

OXFORD

INTERNATIONAL  
AQA EXAMINATIONS

# INTERNATIONAL AS LEVEL BIOLOGY

(9610) BL01

Report on the examination

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January 2022

## REPORT ON EXAMINATION: INTERNATIONAL AS LEVEL BIOLOGY 9610 UNIT BL01 January 2022

Overall, the paper gave a wide range of marks but with a lower overall mean mark than in previous years. On a number of occasions, it seemed that a good number of students may have rushed into their answers without fully taking into account all the information provided within the question. Student performance in the calculation-based questions was not as strong as previously seen. It is important to remind students of the need to express their answers clearly, as some answers in this series were difficult to read due to the quality of handwriting.

There were many excellent responses across the paper, but students demonstrated particularly good knowledge and understanding of the structure of DNA nucleotides (question 2) and cell transport involving diffusion and active transport (question 4). Also, a strength was question 5, where students showed confidence in applying knowledge of surface area to volume ratio.

Areas that students found more challenging were applying knowledge and understanding to the novel contexts of certain questions, especially of taxonomy and biological classification (question 8) and protein synthesis (question 6). Regarding general knowledge and understanding, this cohort performed less well in the following topic areas: the process of meiosis, describing the biochemical test for a non-reducing sugar and adaptations of the human gas exchange system. Students also showed a lack of understanding of mitochondrial DNA.

### QUESTION 01

This question had the context of biological molecules.

In question **01.1** students had to state the number of carbon atoms found in glucose and ribose. The question was answered reasonably well, with over half of students gaining both marks. Where students scored one mark it was typically for only giving the correct number of carbon atoms in glucose. Nearly three quarters of students obtained the mark for question **01.2** by correctly stating nitrogen. Question **01.3** was answered less well than the previous two parts and only about half of the students scored the one mark. A large number of answers simply referred to the general structure of amino acids being different. In question **01.4**, students had to give a description of the biochemical test for a non-reducing sugar. Only a very small proportion of students gained all three marking points and less than a quarter gained two marks. Many answers did not refer to heating the sample with Benedict's solution and/or did not include details of how to hydrolyse sucrose. A good number of answers just gave the biochemical test for a reducing sugar instead.

### QUESTION 02

This question tested knowledge and understanding from sections 3.1.7.1 (structure of nucleic acids), 3.1.7.2 (DNA, genes and chromosomes) and 3.1.7.3 (DNA replication).

Overall, students demonstrated good knowledge of DNA nucleotide structure in question **02.1** with over three quarters of the answers scoring two marks and over half gaining all three marks. In question **02.2** over half of students gained both marking points. Where students gained just one mark it was usually for the correct answer but given either in  $\mu\text{m}$  or in the incorrect order of magnitude. Less than a quarter of answers gained two marks in question **02.3** and just over half gained one mark. The first marking point was the most frequently awarded but not as many could recall that the mitochondrial DNA is not associated with proteins. Unfortunately, many students made a comparison of length despite the question informing them that mitochondrial DNA is shorter and that they should give two other differences. Question **02.4** proved to be a good discriminator but was not answered as well as expected with less than a quarter of answers gaining four or more marks. Whilst many students could recall the role of DNA helicase only a few could correctly describe the function of DNA polymerase. Very few students referred to the last marking point regarding the formation of phosphodiester bonds through condensation reactions.

## QUESTION 03

This was based on meiosis (section 3.1.9.1 from the specification). In **03.1** students were asked to complete the missing information about the number of chromosomes and mass of DNA after each stage of meiosis. Less than a quarter of answers were awarded both marks with the most frequent error occurring in the number of chromosomes. Answers did not demonstrate thorough understanding of the two divisions in meiosis (question **03.2**) with the same proportion of answers getting both marks as in question **03.1**. Many responses just gave a simple description of Figure 2 without referring to homologous chromosomes or chromatids. Despite the instruction not to include details of processes that contribute to variation, it was not uncommon to read answers giving details of independent segregation of homologous chromosomes and crossing over. In **03.4** just under half of students gained the mark for referring to either random fertilisation or genetic mutation. It seemed that, as in question **03.3**, students did not consider the wording of the question and there were numerous responses stating meiosis or crossing over.

