OXFORD
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INTERNATIONAL AS LEVEL BIOLOGY

(9610) Paper BL02 Report on the examination

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REPORT ON EXAMINATION: INTERNATIONAL AS LEVEL BIOLOGY (9610) UNIT BL02 JANUARY 2023

Overall, this paper produced a good spread of marks with a mean of 31 marks. There were some very impressive answers, with students displaying an excellent understanding of certain parts of the specification. Despite this, students did not perform quite so well in the application questions. This was also the case with question 4, which linked to required practical 4 (preparation of stained squashes of root tips and examination of these with a microscope). There was little evidence of any general misinterpretation of questions or of students not having enough time to complete the examination paper. On a more general note, the incorrect use of scientific terminology and limited powers of expression prevented some students from accessing specific marking points. In addition, a large number of answers were completed in the form of bullet points. Often, these answers were missing the key details needed to be awarded full marks. This was particularly evident on the longer answer questions.

QUESTION 01

Question **01.1** was a straightforward question and over 85% of students correctly identified the sequence of amino acids. Unfortunately, a small proportion of students misinterpreted the question and instead gave a complementary DNA or RNA base sequence.

For question **01.2**, just under 60% of students gained both marks. Where this didn't happen, it was usually for a correct description of mutation 1 but without any attempt to explain how it shows the genetic code is degenerate.

01.3 was generally answered well and the question also proved to be a good discriminator. 60% of students gained at least 2 marks and just over a third gained all three marking points. Answers showed a good understanding of the possible effects of mutations on proteins. The marking point that was most often missed was the idea that bonds within the polypeptide, eg hydrogen or ionic, would likely change resulting in a change in the tertiary structure.

QUESTION 02

Questions **02.1** and **02.2** were well answered with over 60% of students gaining the mark in both questions. For some students there was confusion between the two fluids in these part questions and there were also some vague answers such as blood instead of blood plasma.

02.3 was not answered very well, with only around 20% of students gaining the mark. It was common to see very brief answers, eg to drain tissue fluid, but without any reference to where this tissue fluid is then moved to.

In question **02.4**, just under 50% of students gained one or more marks. It was common to see answers referring to the thin capillary walls providing a short diffusion pathway. Very few students mentioned the fenestrations or the idea of gaps between cells. There were a number of incorrect points observed, such as the capillaries having a large lumen or a fast rate of blood flow.

02.5 proved to be a challenging question for students, with only 25% of responses gaining 1 or more marks**.** Many students found it difficult to apply their knowledge of osmosis and water potential to this context. There were numerous incorrect explanations, such as the swelling being a result of large molecules moving into capillaries and causing a blockage for blood plasma. Other answers mentioned that the capillary walls are stretchy and that as they take in extra fluid, the walls of the capillary stretch resulting in swelling.

QUESTION 03

Just over 70% of students gained both marking points in question **03.1**, with many good descriptions of how pathogens can cause disease. Where marks were not gained it, was usually for vague statements, eg pathogens attacking body cells or taking over body cells.

In **03.2**, over 75% of students gained at least one mark and just under 25% achieved all three marking points. Some excellent answers were seen for this question, demonstrating a good level of understanding of the process of phagocytosis. The marking point most often missed was for the idea of lysosomes joining or fusing with the phagosome.

Only around a third of students gained one or more marks in **03.3**, with many vague statements made, such as stating that antibodies bind to pathogens. Where students did write about antibodies binding to antigens, it was usually followed up with unclear statements, for example that antibodies destroy the pathogens, as opposed to referring to agglutination. Another common mistake observed was that students just described the graph in Figure 2 without any attempt at an explanation.

Question **03.4** was answered well, with close to 75% of students gaining at least one mark. Many students had the correct idea of antibodies binding to complementary antigens, although the term antibody-antigen complex was rarely seen. Occasionally, some students confused this context with the binding of substrates to enzyme active sites.

QUESTION 04

In **04.1**, just under 70% of students gained one or more marks. Most marks were awarded for the idea of preventing any possible damage to the chromosomes or cells. Fewer students referred to the importance of producing a single layer of cells so that light could pass through.

For question **04.2**, just under 50% of students gained the one mark. Where students failed to gain the mark, it was usually for stating that the stain makes the cells more visible, with no reference to chromosomes or chromatids.

Just over 25% of students scored the mark in **04.3** by making a suitable suggestion as to why toluidine blue stain was used. Both marking points were seen numerous times. Answers referring to cost or that toluidine blue was the only stain available were not credited. In addition, simply stating that the stain makes the chromosomes visible was not sufficient for this question.

The calculation in question **04.4** was generally well answered, with just over two thirds of students gaining the mark. Where this wasn't the case, it was usually a result of giving an answer that was not a whole number or for incorrect rounding.

Question **04.5** proved to be a good discriminator and only around a third of students gained one or more marks. Unfortunately, many students simply described the data in Table 3, eg as the distance from the root tip increased the mitotic index decreased. Where students did identify the overlap or non-overlap of SD, very few went on to describe what this meant.

04.6 was answered well, with more than 85% gaining one or more marks. Where this didn't happen, it was mainly for simply repeating part of the question or for just quoting data from Table 3.

In question **04.7**, students had to suggest three possible causes for the differences in mitotic index between the results. Although around 40% of students gained one mark, only a small proportion scored higher than this. A large number of students commented on possible errors with the counting of cells or errors made when deciding whether cells were dividing or not. Other common answers either linked to

the idea of having more or fewer cells in the fields of view or different ages of root tips being used. There were many unclear answers which lacked specific details.

