Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

November 2021

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

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November 2021
Publications Code 4SS0_2B_2111_ER

General Comments

There was a wide range in standard of the scripts. The examiners commented on the high quality of knowledge that many students demonstrated in their answers. Many students were able to apply their knowledge to novel situations and complete calculations accurately. The understanding of practical science was often excellent, with many students writing detailed, accurate accounts of how to determine the energy content of substances. Many students had an excellent understanding of the meaning of all the command words and few confused describe ad explain.

There were several scripts that were of lower quality. Some students underestimated the level of depth required to attain marks and did not use scientific language confidently. Some of the students also did not have a strong knowledge of the practicals listed in the specification. Some students did not use their knowledge to solve questions that focused on unfamiliar work. The command word 'suggest' should indicate to students that the context may be unfamiliar but that they should apply their knowledge of the specification to reach an answer.

Question 1

The comprehension focused on how heart transplants are carried out. Many students were familiar with the human circulatory system and were able to apply their knowledge to the questions.

(a) This question asked students to suggest why cardiomyopathy leads to heart disease. It is not a specification term, but the information in the text should have helped them to appreciate how it would affect the pumping of the heart. Many students recognised that the heart would not pump as well. A significant number of students simply quoted words from the text, such as 'stretched wall'. Students should be careful not to just copy out sections of the text.

(b) Many students were able to explain that the atria receive blood from the vena cava and the pulmonary vein, or that they receive oxygenated and deoxygenated blood. Fewer went on to state that the atria push the blood into the ventricles. A number of students confused the atria with ventricles suggesting that they push blood around the body. Some students also suggested that atria receive blood from arteries.

(c) Most students were able to state that the blood in the pulmonary artery has less oxygen than the aorta, but only stronger students went on to give a second difference such as carbon dioxide levels. A significant number of students confused the aorta and the pulmonary artery and suggested that the aorta would have less oxygen.

(b) This question was well answered by many students with a significant number gaining at least one mark. Many appreciated that the heart-lung bypass machine would pump blood around the body, and many also went on to correctly state that it oxygenates the blood so muscles and other tissues would be able to respire. A significant number of students incorrectly thought that the machine would pump blood to the lungs for oxygenation. Where students did not gain credit, it was often for giving overly simplistic answers such as 'keeping the patient alive.'

(e) Stronger answers correctly referred to the role of immunosuppressant drugs stopping the immune system from rejecting the new heart. Some answers used excellent scientific language such as referring to different antigens being present on the transplanted heart. Some students gave very basic answers that did not gain credit, e.g. 'the drugs keep the patient alive'.

(f) The examiners saw many excellent answers that correctly stated that smoking could reduce oxygen levels, cause clotting, raise blood pressure, and lead to heart attacks. Weaker answers often vaguely referred to smoking damaging the heart or suggested that tar would diffuse into the bloodstream and damage the heart. Students should try to use correct scientific terminology when appropriate.

(g) This question asked students to state what is meant by a balanced diet. Many students did not gain this mark due to giving answers that were too vague. The mark scheme required students to give the full list of nutrients (or refer to <u>all</u> nutrients) in the correct proportions. Students should try to ensure that they give accurate and precise definitions. Weaker answers tended to give incomplete lists of nutrients or referred to different types of foods.

(h) This calculation was answered well with most students gaining both marks. It required students to recognise that for 75 % of 200 heart transplants people survive more than five years, and then go on to complete the calculation.

(i) This question required students to suggest why the recipients of heart transplants are advised not to perform strenuous exercise. Many students recognised that the exercise would place strain on the heart and increase the heart rate. Weaker students often gave overly simplistic answers such as 'prevent heart damage', or 'stop the patient being ill'.

(j) This question asked students to suggest why patients who have had heart transplants are at risk of food poisoning. Many students correctly recognised that the use of immunosuppressant drugs would mean that the patients could not react to the microbes. Weaker answers that did not gain credit often suggested that the patients would already be ill and so could not fight off infections.

Question 2

(a) (i) and (ii) Most students demonstrated a strong knowledge of flower structure and were able to correctly identify the anther as the structure making pollen grains and also identify the stigma.

(b) This question required candidates to explain how the pollen tube enables fertilisation to occur. Many students gave excellent, very detailed answers that referred to the growth of the pollen tube down the style, into the ovule and the movement of the pollen nucleus to the egg cell. The examiners were impressed by the scientific terminology used by many students. Weaker answers were often confused and did not refer to the correct structures. A significant number referred to the movement of the whole pollen grain down the style and into the ovule. Students should always take care to use terminology accurately.

(c) (i) This calculation required students to read the graphs and then calculate the difference in the rate of growth of pollen tubes. Many were able to correctly read the graphs for the control experiment and the actinomycin D experiment. Fewer students then went on to calculate the rate of growth per hour by dividing by three.

