Examiners' Report
Principal Examiner Feedback

January 2023

Pearson Edexcel International GCSE
In Biology (4BI1) Paper 1B

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This January series provided centres an opportunity to take the International 9-1 GCSE.

The examining team commented on the knowledge and understanding shown by many students during the January papers.

Students were often able to apply their knowledge and understanding of biology to novel contexts. They were able to analyse and evaluate data and information from unfamiliar scenarios and experiments. Centres have worked hard to prepare students for the examination, and this was reflected in the responses of many of the students. Some students performed well on the new style of questions and on the new specification content. There was no evidence of students being short of time on this paper.

Question 1 gave students a diagram showing a flower from an apple tree, with some structures labelled. In (a) most students could identify the transfer of pollen being from the anther to the stigma and the style as the structure that the pollen tube travels down. Most could also identify the ovule as becoming the seed. In 1(b) students were asked to give three differences between the structure of this apple flower and the structure of a wind-pollinated flower such as grass. Almost all responses gained some marks with many scoring all three for large coloured petals, anthers and stigma within the flower in an insect pollinated flower. Some students failed to earn full credit for writing about scent or nectar without referring to structures. In part (c) students were asked to suggest how sweet-tasting fruit enables the plant to spread its seeds. About half of the responses gained credit with the best explaining that the fruit is eaten by animals who then egest the seeds away from the plant.

Question 2 gave students a diagram showing a transverse section through a human heart. In part (a)(i), some seem to be confused by the transverse section but many students were able to draw an X on the diagram to show the position of the septum. In (a) (ii) most responses were able to state at least one difference between the composition of the blood in the coronary

artery and the composition of the blood in the coronary vein. In part (iii) (iii) most students could explain the differences between the left ventricle wall and the right ventricle wall. A few responses failed to earn full credit because they

wrote about the left ventricle wall withstanding pressure rather than generating it. In part (b) students were asked to explain the factors that can increase the risk of developing coronary heart disease. Most gained credit for reference to the effects of high fat diet, smoking, increased blood pressure and lack of exercise.

Question 3 showed the nutritional content of two non-dairy milk products, oat milk and almond milk. In part (a) students were asked to use the information from the milk contents to discuss which milk would be the most suitable for a person who had been advised by their doctor to lose weight. In this item almost all responses gained credit with most scoring 4 or 5 marks. In part (a) (ii) students were asked to suggest why a person might drink a non-dairy milk such as oat or almond milk rather than cow's milk. Again, this was well answered with most suggesting that the person may be lactose intolerant, vegan or wishing to reduce their fat intake. In part (b) almost all responses were able to describe how to test a sample of milk for glucose. In part (c) most students were able to offer some explanation as to how the special proteins found in human breast milk can help protect the baby from disease. Some weaker answers wrote about protein being digested into amino acids for growth and repair.

Question 4 gave information and data about changes in the numbers of two forms of the peppered moth between 1992 and 1998. In part (a) students had to calculate the difference between the percentage of moths that are dark-coloured in 1992 and the percentage of moths that are dark-coloured in 1998. Only the better students were able to correctly calculate the difference in percentage change. In part (b)(i) students were required to plot a line graph to show the number of light-coloured moths and the number of dark-coloured moths from 1992 to 1998. The graphs they plotted were of a high standard with most scoring 4 or 5 marks. Those who failed to gain full marks usually chose a scale that produced a graph that was too small for the grids provided. The grids used in the papers are always designed so that a sensible choice of scale can produce a graph that covers most of the grid. In part (b)(ii) students were told that In the 1990s, many cities introduced laws that prevented the burning of coal. They were asked to comment on the changes in the number of light-coloured moths and the number of dark-coloured moths between 1992 and 1998. This evaluative item produced a range of candidate responses with almost all candidates scoring and most scoring 3 marks. The best responses were able

to note the change in numbers of light and dark moths and link these to the amount of pollution. They also commented on the increased predation of those moths that were poorly camouflaged and the better adapted moths passing on their alleles.

