OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL A-LEVEL BIOLOGY

(9610) BL04 Control

Report on the examination

June 2023

REPORT ON EXAMINATION: INTERNATIONAL A-LEVEL BIOLOGY (9610) BL04 CONTROL JUNE 2023

The paper produced a wide range of marks from 2 to 65 (out of 75) and the mean mark of 36 matched that of BL04 in the summer of 2019. Although correct responses were seen in all parts of all questions, many students struggled to express their ideas in clear, concise, scientific English. This is reflected in that the mean score on this paper was less than half marks. Students are reminded to read the command words in questions carefully and follow what is required.

Topics in which students demonstrated good knowledge included explaining the rise and fall in membrane potential during an action potential (01.2), muscle contraction (06.2, 06.4, 06.6) and how abnormal methylation can affect gene expression (05.5). Knowledge was less secure on why the refractory period causes action potentials to move in only one direction (01.4) and applying knowledge of the action of insulin (07.3).

There was a wide range of performance on the questions related to the assessment of practical skills. Overall, the performance on the mathematically based questions was good, except for 01.3, which students found more challenging. Converting between units was also identified as an area where many students lost marks.

QUESTION 01

Question **01.1** was a straightforward question with 50% of students gaining one mark and around 45% gaining both marks. Most students correctly identified the myelin sheath or Schwann cells, but not as many identified dendrons as the structure that conducts nerve impulses towards the cell body; the common mistake seen was axon.

01.2 was generally answered well and the question also proved to be a good discriminator. Around 90% of students gained one or more marks, with around a third achieving all four marks. There were some excellent answers showing a good level of understanding and it was pleasing to see that many students referred to sodium/potassium ions or wrote it using the correct symbols. Students were better at explaining depolarisation but were not as secure at describing repolarisation. The movement of potassium ions into the axon was seen on numerous occasions.

Question **01.3** was not answered very well, with only around 25% of students gaining two marks. It was also the question that gave the most non-attempted responses. There were various errors made when answering this question, but most commonly it was for incorrect reading from the graph (despite the arrows indicating the length of the refractory period) and problems converting between units eg between milliseconds and seconds.

In a similar way, **01.4** was not answered very well, and although around 30% gained one mark, very few responses were awarded the two marks. Many students simply repeated the wording of the question and few actually addressed question. Students tended to explain what the refractory period is or the purpose of the refractory period without relating this knowledge to the question. Some students went off track and explained why synaptic transmission is unidirectional.

QUESTION 02

Although many students understood the principle of question **02.1**, only around 40% of students gained the mark. Rather than describing the idea of vectors transferring a gene, many students used vague terms such as genetic information or genetic material rather than gene.

Question **02.2** was a good discriminator and despite more than 75% of students gaining at least one mark, less than 10% of students went on to achieve full marks. From the responses, it appeared that students are confident in explaining the need to use the same restriction enzyme in order to create complementary sticky ends. Students were less secure on describing the role of DNA ligase, with many responses showing a lack of clarity and/or errors in knowledge eg joining the PETase gene into the yeast DNA rather than into the plasmid.

Question **02.3** was a very low scoring question, with only a few students gaining the mark. Most students either just repeated the question ie, it would lower plastic pollution, or they described how yeast could produce PETase with no further qualification. Other common answers included that yeast are living organisms so can reproduce, or the PETase gene can breakdown plastic.

QUESTION 03

In question **03.1** around 45% of students gained the one mark, with many stating that the concentration of the chemicals or the age/sex of the beetles would need to be controlled. A good number of students did not read the wording of the question carefully and stated temperature or light, despite it being mentioned in the question. Many students also stated carbon dioxide / oxygen concentration, which were ignored.

Question **03.2** led to many vague answers and less than 10% of students gained the mark. Most students wrote fairly general points eg to allow the beetles to get used to the environment or to simply adjust to the choice chamber. Although many students showed that they understood the question in principle, many gave no further qualification by linking to investigation.

