Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2020

Pearson Edexcel International GCSE Level In Biology (4BI1)

Paper 2B

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Introduction

This was the first 4BI1 2B paper for the January examination series. The examiners commented on the high standard of answer from many of the students. Many centres have clearly adapted to the new specification and are preparing students well for the exams. Some students found the paper very challenging, particularly questions about topics that were not on the legacy specification, such as transcription and translation. Longer answer questions also caused some students difficulties and in future series, students should plan answers to five- and six-mark questions carefully. Data analysis and mathematical skills were generally very good, although some students confused the command words explain and describe when analysing data.

In future examination series, students should try to:

- Ensure that they are fully familiar with all the 'new' topics on this specification
- Ensure that they understand the definitions of all the command words
- Pay particular attention to topics in the specification that are in bold when preparing for Paper 2.

Question 1

This comprehension discussed the role of badgers in the spread of tuberculosis. It related to several areas of the specification such as immunity, ecology and gas exchange and tested students' knowledge and ability to analyse data.

(a) This question asked students to suggest why cattle with lung damage have gas exchange problems. Many students were able to correctly explain that the alveoli would be damaged and that this would reduce the surface area for diffusion. Some students did not use enough detail and so did not gain full credit – students should always try to use appropriate terms such as diffusion.

(b) Most students were able to gain at least one mark on this question, typically for stating that in pasteurised milk, the bacteria would be killed. Fewer went on to explain that this would mean that there was less chance of people being infected.

(c) This question required students to apply their knowledge in a different context and suggest why Europe has fewer cases of bovine TB. Most students were able to suggest one correct reason. The most commonly seen correct answers were: the use of vaccination, fewer cattle being present in Europe and fewer badgers being present in Europe. Some students tended to give answers that lacked detail, such as 'cattle have more care in Europe.' Students should always take care to give as much technical detail as possible.

(d) Most students were able to gain at least one mark on this mathematical question which required them to calculate the case to death ratio. Some students did not convert it to a ratio to one, and some gave the death to case ratio.

(e) This question tested students' knowledge of biotic factors in a novel context, asking for two reasons why having territorial behaviour would be of benefit to badgers. Many students found this question challenging and gave answers with little depth, such as, 'protection' or 'reduces disease.' Where students scored both marks, they gave more detail, such as, 'protection of young from predators,' and 'reduce competition for mates.' It is important to give precise, accurate answers to gain full credit.

(f) Most students had a very good understanding of how vaccination leads to immunity. Many answers showed excellent use of key terminology, such as antigen, memory cells and rapid release of antibodies. Students should always be careful to state that vaccines contain dead or attenuated (or weakened) microorganisms rather than stating a small dose. They should also be careful to point out that the secondary immune response causes faster / more / sooner production of antibodies rather than simply 'produce antibodies.'

(g) This question required students to produce a simple experimental plan for testing the effectiveness of the TB vaccine. Many students found this question very challenging and did not give a suggested experiment but instead gave a description of how the vaccine would protect cattle. A significant number of students confused vaccination of badgers with vaccination of cattle and others did not include a control of an area with no vaccinated badgers. Only a minority of students suggested the use of controls such as numbers of cattle or badgers. Many students did not give a method for detecting the effectiveness of the vaccines such as the number of cattle that became infected, and instead just suggested 'seeing if the vaccine worked.'

Question 2

(a) Approximately half of the students were able to gain at least one mark on this question. Where students scored marks, it was typically for describing the functions of transpiration in cooling, movement of water to the leaves and transport of minerals. A surprising number of students considered that the function of transpiration was the removal of excess water. Students need to be fully familiar with all the bold content on the specification when sitting Paper 2.

(b)(i) This question required students to use the graph to determine the water loss of a plant in still air and then use multiply it by 250 cm^2 for the leaf. Most students were able to correctly read the graph and multiply the number for 250. Many students, however, did not notice that the vertical axis units were $x10^{-4}$ and so did not include this in their calculation. Students should be careful to read all information given to them in questions.

(b)(ii) This question required students to explain the increased rate of water loss by plants in windy conditions. Some students gave excellent explanations that fully explained how the wind would blow water away and that this would increase or maintain the diffusion gradient. A significant number of students did not give an

explanation and instead gave a description of the results. The command words, 'describe' and 'explain' are frequently confused – students should be careful to read the definitions of all the command words listed in the specification. Some students also did not use key vocabulary such as diffusion and concentration gradient – accurate use of terminology is essential to gain maximal credit.

(c) Most students were able to gain at least one mark for stating one variable that needed to be controlled in the experiment. The question asked for any two variables, such as temperature or light intensity. It also required students to justify the variables, so to gain full credit, students had to name the variable and then explain why it would be needed to be kept constant. Many students were able to name variables but did not go on to state why they needed keeping constant. The command word 'justify' requires students to give evidence to support their choice.

Question 3

(a)Most students were able to correctly recognise that the left ventricle wall is thicker in order to pump blood around the whole body.

