Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2021

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

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Introduction

The examiners were very impressed with the high standard of many of the scripts seen. Students and teachers should be commended for preparing so thoroughly for this January series in what is a very challenging situation. Many students demonstrated excellent factual knowledge of enzymes, plant gas exchange and osmoregulation. Some students found the questions about protein synthesis and micropropagation challenging and in future series, student should be careful to cover all areas of the specification in detail. Mathematical and experimental skills were very good with the many students gaining some credit on each mathematical question. Some students lack confidence when asked to apply their knowledge to unfamiliar scenarios, and in future series, students should be encouraged to think about questions carefully if they do not have an immediate answer. Use of scientific terminology was good - students should always be careful to use accurate terminology in their answers.

Question 1

The comprehension sets a context for questions which then draw from several areas of the specification. The context for this comprehension was the effects of plastic pollution in oceans. Students should read the comprehension, and when answering questions should use the line guidance given in each question to find relevant information.

(a) (i) and **(ii)** Many students demonstrated an excellent understanding of food chains with many correctly identifying microscopic plankton as the producers and humans as a tertiary consumer.

(b) This question tested students' knowledge of the digestive and respiratory systems. Many excellent answers were seen that fully explained the consequences of blockages to the trachea and oesophagus. Weaker answers tended to give less detail so did not explain the full consequences of reduced digestion or oxygen uptake. Students should always give as much detail as possible and answer questions fully to gain full credit.

(c) Many students were able to recognise that bioaccumulation would lead to plastics or toxins building up along food chains and that humans who eat fish at higher trophic levels would consume the plastic. Where students did not gain full credit, it was typically for implying that humans would consume plastic directly rather than through eating organisms in the food chains.

(d) Many students were able to correctly calculate the difference in number of plastic particles ingested by a fin whale and a whale shark, but a significant number did not give their answer in standard form. Students should be careful to follow all instructions in questions.

(e) Many students were able to correctly state that a reduction in reproduction would reduce biodiversity. Many were able to go on to explain why reduced reproduction would lead to reduced populations that could lead to extinction, or gave correct negative impacts on food webs.

(f) Most students were able to recognise that using biodegradable bags would reduce the number of animals damaged by consuming plastics. Strong answers explained that biodegradable bags would be digested or broken down enzymatically by microorganisms. When given a term such as biodegradable, students should try to use different terminology when explaining what it means, for example, not simply stating that biodegradable bags will degrade.

Question 2

(a) Many students were able to correctly state that area A, the kidney, contains nephrons.

(b) Many students were able to correctly identify a substance found in urine, the most common answers being water, urea and salt.

(c) (i) This question presented students with the results of an experiment about osmoregulation. Students were asked to explain the effects of drinking salt solution and water on the production of urine. Many students found this question challenging and described the data rather than giving an explanation. Stronger answers explained that the reduced volume of urine when drinking salt solution would be due to increased release of ADH and increased permeability of collecting ducts to water. Several students were aware that ADH and collecting ducts were involved but did not use the terms accurately. Students should be careful to always use scientific vocabulary accurately and confidently.

(c) (ii) This question tested students' understanding of osmoregulation and asked for two other factors that affect urine volume. Many students correctly stated factors such as temperature and sweating. A significant number of students referred to the salt water; this question asked for 'other factors' - students should be careful to read the questions carefully.

Question 3

(a) This question asked students what the term *'in vitro'* means. Only a minority of students were aware of its meaning with many confusing it with the need to control variables.

(b) (i) This question presented students with data showing the effect of pH on shoot growth from explants grown in culture. Many students recognised that there was clearly an optimal pH for shoot growth and that this implied a role for enzymes. Some students gave a description of the data rather than an explanation.

(b) (ii) Many students found this question challenging and did not give accurate descriptions of micropropagation, with many giving generic descriptions of plant growth. The question asked for a description of the techniques used in micropropagation, such as the use of sterile, nutrient agar, along with experimental details such as the use of explants from the same species of plant. Strong answers gave specific details and gave accurate descriptions such as the use of disinfectant to sterilise explants. Weaker answers demonstrated an understanding of the need for factors such as light for plant growth but gave few experimental details.

(c) Many students were able to give two benefits of using micropropagation the most commonly seen were: the rapid production of plants, the production of genetically identical plants and the production of large numbers of plants. A few students confused micropropagation with pollination and so suggested that it would create genetic variation.

