Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

November 2023

Pearson Edexcel International GCSE
In Biology (4BI1) Paper 2B

General Comments

The examiners were highly impressed with the quality of many of the answers presented by candidates. Candidates and centres clearly prepared very carefully for the examination and demonstrated an excellent grasp of most areas of the specification. Practical and mathematical skills were generally excellent and most candidates used scientific vocabulary confidently and accurately. Some candidates found the paper challenging, especially the longer discussion style questions. When discussing data, candidates should identify all patterns and suggest explanations. Some candidates also underestimated the level of depth needed to gain maximal credit in answers. Candidates should also be careful to use terminology in the correct contexts, for example, a number of candidates used relevant terminlogy when answering question 4 (b) but in the wrong contexts. Some candidates still find the topic of protein synthesis challenging. Nearly all the candidates attempted every question and most worked at an appropriate pacce throughout the exam.

Question 1

The context for the comprehension question was the role of plants in the carbon cycle and their role in minimising increases in atmospheric carbon dioxide.

(a) This question was well answered by many candidates. Most recognised that cars use fossil fuels and that they release carbon dioxide when these fuels are combusted. Some candidates gave overly simplistic answers stating that 'cars release carbon dioxide' without any explanation.

(b) This question was well answered by many candidates. Most were able to explain that carbon dioxide is a greenhouse gas, can trap heat and cause an increase in temperature. A few candidates referred to an increase in temperature to gain one mark but did not give any further explanation.

(c) Many candidates found this question challenging with only a few gaining both marks. Over a third of candidates gained a mark for stating that carbon dioxide is a raw material in photosynthesis but few went on to explain that carbon dioxide can act as a limiting factor in photosynthesis.

(d) Strong answers to this question explained that deforestation leads to increased decomposition and combustion, and so releases carbon dioxide. They also stated that to act as a carbon sink, photosynthesis rate must be greater. Many candidates also correctly stated that deforestation leads to reduced photosynthesis.

(e) This question required candidates to give an account of a practical that could be carried out to investigate the effect of light intensity on gas exchange by a leaf. This is a practical that is listed in the specification and so candidates should be familiar with it. A surprising number of candidates suggested incorrect practicals such as measuring starch production or measuring water loss. Strong answers gave a method for changing light

intensity, rather than just stating 'change the light intensity', explained the colour changes of hydrogen carbonate indicator, and suggested a control variable. Candidates should make sure that they have a full knowledge of all the practicals listed in the specification.

(f) This maths question required candidates to calculate the number of stomata present in a leaf. Many candidates gained at least one mark, but few went on to gain all three. A significant number of candidates correctly calculated the density of stomata per square millimetre of leaf, but many did not appreciate that units needed converting between millimetres and centimetres when scaling up the number of stomata for the whole leaf. Candidates should be familiar with all the required mathematical skills listed in the specification.

(g) This question was generally well answered with most candidates gaining at least one mark. Most recognised that water loss occurs through stomata and a significant number went on to correctly state that water loss from the stomata generates a transpiration stream pulling water up from the roots. The examiners were impressed with some of the excellent vocabulary used by many candidates who referred to water potential gradients, transpiration pull, and evaporation.

Question 2

(a) This straightforward question required candidates to state what the term, enzyme, means. Most candidates correctly stated that enzymes are biological catalysts and speed up reactions.

(b) This practical skills question was well answered by many candidates who correctly stated that the surface area exposed would be higher after cutting up the cylinders into discs. Some candidates also correctly stated that cutting up the cylinders into discs would speed up the reaction rate.

(c)(i) Most candidates were able to correctly identify the dependent variable as the volume of oxygen produced. Some candidates confused the dependent variable with the independent variable, or with control variables.

(c)(ii) Most candidates were able to suggest at least one correct abiotic control variable, such as the concentration of peroxide, or temperature. Some candidates incorrectly referred to controlling the pH or biotic variables such as the type of potato used.

(d)(i) This maths question required candidates to calculate the percentage change in rate of reaction. Many candidates gained both marks, but some candidates were unsure how to calculate a percentage change rather than a simple percentage, often dividing the rate at pH 7 by the rate at pH 4.

(d)(ii) Many candidates found this question challenging with few gaining both marks. The question required candidates to appreciate that the rate of reaction would fall after five minutes as the substrate was being used up and so there would be a lower frequency of enzyme-substrate collisions.

Many answers incorrectly stated that the enzymes would be used up or would denature.

(d)(iii) This question was generally well answered with many candidates gaining at least two marks. Most recognised that enzymes have an optimal pH and denature at extreme pHs causing a change in shape of active site. Some candidates incorrectly referred to optimal temperatures rather than pHs and some did not explain why denaturation causes the rate to slow.

Question 3

(a)(i), (a)(ii), and (a)(ii) Most candidates were able to gain at least one mark for these questions with many gaining all three. Most were able to identify the Bowman's capsule and loop of Henlé although fewer recognised that the collecting duct is affected by ADH.