In question **03.3** students were required to apply their knowledge of a kinesis response to the scientists' observation. Just under 20% of students gained one mark and this was usually for the idea that the beetles would move more slowly within the control section. Less than 10% achieved both marking points. Many answers gave good descriptions of what a kinesis response was, but then failed to link to the question. There was also a good number of vague answers such as the beetles would show random movements until they find a favourable area. The question highlighted that a number of students had some confusion between kinesis and taxis responses, and some even referred to tropisms.

Question **03.4** was a good discriminator. Over 85% of students gained at least one mark and of these students, around 50% scored three or more marks. Less than 20% of responses were awarded all five marks. All the marking points for question were seen, but overall, students were much better at identifying the against points. The points about there only being a small sample size of 30 beetles and the fact that only one species had been investigated were particularly common. There were some issues with the wording of some answers eg references to significant results rather than significant difference. In addition, some students wrote about the differences between anethole and the control being significant above a concentration of 0.1 g dm^{-3} rather than above 0.01 g dm^{-3}.

QUESTION 04

Although over 40% of students gained one mark in question **04.1** very few scored two marks. Surprisingly many students stated light intensity or temperature despite these being mentioned in the question. Many students also gave answers that were not environmental variables eg, the age of the seedlings or type/species of seedlings.

In question **04.2,** around a third of students recognised that the shoot tips were removed from each of the seedlings as this is the site of IAA production. Only around 25% of students went a stage further to explain the implications of not removing the shoot tips or to explain that changes in shoot length would only be the result of the added IAA solutions.

Question **04.3** was not answered very well, with less than 20% of students gaining one mark and very few gaining two marks. Most students referred to preventing the seedlings/solution from drying out or avoiding contamination by bacteria. Where students did refer to preventing evaporation, this was seldom followed up by why that matters ie., to prevent changes to the concentration of the IAA solution.

Question **04.4** was answered well with over 50% of students grasping the idea that the range of IAA concentrations was too large to plot without using a logarithmic scale. Where students did not gain the mark, it was usually for vague statements such as a logarithmic scale is more accurate or that the values for IAA concentration are very small.

In question **04.5** over 85% of students gained one mark and this was typically for stating that as the IAA concentration increased, there was a higher mean change in shoot length. Just over 25% of students gained the second mark and correctly emphasised that IAA stimulates shoot cell elongation, therefore causing the higher change in shoot length.

QUESTION 05

Question **05.1** was answered well, with over 70% of students gaining the two marks for this calculation. The most common mistakes were errors when reading values from the graph or dividing by 100 rather than by 16 to work out the rate of growth over the 16-day period.

In question **05.2** just over 50% of students gained the two marks for the correct answer. 30% of students gained one mark and this was mostly for showing that 48 divisions would occur. The common error seen was 48 x 2 instead of 2^{48}.

Just over 30% of students gained the mark in **05.3** by correctly describing tumours as 3D structures or that measuring volume takes the depth of the tumour into account. Unfortunately, there were many vague answers eg ‘volume is better than area’, without giving a clear reason why in this particular case.

Question **05.4** proved to be a good discriminator, with over 65% of students gaining at least one mark, but less than 10% of those achieving all three marks. The first two marking points were often well described and it was clear that most students understood the purpose and function of siRNA. Despite this, some references to siRNA ‘breaking the gene’ and not mRNA were observed. Only a very small proportion of students went further to explain how blocking the expression of this gene would cause increased apoptosis and therefore resulting in a smaller tumour volume.

In a similar way to the previous question, **05.5** also provided to be a good discriminator. More than 75% of students gained one or more marks but just over 25% gained the full three marks. There were many good answers to this question demonstrating that most students have a good understanding of the process. Where marks were missed, it was typically for repeating the wording of the question ‘abnormal methylation’ rather than stating what the abnormality was ie., increased methylation or hypermethylation. Despite the context being set about a tumour suppressor gene, some students wrote about proto-oncogenes instead. Another mistake seen was references to ‘cell growth’ rather than cell division.