Question 4

(a) This question presented students with a transverse section through a leaf and asked them to explain how the top layer is adapted for its function. Strong answers referred to the transparency of the layer and how this allows light to reach the palisade cells underneath. Other students referred to the role of the layer in protecting the leaf from pathogens or reducing water evaporation. Some students confused the layer with palisade cells and incorrectly stated that it would have many chloroplasts for photosynthesis.

(b) This question asked students to explain the adaptations of layers B and C of the leaf. Many were correctly able to recognise that layer C was the layer adapted for gas exchange and that layer B was adapted for photosynthesis. Strong answers referred to the large surface area of palisade cells and their large number of chloroplasts for light absorption. Students should be clear that these cells have many chloroplasts rather than just stating that there are chloroplasts present. Many also explained that the air spaces in layer C allowed gas exchange of carbon dioxide and oxygen gases.

(c) Many students were able to correctly recognise that layer D has guard cells and stomata present and that the guard cells open and close the stomata. Strong answers went on to explain that the stomata open in light to allow carbon dioxide to enter and close in the dark. Students should always refer to the diffusion of gases rather than simply referring to their movement.

(d) Many students found this question challenging. It presented students with a context about an anti-transparent spray that prevents water vapour passing through it but still allows other gases to move. Stronger answers described how reduced water loss could lead to less wilting, and also mentioned that if there is

less transpiration, fewer mineral ions would be transported to the leaves and the leaves would cool less efficiently. Strong answers also explained that carbon dioxide would still be able to enter the leaves so that photosynthesis could continue. Weaker answers often suggested that photosynthesis would be reduced due to less water availability.

Question 5

(a)(i) and **(ii)** Most students understood that the genetic code is a triplet code and that the sequence of DNA in the question would code for five amino acids. Many students were able to give a correct complementary sequence for the mRNA. Some students did not substitute T with U on the mRNA but still gained one mark if the other bases were complementary.

(a) (iii) Many students found this question veery challenging. Strong answers explained that each triplet is a discrete code for one amino acid and that each base is not used in more than one codon.

(b) This question drew a mixed range of responses. Some students gave excellent, detailed accounts of translation that used terminology accurately. A significant number of students confused translation with transcription and gave accounts of mRNA production. Some students gave confused answers that did not describe the roles of tRNA and mRNA. Students should be careful to prepare this section of the specification so that they are confident in their understanding of the stages of protein synthesis.

(c) Many students correctly stated that a genome is the total DNA content of an organism. Where students did not gain credit, they often confused the term genome with genotype or phenotype.

Question 6

(a) This question required students to give the relationship between the number of potato discs and the rate of oxygen production. Many students were able to gain both marks by stating that the as potato disc number, or enzyme concentration, increased, the rate of oxygen production would increase. Some students correctly described the two variables but did not give the expected relationship between them. A few students confused the terms dependent, independent and control variables, often suggesting that the oxygen production or temperature was the independent variable.

(b) Many students were correctly able to identify two variables that were controlled, the most frequent being temperature, volume of hydrogen peroxide, volume of buffer and shape of potato discs. Students should be careful to refer to terms such as volume and mass rather than the term, 'amount.'

(c) (i) and **(ii)** Mathematical skills were very good and many students were able to correctly calculate a mean for part **(c)(i)** and a percentage increase for part

(**c)(ii)**. Fewer recognised that there was an anomalous value in the data for part **(c)(i)** and so only gained one mark. Students should be careful to not include anomalous values when calculating means.

(c) (iii) Many students found this question demanding and gave only a description of the results rather than an explanation. Strong answers explained that if the enzyme concentration increased that there would be more active sites and so more collisions between enzymes and substrates. Students should be very careful to not confuse the command words, explain and describe.

(d) This final question was challenging but many students were able to gain at least one mark. Many recognised that the rate of reaction could decrease as the substrate is used up and that the initial reaction would be most rapid at the start when there was the highest concentration of substrate. A significant number of students suggested that the enzymes would be used up – students should be clear that as catalysts, enzymes are not used up in reactions.

Summary

In future series, students should:

- apply their knowledge and understanding confidently when answering questions with unfamiliar data or contexts
- ensure that they have a good factual understanding of all topic areas
- use key scientific vocabulary accurately
- give precise answers that address the number of mark points allocated.

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