(b) (i) This question required candidates to explain that glucose is passed from the glomerulus into the Bowman's capsule and is then reabsorbed in the proximal convoluted tubule by active transport. Many candidates demonstrated an excellent knowledge of kidney function and gained at least two marks. Candidates should always give full descriptions of active transport in terms of using energy and moving substances against a gradient. Candidates should also be careful to describe the movement of substances from the glomerulus into the Bowman's capsule when describing ultrafiltration.

(b)(ii) Most candidates were able to gain both marks for this question by correctly stating that Benedict's solution is used to test for glucose and that the positive result is a red or orange colour.

(c) This question asked candidates to describe the effects of dehydration on urine. Most correctly stated that the volume of urine would decrease and the concentration increase. A small number incorrectly stated that the concentration would decrease.

Question 4

(a) Over half of the candidates were able to correctly state that a mutation is a change to the sequence of bases in a gene. A number of candidates gave vague definitions such as 'a change in an organism' or 'an inherited change.' Candidates should be familiar with all the words that are defined within the specification.

(b) This challenging question asked candidates to explain how a single base mutation would affect transcription, translation, and enzyme activity. Many candidates gave very confused answers that showed some understanding of the processes of transcription and translation but with incorrect detail. Common errors included referring to transcription producing a protein and translation producing RNA. Some candidates confused the roles of mRNA and tRNA. Several candidates did not continue their answers to explain the effects of the change on the enzyme structure and function. Some outstanding answers were seen that fully explained the effects of nucleotide

changes on amino acid sequences, the effect of a change on amino acid on enzyme structure and activity and how a nucleotide change could have no effect. Candidates should always try to use detailed scientific vocabulary but should be careful to use it accurately.

(c)(i) This mathematical question required candidates to calculate a mean value. Most candidates were able to gain both marks.

(c)(ii) This question asked candidates to suggest why mutation rate was calculated per division per cell rather than just per cell. Very few candidates recognised that meiosis has two divisions whilst mitosis has only one division.

(c)(iii) This question asked candidates to comment on data about the mutation rates of three different strains of yeast in both mitosis and meiosis. Strong answers compared the rates of mutation in meiosis with mitosis and also looked at differences between the yeast strains. When commenting on data, candidates should explore all aspects of the data fully and identify as many patterns as possible. Most candidates gained at least two marks, but many tended to focus their answers on only one or two aspects of the data.

Question 5

(a)(i) This question asked candidates to explain why plants need nitrate ions. Most candidates were able to gain at least one mark for stating that nitrate is needed for amino acid synthesis, protein synthesis, and plant growth. Some candidates also correctly stated that the nitrates are used to make nucleic acids and chlorophyll.

(a)(ii) This question was a factual recall question that required candidates to identify stages in the nitrogen cycle. Many candidates gained all three marks, but a significant number of candidates confused the processes of nitrogen fixation, nitrification, and denitrification. Candidates should ensure that they know all the stages in the nitrogen cycle when sitting Paper 2.

(b)(i) This question presented candidates with data showing the changes of nitrate levels in a river along with the changes in nitrogen applied to fields. Most candidates were able to correctly recognise that both increased but that there was much more fluctuation in the amount of nitrogen added to the fields. Fewer candidates gave correct suggestions for the changes in nitrate and nitrogen. When discussing data, candidates should try to describe patterns and trends and attempt to make explanations.

(b)(ii) This question was well answered by many candidates with a significant number gaining all three marks. Most candidates recognised that the river would have increased algal growth, increased bacterial decomposition, reduced oxygen, and loss of fish species. Most candidates demonstrated an excellent, detailed understanding of eutrophication and its effects.

Question 6

(a) This question asked candidates to explain how stem cells differ from other types of cell. Most gained one mark for the idea that stem cells are undifferentiated and about half of these went on to state that stem cells can continue to divide and then differentiate into different types of cell. Candidates should be careful to state that stem cells can produce 'different types of cell' rather than simply 'produce more cells'.

(b) This question asked candidates to explain how stem cells could enable different blood conditions to be treated. Many candidates found this question challenging and gave vague answers, such as, 'stem cells could produce more blood cells.' Strong answers gave specific details about the blood cell types and conditions, such as 'red blood cells could be made that can increase oxygen transport' or 'more lymphocytes could be made to treat people with immunity issues'. Candidates should always try to give as much specific detail as possible, always focusing on the number of marks allocated.

(c) This question asked candidates to explain why using a patient's own stem cells is better than a donor's. Most candidates were able to gain at least one mark, most frequently for stating that the cells would not be rejected as they are genetically identical with the same antigens. Candidates should always be careful to use the terms 'antigen' and 'antibody' accurately.

Summary Points

In future series, students should:

- make sure that they are familiar with all the mathematical requirements including unit conversions
- be familiar with all the command words
- when answering evaluation and discussion questions, structure answers clearly
- use key vocabulary accurately and precisely
- have a detailed knowledge of all the core practicals listed in the specification
- be fully conversant with the terms independent, dependent, and control variable
- ensure that they know the formal definitions for terms, such as mutation that are listed in the specification