AQA

AS LEVEL
BIOLOGY

7401/1- Paper 1
Report on the Examination

7401
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General comments

It was pleasing to note that many students were able to complete the paper fully and attempt the majority of the questions. Plenty of space was provided for students to write their answers on the answer lines; few students needed to use the extra space at the back of the question booklet.

Mathematical skills account for about 10% of the marks for this paper. Students are getting much better at attempting maths questions and are reminded to show working in order to possibly gain intermediate marks if they get the final answer wrong.

Practical skills account for about 15% of the marks for this paper. Students are encouraged to write practical methodology. They need to explain how to take measurements, make observations, take repeats, read off graphs and use these practical skills to record and process data.

Question 1

01.1 A complete-the-table exercise, linking diagrams of biological molecules to statements. Some students had not fully understood the biological drawings, so could not match them correctly to the description. Students were told that some letters may not be used, or used more than once, but may have missed this and maybe chose an incorrect letter as it was the only one left. 40% of students achieved all 4 marks, however.

01.2 This question was about transport of amino acids in the small intestine. Many students included unnecessary information about digestion before proceeding to answer the question about absorption. It was encouraging that lots of students were able to gain a mark for co-transport. Weaker answers just described active transport of amino acids rather than explaining the role of sodium ions or just described diffusion rather than facilitated diffusion of the amino acids.

Question 2

02.1 Only 18% of students gained the 2 marks. Some students knew that ribosomes were made of RNA although a minority stated that ribosomes were made of tRNA or mRNA, which is not correct.

02.2 48% of students achieved at least 3 marks out of 4. The use of a table helped to scaffold the student answers and helped students give the differences between the DNA and mRNA. Many did attempt to give structural differences between the two molecules and marks were only awarded for the correct comparisons. It is important that students are able to state correct pairs of statements. So, for example, if DNA is described as a double helix then RNA should be described as a single helix. Furthermore, abbreviations such as A and U should not be used, but they should be written as they appear in the specification, adenine and uracil.

Question 3

03.1 The flagellum was correctly identified by 94% of the students.

03.2 It is pleasing to see that students are familiar with a scanning electron micrograph image but need to take this one step further and compare it with a transmission electron micrograph image. When asked to describe a difference, a full answer must make reference to both images. Many students for the difference would just state the SEM image is 3D, but then omitted to say that a TEM image is 2D in order to get a mark. As a result only 13% of students achieved both marks.

03.3 Explanations of the different resolutions of images taken by light and electron microscopes is a common question. Many students wrote very brief explanations and focused on the microscope itself rather than the differences in wavelength between the light and electrons to explain the differences in resolution.

03.4 This was a practical skills question where students were told they had a photograph, ruler and calculator and asked how to use these to work out the actual size of the object in the picture. Whilst only 13% of students did get full marks on this question, it was noticeable that many students had clearly not had practice at this. Nevertheless, 55% scored at least one mark. It was really pleasing to see that many students were very confident with the equation for calculating image size and could convert millimetres or centimetres into micrometres. The scale bar method, as seen in marking points (MP) 3 and 4, was rarely seen.

03.5 Only structures found in all bacteria were awarded marks. Many students wrote plasmids or DNA without qualification, which did not score a mark. A flagellum was another common incorrect answer, maybe as this structure was shown to students in question 03.1. 32% of students scored at least one mark, most commonly correctly identifying a murein cell wall or mesosome as the bacterial feature *only* found in bacteria.

03.6 Students seem to have a better grip of viral features, with 69% of students scoring at least one mark. Capsids and reverse transcriptase were commonly stated. Many students ignored the rubric which instructed them NOT to include attachment proteins in their answer and wrote down attachment proteins. As ever, students must read the question carefully and follow the instructions given.