QUESTION 06

Question **06.1** was mostly answered well, with just under 25% gaining one mark and a further 60% gaining the two marks. The most common mistake seen was in converting between mm to µm, which led to answers out by a factor of 10 eg, 3,000 or 300,000.

Students answered **06.2** very well, with just under 20% gaining one mark, and over 75% gaining the full two marks. The most common mistake seen in this question was reference to the A-band increasing or decreasing in length.

Over 50% of students gained the mark in **06.3** and in a similar way to 06.1, the main issue was converting between units, in this case between µm and nm. The majority of students completed the first step correctly by dividing 0.64 µm by 16 (0.04 µm for one ATP molecule) but then either divided by 1000 or multiplied by 100.

Question **06.4** was answered well with over 60% of students gaining both marks. Where students did not gain marks, it was usually for vague statements eg, phosphocreatine turns ADP into ATP but with no further qualification. Occasionally students described phosphocreatine as providing energy.

06.5 proved to be a good discriminating question and was generally answered well. Over 90% of students achieved at least one mark but just under 20% obtained the full five marks. In a similar way to 03.4, students were particularly good at identifying the 'against' points. Ideas such as the small sample size or only using two different pH values were seen often. Students were good at identifying the non-overlapping or overlapping error bars, but it was common to see references to significant or non-significant results (instead of significant/non-significant differences).

Question **06.6** also proved to be a good discriminator, with just under 70% of students gaining one or more marks. Despite this, less than 10% of students gained the full three marks. Although there were many good descriptions about the role of calcium ions in muscle contraction, it was often not linked to the actual question ie., why there would be a lower force of contraction. Figure 7 showed that a reduced pH caused a reduced force of contraction, but a good number of students explained how there would be no tropomyosin movement away from the actin binding sites or no formation of cross bridges.

QUESTION 07

Question **07.1** was answered well, with around two-thirds of students gaining the mark. Most students realised that this was to reduce the blood glucose concentration to within a normal range, or so that all the mice would have a similar starting blood glucose concentration.

In question **07.2** around 85% of students gained at least one mark and just under 30% achieved all three marks. The question was answered well with some good, clear descriptions of the four different diets. Some students did not refer to the control diet (CD group) and some students wrote at great length about the differences between the HF and HS diets, despite both leading to very similar results overall. Some students only compared specific lines and therefore did not manage to achieve certain mark points.

Question **07.3** proved to be a good discriminator, with around two-thirds of students achieving at least one mark. Despite this, only around 15% of students managed to gain all four marks. Many students realised that insulin would have been released, but it was not always stated where the insulin was being released from. The third marking point was not always worded in a detailed manner eg just the 'body becomes more permeable to glucose'. Only a small proportion of students referred to enzymes catalysing the conversion of glucose to glycogen. Occasionally, some students misread the question and attempted to explain the results for all the different diets from 30 minutes onwards.

In question **07.4** around 75% of students achieved at least one mark but only around 25% managed to gain all three marks. Some students misinterpreted the y-axis in Figure 9 eg, as concentration of Cpd1 increased the greater the decrease of glycogen remaining in the livers.

Generally, there was a lack of precision in graph reading skills when reading values off the y-axis. Some attempted to explain the results, which was not required for this question.

For question **07.5** just under 50% of students gained one or more marks but only a very small proportion of students achieved full marks. Many students seemed to understand the principle behind the question ie., less glycogen would be hydrolysed to glucose. Despite this, knowledge of the 2nd messenger model was unclear in most responses and there were numerous vague answers eg, 'less 2nd messenger model' or 'less enzymes involved in the 2nd messenger model'. Some students just described the general role of glucagon and did not relate this knowledge to the context of the question.

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