## QUESTION 04

In this question students were required to apply their knowledge and understanding from sections 3.1.4.2 (diffusion) and 3.1.4.3 (active transport) from the specification.

Question **04.1** was answered reasonably well with over two thirds of students gaining two or more marks. Many responses described that the uptake of P increased throughout the 10 hours whereas the uptake of Q levelled off. In addition, there was some good use of data from Figure 3. A number of responses attempted to explain the uptake of P and Q which was not required for this question. Question **04.2** was answered reasonably well with over half of students gaining the two marks. Mark points one and two were most frequently seen but there were only a few responses that referred to active transport requiring carrier proteins. In question **04.3** many answers were awarded one mark for the idea that uptake of P did not decrease or level off. However, only a third of all the answers went on to explain that uptake of P would therefore not have been affected by the concentration gradient. Question **04.4** was found to be the most challenging part of this question with only around a third of answers gaining one mark and even fewer getting both marks. Many answers simply stated that 37 °C is the optimum temperature for cells or for the human body without making any references to enzymes. Very few students made the connection to enzymes either being involved in the production or hydrolysis of ATP.

## QUESTION 05

This was based on sections 3.1.5.1 (surface area to volume relationship) and 3.1.5.2 (gas exchange systems) from the specification.

Question **05.1** was answered well with around two thirds of responses gaining the two marks. Where students only achieved one mark it was usually because they did not give the answer to two significant figures. Question **05.2** was also answered reasonably well with many answers referring to bacteria having a very large surface area to volume ratio. Just under than half of all responses went on to say that bacteria could rely on diffusion across their surface or bacteria having a short diffusion distance. Common mistakes seen in this question were that bacteria are not living or that because bacteria are much smaller, they have a larger surface area compared to humans. Question **05.3** was not answered as well as expected for an AO1 question of this type. Only a quarter of all responses gained two or more marks. The most common issue was that adaptations of the lungs were correctly stated but unfortunately without any attempt to explain how these adaptations maximise the diffusion rate of oxygen.

## QUESTION 06

This question was mainly based on section 3.1.8 (protein synthesis) from the specification, in a novel context of an investigation into the roles of organelles in the synthesis and transport of polypeptides through cells.

In question **06.1** only around a third of answers gained one mark and very few answers gained both marking points. It seemed that generally students did not appreciate that the reason for using radioactively labelled amino acids was to track the movement through the different organelles. Many

answers just gave vague statements e.g., so that radioactively labelled amino acids could be more easily identified. For the second part of the question, many responses merely repeated the wording of the question without providing any explanation. By contrast, question **06.2** was answered much better with roughly two thirds of students correctly stating translation. Where marks were not gained it was usually for incorrectly stating transcription or ribosomes. Question **06.3** proved to be a good discriminator with nearly two thirds of responses gaining at least two marks. Where marks were lost in this question it was usually for not mentioning the role of chaperone proteins. When chaperone proteins were seen in answers the level of detail in their function was very good. In question **06.4** less than a fifth of all answers gained the one mark available. Despite the question stating that organelle Y is the Golgi apparatus, many responses gave this organelle for either organelle X or Z. Where responses correctly identified organelle X as the rough endoplasmic reticulum very few went on to name organelle Y as a secretory vesicle. Around half of all responses gained the mark available in question **06.5** with virtually all of these stating that the Golgi apparatus receives radioactively labelled polypeptides to modify them and hence why the level of radioactivity increased. In question **06.6** students were asked to calculate the mean rate of change in percentage radioactivity between two points from Figure 4. Unfortunately, less than half of the responses gained this mark. Many correctly stated that the radioactivity decreased by 30% but did not go on to divide by 20 (minutes). In question **06.7** students needed to suggest why radioactivity decreased in organelle Z and only a quarter of all responses gave one correct answer. Most students wrote about the radioactivity or the amino acids being used up or that organelle Z had finished its function.

