AQA
Questions matter

AS

Biology

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Report on the examination

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General points

This paper produced a wide range of marks with students displaying good AO1 knowledge of a variety of topics on the specification content. As in previous years, students encountered difficulties with some of the questions assessing AO2 and AO3 skills. This was particularly evident in questions involving the interpretation of graphs (questions 01.4, 02.3, 03.4 and 04.4) and tabulated data (questions 06.4 and 08.1). However, overall students performed reasonably well on questions involving calculations (02.4, 04.1, 06.4 and 07.4). The performance of students on questions assessing practical skills varied considerably. This is outlined in the commentary on these questions. The use of incorrect or imprecise terminology prevented many students accessing some mark points. For example, 'fighting infections' or 'results are significant' will not be credited at this standard. Failure to carefully note the wording of questions was another factor limiting the marks obtained by students. However, there were also many examples of some excellent responses by well-prepared students.

Question 1

1.1

This opening question was a good discriminator. Approximately 50% of the entry were able to correctly identify both the pulmonary artery and the renal vein. Approximately 30% of students were able to identify one of these blood vessels for one mark.

1.2

Approximately 85% of students were able to correctly identify the correct blood vessels.

1.3

This question was a good discriminator. Approximately 10% of students obtained all three marks and approximately 70% at least one mark. Many students were able to correctly describe primary and tertiary structures, but fewer were able to distinguish between secondary and tertiary structures in terms of bonding. Some students simply mentioned primary, secondary and tertiary structures and consequently gained no credit.

1.4

This question highlighted the need for correct terminology. There were many references to less oxygen at high altitudes, and haemoglobin having to carry more oxygen. As always, references to loading faster gained no credit as there is no time element on the dissociation graph. Whilst there were some good explanations of haemoglobin having a higher affinity for oxygen at low partial pressures, this wasn't always linked to respiration. Approximately 15% of students obtained both marks and approximately 60% at least one mark. This question was an effective. Discriminator.

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Question 2

2.1

Most students correctly identified the organelle labelled **X** as a mitochondrion. However, a significant number of students incorrectly referred to the creation of energy, or energy being used for respiration. Consequently, these students did not achieve the second mark point. Nevertheless, almost 50% of students obtained both mark points and over 90% at least one mark.

2.2

Most students knew the functions of the rough endoplasmic reticulum and the Golgi apparatus, so were able to gain credit for mark points 2 and 3. Some failed to link protein synthesis to enzyme production and very few were able to link vesicles fusing with the cell surface membrane to the secretion of enzymes. This question was one of the most effective discriminators on the paper. Approximately 15% of students obtained all four marks and approximately 85% at least one mark.

2.3

This question was very poorly answered, with less than half the entry scoring one mark. Approximately 6% of students obtained all three marks. Many students simply described the curves and gained no credit. A number of students clearly understood that when oxygen was present uptake of glucose was much quicker but neglected to link this to active transport. Mark point 1 (active transport occurring) and mark point 2 (facilitated diffusion occurring) were the most frequently seen. Very few students were able to explain why glucose uptake levelled off due to carriers being saturated in curve **S**, or why uptake for curve **T** only began at 6 mg dm^{-3}. This question was another effective discriminator.

2.4

Most students were able to correctly read 600 and 240 off the graph but did not always express their answer in a ratio to one. Consequently, a frequent response which was not credited, was 5:2. Approximately 40% of students provided the correct ratio.

Question 3

3.1

This question was auto marked. Approximately 45% of students identified the correct elements in each molecule in **Table 1.**

3.2

Less than 50% of students obtained both marks for this question and approximately 80% at least one mark. A few students neglected to describe the correct test, and some were unable to get mark point 1 as they didn't add water.

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3.3

Approximately 83% of students identified the correct fatty acid (**B**) and referred to the double bonds between the carbon atoms. Students who did not gain credit often neglected to state that the double bond was between two carbon atoms.

