Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2022

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

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General Comments

The examiners all commented on the high standard of answers produced by many students. Many students have clearly worked very hard to develop an excellent understanding of the knowledge and skills required at this level. Centres should also be commended on how well they are preparing students. There were, however, some students who found many of the questions challenging, often writing answers that lacked the depth and detail required. The use of accurate and precise vocabulary is essential, and students need to use it confidently in their answers. Some students did not fully appreciate the demands of the different command words and often confused the commands 'describe' and 'explain'. Mathematical skills were generally very good with many students demonstrating that they could complete two step calculations. Practical skills were also good with most understanding how to carry out practicals such as ecological sampling and protein testing. Most students had a good appreciation of how to answer the longer, discussion-style questions although a minority of students left these questions blank.

Question 1

The context of the comprehension was the manufacture of blood to meet demand. It asked questions from several areas of the specification including transport, stem cells, osmosis, and codominance. Most students seemed to find the comprehension accessible and attempted all questions.

(a) Many students correctly identified lymphocytes as the cells that produce antibodies. A significant number of students stated that white blood cells produce antibodies, which although correct, lacked the detail required. Students should always be encouraged to provide as much detail as possible in their answers.

(b) (i) This question asked students for a definition of codominance. Many students correctly referred to two alleles both affecting the phenotype of an organism. Some students gave vague answers such as 'alleles that affect appearance' or 'two alleles that have equal effects.' When giving definitions, precise language is essential.

(ii) Most students were able to correctly identify that all four blood groups could be produced from the cross.

(c) Many students could complete the first stage of this calculation to gain one mark. Fewer went on to give the answer in standard form. The use of standard form is one of the mathematical skills listed in the specification – students should be fully familiar with how to use it.

(d) This question assessed students' knowledge of the shape of red blood cells. Many excellent answers that gained all three marks were seen. Strong answers often referred to the biconcave disc shape of red blood cells, the increased surface area to volume ratio, and the improved binding of oxygen. Some, weaker answers incorrectly suggested that the biconcave disc shape results in a lower surface area to volume ratio.

(e) Many students correctly stated that artificial blood does not clot due to a lack of platelets. Some students gave answers that lacked detail such as, 'no other blood cells.'

(f) This question required students to use their knowledge of osmosis in a new context. Strong answers referred to the potential uptake of water by red blood cells if placed into water and used terminology accurately. Weaker students did not refer to osmosis and often suggested that the red blood cells would need to take up salt.

(g) (i) Many students gained at least one mark on this question. Students were asked to explain why stem cells are used to make the artificial blood cells. Many understood that stem cells are undifferentiated and can make other cell types. A significant number went on to explain that stem cells can also divide by mitosis. Students should always try to give detailed answered where possible, for example, stating that 'stem cells divide by mitosis' is a higher quality answer than just saying 'stem cells divide.'

(ii) Many students recognised that red blood cells with blood group O would lack antigens and so would not generate an immune response. Many others also correctly explained that blood group O can be donated to anyone. Weaker answers often confused antigens and antibodies and gave confused descriptions of immune responses.

(h) Many students were able to give two correct substances that are found in plasma. A significant number of students, however, listed other blood cells rather than substances found in the plasma. Students should read questions carefully before writing answers.

Question 2

(a) This question assessed students' understanding of how fungi obtain their nutrients. Many high-quality answers were seen that gained all three marks. These answers used precise, accurate terminology such as, 'extracellular digestion using enzymes.' Surprisingly, only a minority of students stated that saprophytic fungi obtain nutrients from dead organisms and decaying organic material. Weaker answers often referred to enzymes but gave confused accounts of extracellular digestion. Some students referred to the absorption of food and nutrients rather than describing the absorption of digested food.

(b) (i) Many students found this question challenging. Students were asked to suggest why measuring cloudiness was a problematic method when assessing spoilage. Strong answers referred to the method not being quantitative and/or being very subjective. Weaker answers often gave vague answers suggesting that cloudiness meant the peas could not be seen.

(ii) This question asked students to explain why the peas became cloudier when placed at a higher temperature. Many strong answers were seen that explained that enzymes had more kinetic energy at higher temperatures leading to a faster rate of decay. Weaker answers often failed to explain that enzymes were involved or simply described the data rather than giving an explanation. A significant number of students thought that the experiment was about osmotic effects.

(iii) This question asked students to explain why there was no cloudiness present when the peas were placed in vinegar. The question stated that vinegar is a weak acid to help guide students to the idea of pH effects on enzymes. Stronger answers correctly stated that enzymes in the fungi would denature and went on to explain the effects of this. Weaker answers often gave descriptions of the data rather than explanations.

Question 3

(a)(i) Most students were correctly able to identify area B as the area of the leaf where palisade mesophyll cells are located. A few students stated that area C is where these cells are located.

(ii) Many students correctly recognised that low humidity and high temperature would lead to rapid transpiration. A significant number of students incorrectly stated that a high humidity would lead to a high rate of transpiration.

(b)(i) This question required students to identify carbon dioxide as the independent variable in the investigation. Most students answered this question correctly with only a minority suggesting that stomatal number was the independent variable.