QUESTION 05

In **05.1**, just under 50% of students gained the one mark for naming the other component of a chylomicron. Incorrect answers typically included components of a triglyceride, eg fatty acids or glycerol/monoglyceride.

Only a small proportion of students gained both mark points in **05.2**, with just under 45% achieving one mark. Most correct answers were for the first part and the idea that the results would not be affected by any pre-existing medical conditions. Often students answered this question quite vaguely, eg just to get reliable results. It was also common to see answers where part of the question had just been reworded without any further reasoning.

Question **05.3** was mostly answered well with over 25% of students gaining one mark and over 55% gaining all two marks. Where the second mark was missed, it was typically for expressing the ratio the wrong way round, i.e. volume divided by SA, and so gave an answer of 1.63:1

05.4 proved to be a relatively straightforward question and just over 80% of students gained the mark. Despite this, question **05.5** proved to be more challenging for students with just over 20% gaining one mark. Very few students referred to the idea that collectively the small lipid droplets would present a larger total surface area. It was not uncommon to see answers which showed confusion with SA:V. In addition, very few referred to the faster or greater rate of digestion to fatty acids and monoglycerides. There were many vague answers eg just referring to enzymes rather than lipase.

QUESTION 06

Question **06.1** was generally answered well, with just under 70% gaining one or more marks. Unfortunately, there were a significant number of students who incorrectly spelt capsid as caspid, resulting in the mark not being awarded. Fewer students could recall the lipid envelope for the outer surface formed from the cell-surface membrane of cells infected with HIV.

06.2 was not answered very well, with only around 25% of students gaining two marks and around a third achieving just a single mark. Many answers just described the decreasing number of helper T cells without commenting that by 8 years, the number must have reached a critically low level. There were many vague comments, eg that the immune system is weaker, without going into any more detail. Very few students referred to the idea of reduced antibody production.

Only around 15% of students gave the correct answer to the calculation in **06.3**. Around a third of students gained a single mark for correctly calculating the number of helper T cells as a result of the 35% increase in CD4%, but then did not find the difference to give the actual increase in helper T cells. Some students either did not round to the nearest whole number or rounded incorrectly.

Question **06.4** proved a good discriminator and there were some good answers. Around 75% of students gained at least one mark but only 10% gained all three marking points. Most students named the enzyme reverse transcriptase but the explanations that followed were often either not clear or lacked sufficient detail. Better answers demonstrated a clear understanding that viral DNA could not be formed from the viral RNA templates.

QUESTION 07

In question **07.1**, students were asked to state three control variables for the investigation that had not been mentioned in the method. Just over 90% of students gained at least one mark, with just 20% getting all three marks. Most of the marking points were seen, but the one most commonly awarded was for the idea of controlling the growing conditions of the plants either before/during the investigation. Unfortunately, some students only listed different environmental conditions and others included the ones mentioned in the method. Many answers referred to using the same species or age of plants, and also the idea of the same leaf surface area being inserted into the chamber. Again, there were quite a few references to using the same plants each time, despite step 6 in the method mentioning that new plants were used in each repeat.

In **07.2**, over 50% of students gained at least one mark and this was typically for the correct reference to the stylet puncturing the phloem. Some students didn't gain this mark due to referring to the stem or leaf instead. Only around a third of students gained both marking points by correctly describing the sap in the phloem being under pressure. Many students gave vague statements of aphids drinking or sucking out the contents of the phloem.

Question **07.3** was not answered very well, with just over 10% of students gaining the mark. The majority of answers seemed to confuse the chi-squared test with other statistical tests, eg for comparing means, or simply gave vague statements that the data is more accurate or to test if the results are significant. In a similar way, **07.4** was also not answered well, with less than 10% gaining two marks. It was not uncommon to see answers which stated that the difference was not significant, demonstrating an overall misunderstanding of what $p<0.0001$ means. Students also showed difficulty in applying and using the terms 'probability' and 'chance' within their answers.

Although just over 50% of students gained at least one mark in **07.5**, only a very small proportion of these students were awarded the full 4 marks. Many students simply quoted data from Figure 6 without explaining what the results showed. Many speculated that the sample size was too small, even though 600 aphids were used during the investigation. Most of the students that gained marks commented on the idea that the investigation only used one species of plant or aphid. Better answers included additional points such as how the investigation took place in controlled conditions in a laboratory and that the results may have been different under natural conditions.

QUESTION 08

08.1 was a good discriminator as although around 60% of students gained at least one mark, less than 25% of them gained a mark of three or more. Very few students achieved full marks in this question. The most common issue was that many students simply gave a description of the blood flow through the heart rather than attempt to provide any sort of explanation. There were numerous errors in the naming of valves and also in the direction that blood travels eg on several occasions students described blood moving from the ventricle into the atrium and then out through the aorta. Very few students made the connection that the increase in pressure was due to contraction of the cardiac muscle.

Question **08.2** was also a good discriminator and was answered slightly better than the previous part. In a similar way, many students gained at least one mark but very few (less than 10%) went on to achieve 4 or 5 marks. The first marking point was to describe what the atheroma is and where it forms but a significant number referred to the formation on or in the artery which was ignored. References to the coronary arteries and the idea of thrombus formation were seen often, although the latter was not always in the correct context. Many answers stated that less oxygen would be delivered to the heart rather than to the muscles cells of the heart. It was very rare to see any references to reduced respiration leading to myocardial infarction.

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