Question 4

04.1 The use of data is an important skill in biology. Students who scored high marks on this question were able to use data from the diagram in support of their answers. Only 4% of students achieved the maximum of 4 marks. Many students failed to grasp that this question was about the movement of oxygen from the seawater into the blood of the lugworm. Over 40% of students failed to gain even one mark. Instead students discussed osmosis, water potential and counter-current mechanisms of blood and water flow. The better students could use the data correctly to conclude that most oxygen was absorbed by diffusion at the gills due to their large surface area. Partial pressure of oxygen was confused with water potential and this compounded the confusion between diffusion and osmosis.

04.2 Many students could correctly read the graph and deduce a value of 1.5 kPa of O_2 and could then go on to re-arrange the given equation to calculate the CdO_2. However, only 13% of students managed to score all 3 marks.

04.3 This question was largely misinterpreted. Only 19% of students managed to score 1 or 2 marks. The question asked how a scientist would use data from a colorimeter and a calibration curve to determine pO_2. However, a large number of students wrote detailed accounts of how to produce a calibration curve. This was not necessary. Students seem to struggle with explaining how to use readings from a colorimeter to interpolate using the calibration curve. Some students could explain how to draw a line to the calibration curve but then did not indicate reading the pO_2

value by drawing another line down to the x-axis. It is a higher skill for biology students to write about how to take measurements and interpolate them using a graph.

Question 5

05.1 A straightforward AO1 question with 24% of students scoring full marks. However, errors included not naming the monomers as amino acids, incorrectly naming the bonds between the amino acids and, more commonly, not giving the sequence or order of amino acids that form the primary structure.

05.2 The importance of the similarity and difference between the two models of enzyme action was highlighted in the way the question was structured to encourage students to answer the question. Part 1, the similarity, was generally done well, most students being able to describe an enzyme's active site and a substrate binding to form an enzyme-substrate complex. Those who did not attain the mark generally described the active site and substrate as complementary in both models which is, of course, not the case for the induced-fit model. Since this was a significant minority, teachers could consider spelling out the difference more clearly. Although many students could highlight a similarity, fewer students could fully describe a difference. They are, once again, reminded to write a full answer to consider a difference between both enzyme models. This is part of the exam technique that is lacking. Many just stated that in the induced-fit model the enzyme changes shape. It is the active site that changes shape in the induced-fit model and then they should go on to say that the active site doesn't change shape in the lock and key model. As a result, only 20% of students achieved both marks.

05.3 60% of the students fully appreciated that enzymes lower activation energy. Other answers included enzymes providing alternate pathways or simply catalysing reactions.

05.4 This was a straightforward rate of reaction calculation. 70% of students successfully scored 2 marks.

05.5 68% of students correctly identified the increased maltase concentration as the independent variable in the experiment. However, all of the other answers were seen, particularly increased maltose concentration.

Question 6

06.1 Many students could access MP 2 easily and described how haemoglobin carries oxygen. Students must take care with their use of terminology; oxygen *binds* to haemoglobin rather than bonds to it. 71% of students were able to score at least one mark.

06.2 10% of students were able to score all three marks for this question. When students are given unfamiliar information, such as the effect of the hormone hepcidin on ferroportin, they need to try to understand the information and then use it to answer the question. The information in the diagram was clearly laid out and told students new information that they should be able to understand using their knowledge of biology. Many students gave very generic answers. It is important that students state the exact effects of not producing the hepcidin as requested by the question. Just stating that a lack of hepcidin affects ferroportin is insufficient. A structured answer in this case would go along the lines of: less of X, so more of Y, so more movement of Z. All of this was deducible from the data.

06.3 Only 16% of students were able to achieve both marks for this question. Maths questions are an area of difficulty for students. 36% were able to gain at least one mark here, but to get both marks the ratio should be in a simplified format of x:1. Commonly students wrote a ratio such as 6104:200 or 763:25 rather than going the step further to bring it to 30.5:1 or rounding to 31:1.

Question 7

07.1 More students could access MP 2 than MP 1. They knew that a tumour had uncontrolled mitosis but didn't also say that it was a mass or lump of cells.