3.4

Students have clearly been trained to answer questions of this type. Consequently, approximately 70% of students obtained at least two marks for their evaluation of the effectiveness of the drug cholestyramine. Over 50% of students obtained three out of five marks. Approximately 5% of students scored 5 maximum marks. Not surprisingly, this question was a very good discriminator. Mark point 1 was awarded less frequently, often because of imprecise wording e.g. writing about the 'results being significant'. Some students referred to the difference in the size of the SD before and after treatment rather than referring to the SD bars not overlapping. A few students referred to 'not all the data being present', referring to the sentence about $\pm$2 SDs including over 95% of the data. Students should understand this concept at this level.

Question 4

4.1

This three mark maths question was an effective discriminator. A third of students obtained maximum marks and approximately 80% at least one mark. Some students did not provide their answer to 2 significant figures and obtained two marks.

4.2

Students struggled to answer this question correctly, approximately 20% of students obtained the mark. Many incorrect answers included 'use an electron microscope' or 'use a larger field of view'. Some incorrect answers
included the first part of the answer but failed to consider that a mean would need to be calculated. Others suggested that only 1 more field of view should be observed, rather than many. If a number is stated it should be 10 or more.

4.3

Approximately, one third of students obtained the mark for this question. A common error was the idea that hairs trapped water or moisture rather than water vapour**.** These responses neglected to consider the effect this had on the water potential gradient. Another common error was to simply identify stomata and their ability to close, an adaptation of all plants, not just xerophytes.
A few students correctly identified the thick waxy cuticle but incorrectly explained that it prevents water escaping. The answer required using the correct terminology of evaporation or transpiration.

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4.4

Less than 5% of students scored full marks on this question. Many correctly identified that as wind speed increased, rate of transpiration increased, however the comparative statement regarding the rate of increase was rarely included. Approximately 75% of students gained at least one mark, usually for mark point 2. These students correctly stated that the rate of transpiration is higher in the non-xerophyte. Very few stated that some transpiration occurs when there is no wind. This question was a poor discriminator.

Question 5

5.1

Approximately 45% of students obtained the mark for this question. There were many different incorrect answers including the entire array of biological molecules.

5.2

Almost a third of students obtained all three marks and approximately 85% at least one mark. Most answers seen were based on the information in **Table 2.** However, a few students didn't use the statements from the table. For example, some answers compared circular and linear DNA, which gained no credit.

For similarities all three correct responses were seen. For differences, histones and membrane bound organelle answers were more common than mitosis, although all answers were seen. A number of students stated both alternatives for mark point 4 (no histones synthesised/no histones associated with DNA) as their two differences so only achieved one mark.

5.3

Many students used the correct term 'mutation' to gain a mark for mark point 1. However, common responses which were not credited included 'to check for errors in the DNA' or 'to ensure cells/DNA are genetically identical'.

The most common correct answers for mark point 2 were in terms of 'uncontrolled cell division' or 'tumours.' The idea that non-functional proteins or enzymes could be produced was only seen in better answers. Approximately 25% of students obtained both marks and approximately76% at least one mark.

Question 6

6.1

Well prepared students were able to describe the mechanism of induced fit clearly and go on to describe the strain on bonds and lowering of the activation energy. Less successful responses simply described the reaction summarised in the equation provided. There were some confused references to hydrolysis of bonds and breaking of hydrogen bonds. Approximately 8% of students obtained all three marks and approximately 62% at least one mark.

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6.2

This question was a very poor discriminator. Approximately 82% of students obtained both marks and approximately 97% at least one mark. Safety goggles and gloves proved the most popular precautions, although there were references to washing hands and not eating in the lab.

6.3

This question elicited a huge range of responses. Approximately a third of the students obtained this mark. Correct answers clearly explained that the arrangement of the potato discs on the pin would maximise the surface of the potato in contact with the hydrogen peroxide. However, there were answers which referenced 'the movement of water' and 'to allow osmosis to occur'.

6.4

Approximately 66% of students obtained all three marks and approximately 84% at least one mark on this maths question. Most students correctly calculated the two surface areas. However, many of these students then failed to work out how much bigger the surface area of the five discs was compared to the uncut cylinder. Many of these students simply subtracted one number from another.

6.5

Many answers simply stated that the surface area of the five discs was bigger than the single cylinder – something they had already found out in question 6.4. Only approximately 5% of students obtained the mark for this question. These students referenced the increased surface area leading to more enzyme-substrate complexes being formed. This question was a poor discriminator.