(b) This question required students to compare the diagram of the heart for a human with reduced blood flow with the heart in diagram 1. Many students recognised that the blood flow to the heart would be reduced due to the presence of fatty deposits in the wall of an artery, but fewer named the coronary artery. Students should try to be very clear as to where blood flow is reduced. Some excellent answers were seen that went on to explain how reduced oxygen transport would lead to less respiration and cell death. Some students wrote descriptions of the effects of heart disease in general rather than focusing on the question.

(c)(i) Many students gained one mark for this question about the use of stem cells but few gained both. The most common correct response was for the recognition that stem cells are undifferentiated cells or can differentiate into other cell types. Only a minority of students referred to the ability of stem cells to divide.

(d)(ii) This question required students to suggest reasons why using stem cells from the same person is better than a different person. Many excellent answers were seen that recognised that the cells would be genetically identical and so not rejected by the immune system. Many students also explained that there would be less chance of transferring viruses to the patients.

Question 4

(a)Many students scored at least on mark although there was some degree of confusion about the differences between RNA and DNA. The most common correct differences given were the single stranded nature of RNA, and the presence of uracil rather than thymine. Some students demonstrated an excellent knowledge and described the sugars as ribose and deoxyribose. A few students gave functions of the molecules rather than structures.

(b) This question tested students' knowledge of transcription and translation, a subject that was not on the legacy specification. Some students wrote very impressive, detailed answers with excellent terminology that fully described the differences between transcription and translation. Excellent references to transfer RNA and messenger RNA were seen along with correct explanations of the functions of codons and anticodons. Some students, however, had only a very basic understanding of the processes and did not gain credit other than stating the locations of the two processes. Students should be careful to prepare all areas of the specification, there are also support materials for these new topics available on the subject webpages.

(c) Many students found this question very challenging with many giving very vague answers and few supported their answers with any numerical evidence. Some students did fully understand that the number of combinations of the bases would be 4 x 4 x 4 = 64. The question asked students to use the information given to them – it is important to relate answers directly to the question.

Question 5

(a) All parts of this question asked students to identify named parts of the nephron or identify the areas where different processes occur. Many students showed an excellent understanding of the functions of all areas of the nephron and gained at least three marks. Part (iii) was found to be the most challenging, with many thinking that the loop of Henle is affected by ADH.

(b)(i) This question presented students with a scatter diagram and asked the students to describe the relationship shown. Most students were able to recognise that the number of nephrons increased with the birth mass, but fewer went on to give more detail such as describing it as a linear relationship. Students should always look carefully at the mark allocation of questions – if two marks are allocated, more detail will be required in their answer.

(b)(ii) This question asked students to explain why the presence of protein in urine is an indication of kidney damage. It required an explanation of why a large molecule that would not normally pass through the Bowman's capsule was present in urine. Many students did not give explanations and restated the question. There was a great deal of misunderstanding about the role of ultrafiltration and selective reabsorption, with many students suggesting that the kidney was unable to reabsorb the proteins. Some students did give detailed, high quality answers that explained that the large molecule had been forced through the Bowman's capsule due to damage in the nephron.

(b)(iii) This question was well answered by many students with most correctly stating that biuret reagent would be used to test for protein and that a positive result would be a lilac colour. Some students stated the wrong colour change and a few suggested that Benedict's reagent could be used.

Question 6

(a) This question required students to describe the functions of paddles in a fermenter. Most were able to gain at least one mark for correctly stating that heat or oxygen would be circulated. Many also explained that the paddles maintain the microorganisms in contact with the nutrients.

(b) This question asked students to explain why the fermenter had a filtered air supply. Many students correctly explained that the filter would prevent other microbes entering and the air provided oxygen for respiration. Some students did not give enough detail and just stated that the air provided oxygen; the question asked for an explanation and so the role of the oxygen in respiration was also required.

(c) Students generally found part (c) the most demanding part of the question. The question asked for the roles of the temperature recorder and the connections on the water jacket input. Many students restated the question by writing that the temperature was recorded, and there was some confusion as to the role of the water input with many thinking that the water passed into the centre of the fermenter. Strong answers stated that the recorder monitored the temperature and switched on the release of cold water into the water jacket if the temperature rose. Many then went on to explain that this would prevent enzymes denaturing.

Question 7

(a) Most students were able to correctly recognise that the parents of a cross that produces a 3:1 ratio would both have a genotype of Hh. Some students gave incorrect genotypes, and some described the phenotypes of the mice.

(b) Most students were able to calculate the correct ratio of the yellow to brown mice. A few students used only one row of the table and some gave the ratio of brown mice to yellow mice.

(d) This question required students to recognise that the predicted ratio of 3:1 had not been obtained and the ratio was 2:1 instead. Most students found this question very challenging and very few gained more than two marks. A few students gave outstanding answers that discussed the possibility that mice with the HH genotype died and so the offspring left would be Hh, hH and hh in a 2:1 ratio. The most common marks seen were for the recognition that the sample size was small, that mutation may have occurred, and that fertilisation is random.

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