07.2 This question tested practical methodology, which is a problem area that students are advised to practise. Although the equation for calculating mitotic index was largely understood, students had to apply this to a practical situation and say how they would determine it from a tissue under a microscope. Students are expected to know the term 'field of view' in the context of using a microscope. Many missed the emboldened 'reliable' in the question, which should have prompted them to carry out many repeats. In order to get reliable results, students are reminded to state how many repeats should be conducted rather than just the need to repeat.

07.3 Many students were able to draw some conclusions from the data presented in this question. However, there was confusion between < and > symbols for some students. A common correct answer was that dogs with a MI > 5 only survive 2 months. Students must be reminded to use the data fully in their answer and make clear concluding statements. One error was that having a MI < 5 resulted in grade 1 tumours, when it should be that dogs with grade 1 tumours all had a MI < 5, or that dogs with MI < 5 could have grade 1, 2 or 3 tumours. Generic answers such as 'the sample size was too small' or 'only 50 dogs were studied' were common.

Question 8

08.1 63% of students gained at least one mark. For MP 1, it was the introduction of a new microorganism that was required. Incorrect answers included chemical contamination or the introduction of an antimicrobial substance. The second mark proved trickier as students mentioned competition, but failed to mention what was being competed for; teachers need to encourage students to include detail. Also, students wrote about the foreign bacteria 'killing' the *E. coli* but not how, i.e. no reference to toxins, etc. Again this could be a result of lack of exam practice.

08.2 Only 10% of students achieved 2 marks; many got 1 mark by working out the correct number of cells per cm^3; others managed a mark for the correct dilution factor; relatively few managed to put the two together. This again demonstrates the need to include the teaching of the mathematical skills in section 6 of the specification.

08.3 Most students managed to draw a bar chart and 18% achieved full marks. There was, however, a worryingly large number of students who failed to label the axes correctly or who drew histograms instead of bar charts, again showing a lack of basic maths skills.

Question 9

09.1 This was the first question following the reading of the comprehension passage. It may help students to underline key ideas or annotate the passage in order to help them access and use the information. Here, some students did not understand the question. The difference in blood composition was often given as a physical difference, e.g. pressure (high/low) or consistency (thinner/thicker) or volume (more/less), rather than a difference in chemical composition. The reason for the difference was often correctly related to gas exchange/diffusion, but without a reference to location. The reason was often related to less blood in the fetus / less respiration in the fetus. It was not unusual to find ‘gas exchange not occurring in the lungs’ expressed as ‘fetus not breathing’.

09.2 MP 1 and MP 3 were commonly seen. Passive immunity was well understood and many students appreciated from the passage that antibodies from the mother crossed the placenta to the fetus. MP 2 was virtually never seen, most students seeming to think that because the mother had antibodies the pathogens would all be killed before they go the fetus. There were lots of answers about protecting the fetus with antibodies, but little evidence of understanding that antigens had to have crossed the placenta. Only part-statements for protection were seen, with no indication of rapidity or immediacy.

09.3 Herd immunity against measles was commonly quoted but a full answer required that this would reduce the spread of the disease. Students are reminded of the need to write a full answer even for a one-mark question. Protection against tetanus proved much more awkward; students found it hard to explain why a vaccine that only protected an individual was useful for the population as a whole. There were lots of references to developing herd immunity in relation to tetanus. Furthermore, many students discussed how vaccines work in general without answering the question about protecting the UK population. As a result only 42% of students achieved at least one mark.

09.4 This question was much better answered, with 65% achieving the mark. Students need to take care when writing even short answers to include sufficient accuracy. Rather than stating that the virus had mutated, weaker answers referred to the disease mutating.

09.5 Another question that was generally well answered, 14% of students achieving all three marks. Answers that did not score well seemed to be the result of not reading the question, which was about why having three vaccinations was good, and just went on in general terms about the production of a secondary response with a single vaccination. A common response was that there would be a ‘stronger immune response’ or ‘faster immune response’, which lacked the details in terms of memory cells and antibodies.

Mark Ranges and Award of Grades

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