Question 7

7.1

This question proved very accessible to better-prepared students. Approximately 52% of students obtained both marks and approximately 87% at least one mark. However, there were some incorrect references to DNA, ribosomes and the cell-surface membrane as structures not being found in all bacteria.

7.2

There were some examples of clear, well thought out answers to this question. Approximately 25% of students obtained both marks and approximately 60% at least one mark. This question was an effective discriminator. Better responses explained that as a protein the toxin would have a specific tertiary structure complementary to the receptors on the cell-surface membrane of the epithelial cells. Failure to gain marks was often due to the lack of correct terminology with many vague references to the toxin 'being specific' to the epithelial cells. There were also references to 'active sites', and some very confused ideas about the toxin being digested because it was a protein.

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7.3

This was another question that elicited some very clear, well-structured answers. These responses explained that the increase in chloride ions would reduce the water potential in the ileum, causing water to enter by osmosis. Approximately 45% of students obtained both marks and approximately 70% at least one mark. This question was a very good discriminator The most common reasons for not achieving marks were omitting the word 'osmosis', or by not explaining the direction of the water movement.

7.4

Even though **Figure 12** had dual axes most students were able to correctly read off the required numbers for the calculations. However, an inability to then calculate actual numbers prevented many students from gaining both marks. Approximately 33% of students obtained both marks and approximately 51% at least one mark. Less successful answers often involved students simply reading numbers off the graph and subtracting one from the other.

7.5

Approximately 70% of students were able to explain that the figures were only reported cases. There were some lower-level responses which referred to 'rounded numbers' and that the figures 'were only an estimate'. This question was a poor discriminator.

Question 8

8.1

Less than 5% of students obtained all three marks for this question and approximately 66% at least one mark. The majority who did get a mark gained it for the first marking point. Many simply quoted numbers (150 or 5 T helper cells) from **Table 4** without commenting on how low they are. This was often followed by comments about how, with a weakened immune system, a person couldn't 'fight infections.' A few students stated that B cells were 'not activated' but not what activated B cells do. This lack of specific terminology and detail in answers prevented these students from accessing marks 2 and 3.

8.2

Approximately a third of the students obtained both marks in this question and approximately two thirds obtained at least one mark. Many students would have probably done a similar practical, or seen it demonstrated. Less successful responses referred to 'washing hands,' or referenced the actions already carried out, despite being asked to provide one other action. There were many references to working near a Bunsen burner flame but few of these were able to clearly articulate the reasons for it.

Question 9

The two parts to question 9 were the most effective discriminators on the exam paper. Well prepared students provided clear, concise descriptions of mitosis and tissue fluid formation.

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Even lower-level answers were usually able to obtain one or two marks. Answers to question 09.2 on tissues fluid were generally better than the answers to question 09.1 on meiosis.

9.1

Approximately 10% of students obtained all five marks on this question, approximately 40% at least three marks and approximately 75% at least one mark. Mark point 1 (two divisions into 4 cells) was seen most often. Although independent segregation and crossing over were frequently mentioned, they were rarely explained clearly or correctly. Once again, this question highlighted the need for the use of the correct scientific language when explaining relatively complex ideas. Students need to be aware that just writing these terms is insufficient in a longer answer. There was the usual confusion between chromosomes and chromatids, which shouldn't be the case at this level. Those students who were able to correctly explain independent segregation and crossing over, usually went on to obtain the remaining marks. These students clearly understood the process. Lower-level answers generally obtained two or three marks. These marks were often for chromosomes separating in meiosis I and chromatids separating in meiosis II, with the production of four haploid cells.

9.2

Approximately 20% of students obtained all five marks on this question, approximately 45% at least three marks and approximately 70% at least one mark. Well prepared students were able to clearly explain the process, often providing all six marking points for a maximum of five marks. Where errors occurred, they were frequently minor omissions or mistakes, such as water being forced out of the arteriole end of the capillary by osmosis. Some students failed to mention osmosis when explaining the return of water at the venule end. Many of the higher-level answers scored the first four marking points in a single concise sentence. They referred to the high hydrostatic pressure forcing water and small molecules out of the arteriole end of the capillary, whilst large proteins remain, lowering the water potential. Less successful answers again failed to achieve marking points due to a lack of clear scientific terminology.

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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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