(ii) Most students were able to suggest two relevant variables that could be controlled. The most frequent variables suggested were temperature and light intensity.

(iii) Most students were able to gain at least one mark for this calculation with many gaining all three. The calculation required students to firstly calculate the mean number of stomata, then to use the formula to calculate the area of the circle, and finally use their values to calculate the density of stomata. Some students did not show their working – it is good practise to always show working as credit is often available for parts of calculations if the final answer is incorrect.

(iv) This question required students to assess a conclusion that a lower density of stomata in areas with a high carbon dioxide concentration, high temperature and low water would be an advantage. Discussion questions require students to fully explore all aspects of a question. Many students wrote detailed, high-quality answers that gained at least three marks. Many explained that high carbon dioxide would affect photosynthesis rates and went on to explain how a lower number of stomata would be compensated for by the high atmospheric carbon dioxide concentration. Many also explained how fewer stomata would result in less water loss which would reduce wilting. Weaker answers tended to focus on only one aspect of the question and a number of students did not attempt the question. Students should try to approach these questions with confidence and at least try.

Question 4

(a) This question asked required students to explain the process of selective breeding. Most students were able to gain at least one mark for stating that fast growing fish should be selected and bred together. A significant number of students went on to explain that this should be repeated with other generations so that the alleles for rapid growth are passed on.

(b) This question assessed students' factual knowledge of the process of nitrification. Few students gained both marks and many students demonstrated confusion as to the roles of the different bacteria in the nitrogen cycle.

(c) This five-mark question required students to look at a method of aquaculture and explain how it reduces pollution and increases profits. Most students were able to gain at least one or two marks with many going on to gain four or five. Many students gave excellent answers that explained how eutrophication would be prevented and how profits would increase due to the production of additional species. The examiners were impressed by the depth and detail given by many students and by the logical organisation of their answers. Some students gave insufficient detail and did not include details such as reduced algal growth, reduced bacterial respiration rates, and increased oxygen in the water. It is essential to give full detail in answers to gain full credit.

Question 5

(a) In this question, students were asked why glucose concentrations differed in different parts of the nephron. Many were able to suggest that the glucose is absorbed but a surprisingly high number did not give much further detail. Strong answers explained that the glucose was absorbed by active transport in the proximal convoluted tubule. Some students simply described the change in glucose concentration rather than explaining the change.

(b) (i) Most students were able to gain one mark for correctly calculating the ratio of urea. Fewer went on to give the answer to two significant figures with many confusing significant figures with decimal places. Students should be fully familiar with the use of significant figures and decimal places.

(ii) Many students found this question challenging. The question asked students to explain why urea concentration increases along the nephron. Many students described the data rather than explaining the increase. Many others suggested the role of the nephron is to manufacture urea. Strong answers recognised that the increase in urea concentration is due to the absorption of water by other named areas of the nephron, especially the collecting duct.

(c) (i) Most students correctly gave a method of testing for the presence of protein in urine. Many answers correctly described the biuret test and what a positive result would be.

(ii) This question tested students' understanding of ultrafiltration. Many answers correctly stated that proteins are large molecules that would be forced out of the glomerulus by high blood pressure. Many students gave excellent detailed terminology, often naming the glomerulus and Bowman's capsule. Students should be encouraged to use detailed, accurate vocabulary wherever possible.

Question 6

(a) Most students correctly recognised that messenger RNA would have a complementary sequence to the DNA sequence and that U replaces T. A number of students did not appreciate that RNA does not have thymine, incorrectly giving option A as an answer.

(b) A wide range of answers was seen. Many correctly identified the process as translation and the triplet as an anticodon. A significant number of students were confused as to the name of the process and the name of the triplet.

(c) Many excellent, detailed answers were seen to this question that asked about how mutations affect the phenotype of organisms. Many correctly stated that mutations are rare, random changes to the DNA and went on to explain how the sequence of bases changes leading to a different amino acid sequence and the production of different proteins. Some students gave vague descriptions of how mutations alter the appearance of organisms. A number of students incorrectly referred to DNA being composed of a sequence of amino acids.

(d) (i) This question required students to describe how butterflies could be sampled. Many excellent answers were seen that explained how quadrats or grids would be used, the need for random sampling and the use of repeats. Most students were able to gain at least two marks. The examiners commented on the excellent understanding of this practical shown by many students.

(ii) This question required students to examine data about the effect of radioactivity on the proportion of butterflies with abnormalities in an area of Japan. Many students found the question demanding but most were able to gain at least one mark with many going on to get three or more. Some excellent answers were seen that commented on the patterns shown by the data, in particular the increase in abnormalities over time and the higher rate of abnormalities in the offspring. Very few recognised that many mutations would be recessive and so would appear at higher rates in offspring if two heterozygous parents bred together. Many students correctly discussed the experimental design, often stating that there was no information about the sample sizes, no control experiment, and no idea of what the actual levels of radioactivity were. Students should try to explore data patterns and experimental design when presented with longer discussion questions concerning investigations.

Paper Summary

In future series, students should try to:

- ensure that scientific language and key terms are used accurately
- understand what each command word requires
- ensure that they have a knowledge of every topic area in the specification
- discuss all data patterns and experimental design when answering longer discuss and evaluate questions.

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