## QUESTION 07

This question was based on required practical 1 and was set out as an investigation into the effect of pasteurisation and time on the pH and concentration of free fatty acids in milk.

In question **07.1** just under half of all students were awarded the two marks for a correct calculation of the percentage decrease in pH. A good number of students did not read the figures from Figure 5 correctly or divided by 13 days instead of the initial pH (at day 0). Question **07.2** was answered well with just under two thirds of students gaining the mark for correctly stating that fatty acids are produced which lower the pH. There were some vague answers which simply described that the pH decreased due to the decomposition of milk. In question **07.3** less than quarter of responses gained the one mark for suggesting how the pH may have been measured in the experiment. Many simply stated the use of an indicator or universal indicator which would not have given the results shown in Figure 5. For question **07.4**, approximately two thirds of students gave one correct control variable for the scientists' investigation. There were numerous references to temperature or to a specific feature of the milk e.g. the source of the milk. Where the mark was not awarded it was usually for vague answers such as keeping the conditions the same, without qualifying this further. Question **07.5** involved giving two reasons why the concentration of FFAs did not increase after 13 days. This question was generally well answered with over three quarters of responses gaining at least one of the marks. Many students described how the enzymes may have been denatured by the change in pH and/or that the triglycerides had all been hydrolysed. Unfortunately, some responses described how the enzymes may have been used up. In question **07.6** students had to realise that the fall in pH of the pasteurised milk happened much more slowly and subsequently go on to explain why this might be the case. Only about a third of answers were awarded one mark and only a small proportion of students gained both marking points. The main reason for this was that a large majority of students simply described the difference between Figure 5 and Table 3 without attempting an explanation. In question **07.7** students were required to describe an experiment to investigate the effect of lipase concentration on the rate of triglyceride hydrolysis. The question proved to be a good discriminator with around a third of all answers gaining three marks or more. Only a very small proportion of the answers were awarded the full five marks. The most frequently awarded marking points were 4, 5 and 7 but all marking points were seen. Some students completely misread the question and either described an experiment with another factor as the independent variable (e.g. temperature) or only gave an explanation of the outcome of the experiment with little or no description of how to obtain the results.

## QUESTION 08

This was a comprehension question based mainly on sections 3.1.10.1 (concept of a species), 3.1.10.2 (biological classification) and 3.1.11.1 (genetic diversity) from the specification.

In question **08.1** less than half of all responses gained one or more marks with only a very small proportion getting both marking points. The idea that the gentoo penguin shares the same genus with the other three *Pygoscelis* species was the marking point most frequently awarded. Whilst a number of students stated that they all share an ancestor, we were specifically looking for the idea that they must share a recent common ancestor (as they are closely related). Unfortunately, many answers included details of the geographic isolation of the colonies and differences in environmental factors which was not the focus of this question. Question **08.2** proved to be a good discriminator. Students were required to give three ways that the genetic diversity of the separate colonies of gentoo penguins could be compared. Less than half of all answers were awarded one or more marks and very few gained all three marking points. Unexpectedly, many answers gave details such as comparing beak size, colour of feathers or aspects of the different environments. In question **08.3** less than a quarter of the answers gained one or more marks and this was typically for either marking point one or two. There was a wide range of incorrect answers and many of these seemed to focus on an idea that penguins in the wild would be more evolved or that they had been subjected to environmental factors. Other incorrect answers claimed that the scientists would not know which species it is in the wild. Question **08.4** proved to be quite challenging for nearly all students. Many did not consider the information at the start of the question that the colonies are geographically isolated and that the penguins in these colonies can no longer interbreed. Despite this many answers focussed on the idea that conservationists should prevent the penguins interbreeding or just keeping them separate. Question **08.5** again proved to be challenging for students with less than a third of all answers gaining one or more marks. Many incorrect answers simply included details about comparing environmental features, body features or diets. In addition, some students simply repeated the answers given in question **08.2**

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