once again, students must relate their answer to the question and the data provided. There were quite a lot of illogical statements, such as 'fish with a larger gill area to body mass ratio need lower concentrations of oxygen'. The link to being able to carry out adequate respiration was rarely seen; fewer than 2% of students scored two marks.

Question 7

Knowledge of enzyme action is a common theme in AS Biology. 07.1 showed a range of very basic answers about enzymes that were little above GCSE level, focusing on substrates fitting in to active sites and the lock and key model. The term active site was used in the question and students were expected to use their knowledge of AS Biology to explain how this causes a high rate of reaction.
The easiest mark point to achieve was 'lowers the activation energy', yet around half of the students failed to score this mark. Many students wrote very simplified accounts which failed to explain how enzymes increase the rate of a reaction. The induced-fit model should be related to the change in the shape of the active site. An enzyme-substrate complex should be related to the bonds within a substrate. Just writing a string of key word terminology without correctly linking them is not going to gain students credit at AS-level.

Students were capable of stating a factor that would have been controlled in an investigation, as seen in 07.2.

Question 07.3 was very poorly answered. Only about 16% of students gained 1 or 2 marks. The question stem clearly explained how rate of reaction was set at 1.0 for the maximum rate. This is not 1/time. Many students simply worked out 1/time using values in the table and scored no marks. Students need to practise manipulating data and not just apply a formula/skill regardless of what the question tells them.

The above also holds for graph plotting in 07.4. Students were asked to plot the processed data in Table 5. Many students correctly realised that concentration of hydrogen peroxide should be plotted along the *x*-axis and rate of reaction on the *y*-axis. Some plotted time along the *y*-axis or got the axes the wrong way round. However, almost a quarter of students scored full marks for the graph. Students are advised to choose a graph scale that is appropriate so that it is easy for them to accurately plot points, so they should divide every 10 squares by equal/even numbers in order to facilitate accurate plotting.

For question 07.5, only around 32% scored 1 mark. Many erroneously discussed changing the hydrogen peroxide or catalase.

Question 8

08.1 was a simple recall question in a practical context. About 60% scored two marks.

Many students seemed unconfident about the structure of a dipeptide and were unable to describe some properties of a dipeptide in 08.2. Many discussed how they are formed, which is not what the question asked, or made some incorrect statements such as 'dipeptides contain bases or triplets'. The most common correct answer was that 'different dipeptides have different R-groups'. The most common incorrect answer was 'a dipeptide has two amine groups', and some thought that a dipeptide has a sequence of amino acids or has a primary or secondary protein structure.
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The technique of electrophoresis was explained in the question stem of 08.3. Many failed to use Figure 6 correctly. There were two spots in Figure 6 after 20 minutes, but there were three types of amino acids placed at the start. Some students realised that one spot must contain two different amino acids and could link this to them having a similar charge or mass. Many students correctly stated that the amino acids were positively charged because they had moved to the negative electrode.

Question 9

Vague general statements about spindle fibres were commonly seen in the answer to 09.1 rather than how prevention of their formation would affect the cell cycle. Some students were able to link this to a stage of mitosis being prevented, but to get two marks they had to use the term chromosomes, centrosomes or chromatids in the correct context. Once again, students are reminded to answer the question. Detailed descriptions of mitosis scored no marks. It was suggestions about the failure of chromosomes to line up or failure of sister chromatids to separate that gained credit.

The most common incorrect answer for 09.2 was writing 'because the benefits outweigh the risks', without relating this to the differences between the cell division of cancer cells compared with normal cells.

Many students used the passage to extract the necessary information, meaning that around 50% of students scored at least 3 marks out of 4 for 09.3. The most difficult concept to grasp was that ABZ caused mitosis to start but not finish, therefore disrupting the cell cycle.

The evaluation question 09.4 required students to give reasons in support and against a suggestion. As in 09.3, students needed to look back at the passage to gain clues for their answers. Nearly all students could give a reason as to why the ABZ could be useful for the successful treatment of stomach cancer but far fewer could give reasons against. It was rarely appreciated that the results were from isolated cells from laboratory tests rather than humans, and the dosages or effectiveness of the treatments were rarely given in answers.

Mark Ranges and Award of Grades

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