(c) (ii) Many students found this question very demanding. The question stated that actinomycin D prevents transcription whilst cycloheximide prevents translation and it required students to apply this information to the data in the graph. Only stronger students correctly explained that transcription produces mRNA, and that translation leads to the joining of amino acids. It was pleasing to see that many students did, however, recognise that both chemicals prevent some protein synthesis and so reduce the pollen tube growth. This area of the specification continues to be very challenging for many students.

(d) This question required students to describe how the scientists could observe pollen tube growth. Only stronger students gained credit. Where students did score credit, it was often for referring to the use of microscopes or lenses, stating that glass slides would be used, and occasionally referring to cover slips.

Question 3

(a) Many students were able to correctly identify part A as the Bowman's capsule in the diagram of the nephron.

(b) (i) This question required students to look at the mass of glucose in three areas of the nephron and go on to explain why it changes. Many students were able to correctly state that the proximal convoluted tubule absorbs glucose by selective reabsorption and that this process is also active transport.

(b)(i) Many students often find the calculation of percentage changes and differences challenging. In this question, stronger students were often able to gain both marks by correctly calculating the mass of water absorbed, dividing it by the starting mass and multiplying by 100. Weaker students often just divided the mass of water in part D by the mass of water in part A.

(b)(iii) Many students were able to correctly identify that protein is broken down to produce urea.

(c) Many excellent, strong answers were seen to this question. Students were told that MDMA increases secretion of ADH and then asked to explain how this would affect the production of urine. Many answers correctly referred to the permeability of the collecting ducts and went on to explain how an increase in MDMA would increase the absorption of water thus leading to a lower volume of more concentrated urine. Weaker answers often incorrectly stated that increased ADH would lead to lower permeability and so an increase in urine volume. Students should be clear on how ADH acts on the nephron.

Question 4

(a)(i) Most students were able to correct state that the term enucleated refers to the removal of a nucleus.

(a) (ii) This question was generally well answered. Students were required to describe how a single cell develops into an embryo. Most correctly stated that cell division occurs, and many went on to refer to the process of mitosis. A small number incorrectly stated that meiosis would occur.

(b) This question required students to look at data showing the success rates of using adult and fetal cells in cloning and evaluate which method is more successful. Most were able to gain at least one mark with many gaining all four. It was very pleasing to see that most students understood that the term 'evaluate' requires statements about both sides of an argument and an overall conclusion. Most recognised that despite adult cell cloning producing more successful pregnancies, there were fewer live births.

Question 5

This question asked students to describe how to compare the energy content of two types of potato crips. The measurement of energy content of food items is a practical listed in the specification that it is expected that students will be familiar with. Many excellent answers were seen that gave impressive experimental detail, such as correctly stating that the crips would be ignited and burnt until they could no longer be ignited. It was also very pleasing to see that many could describe the formula that they would use to calculate the energy and would weigh the crips so that the comparison would be valid. Answers that gained less credit often suggested that the students were not familiar with the practical and instead suggested experiments such as people consuming the crisps and then being weighed, or timing how long the crisps would burn for. A frequently seen misconception was that the crips are weighed, burnt and then weighed again. Students should ensure that they are familiar with all the practicals listed in the specification.

Question 6

This question presented students with experimental data to compare the biodiversity of two areas.

(a) In this question, students were asked how they would obtain random samples. Strong answers referred to the gridding of an area and the use of random number generators. Some students misread the question and just gave a description of how quadrats are used – this question asked how random samples would be obtained rather than how to sample an area.

(b) Most students were able to correctly calculate the mean number of dandelions for **part (i)**, but only stronger students went on to correctly calculate the number of dandelions per m^2 in **part (ii)**. Many students did not notice that the dimensions of the quadrat were 0.5 m × 0.5 m so each quadrat has an area of 0.25 m^2

(c) Most students were able to correctly state that there were more species of plant in Field A and that there were also more numbers of plants.

(d) Many students found this question very challenging. Strong answers gave one of two different possible experiments. Some students correctly stated that a transect could be run across a field and the water content and daisy number determined at different points along the transect. Other students correctly suggested that buttercups could be planted in areas with different drainage and the number growing determined. Weaker students often gave simple methods how to determine the number of plants in an area with quadrats.

Question 7

(a) Many students were able to correctly state that cells in an embryo specialise so that the cells have different functions. Many went on to state that these cells are part of the organs and tissues of the embryo. Many students gained at least one mark, usually for the idea of cell specialisation.

(b)(i) This multiple-choice question tested students' understanding of the nature of adult stem cells. Many correctly recognised that adult stem cells are found in some cells and organs.

(ii) Many students gained at least one mark for this question. Many recognised that the use of embryonic stem cells brings ethical issues. Many also recognised that although adult stem cells have fewer ethical issues, they are more limited in the number of cell types that they produce. Where students only gained one mark, it was typically for only considering one type of cell.

Paper Summary

In future series, students should try to:

- ensure that scientific language and key terms are used accurately
- ensure that they are fully familiar with all the practicals listed in the specification
- answer every question rather than leaving blanks
- understand what each command word requires
- work through maths questions methodically showing all working

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