In question 5 students were given diagrams showing the chromosomes in two different human karyotypes. In part (a)(i) students were asked to explain why a red blood cell cannot be used to show a karyotype. Most responses were able to recognise that red cells lack a nucleus, and the better responses adding, so would have no chromosomes present. In part (a)(ii) most responses could name mitosis as the type of cell division that occurs in white blood cells. In part(a)(iii) most responses could state how the karyotype in diagram 1 can be deduced as being from a male. In part (b) students were given a second diagram showing a karyotype from a female with a condition called Turner syndrome. This condition affects the development of the ovaries so they may not produce normal quantities of sex hormones. In part (b)(i) students were asked to comment on the differences between the karyotypes shown in diagram 1 and diagram 2 and the effects Turner syndrome will have on the person. Most responses gained some marks with the best responses describing features such as: the absence of a sex chromosome, the person will not undergo normal puberty and will not develop secondary sexual characteristics, they cannot release oestrogen, or produce gametes so are infertile. In part (b) (ii) some students were able to suggest how the difference in the chromosomes of people with Turner syndrome may have been produced.

Question 6 described a student experiment to investigate osmosis in potato tissue. This is a core practical from 2.17 in the specification. In part (a)(i) most students could describe what is meant by osmosis, but some descriptions lacked precision especially with regard to the direction of water movement. Although some sources and textbooks describe osmosis in terms of water concentration, we regard this as unhelpful. Osmosis can best be described as the movement of water from a dilute solution to a more concentrated solution through a partially permeable membrane. Or in terms of water potential, as the movement of water from a solution with a high water potential to a solution with a low water potential through a partially permeable membrane. In Part (a)(ii) many responses were unable to state the independent variable in the investigation. In

(b) (i) students were given the formula and asked to calculate the surface area of the potato cylinder. Most were able to correctly carry out this calculation. In part (b) (ii) most responses could how state that increasing surface area would increase the rate of osmosis, but fewer were able to explain that this is due to more contact between water and potato surface. In part (b)(iii) most students could give another variable that the student should control. In part (c)(i) students were asked to explain the changes in the mass of the potato cylinders. Some responses merely described the changes, but the best answer described how water entered the potato in distilled water moving from an area of high water potential to low water potential. In the potato in sucrose solution water entered the potato from an area of high water potential to an area of low water potential and in the air water evaporated from the potato. In part (c)(ii) many students could calculate the final length of the cylinder in the concentrated sucrose solution.

Question 7 showed a food web from an ecosystem in Africa. In part (a) most students could correctly identify the primary consumer, and the organism least affected by a reduction in the population of star grass. Students did less well on identifying the least efficient energy transfer. In part (b)(i) most students were able to explain why only a small proportion of the energy contained within one trophic level is transferred to the next trophic level. In part (b)(ii) most responses could describe how a scientist could compare the population size of star grass in two areas of the ecosystem with many scoring full marks. Students did less well in part (c) with only the better responses gaining full credit for explaining that the stronger and faster dogs would survive to reproduce and pass on their alleles to their offspring. Credit was also given for the idea of no weaker animals slowing down the herd or no sick animals passing on infection.

Question 8 part (a) gave students objective items on yeast with almost all responses identifying yeast as a fungus and that its cell walls are made of chitin. Part (b) describes how a teacher set up an experiment to investigate the effect of temperature on the rate of respiration in yeast. In part (b)(i) the students were asked to explain what additional apparatus the teacher will need to investigate the effect of temperature on the rate of respiration in this experiment. Most responses scored at least one mark with the best explaining that the teacher would need a Bunsen or water bath to heat the test tube and a

thermometer to measure the temperature. Credit was also given for a watch to record the time taken for bubbles to be released. In parts (b)(ii) and (iii) many responses stated the purpose of the liquid paraffin on the surface of the glucose solution and named a suitable chemical that could be used as indicator X to show that the yeast is respiring. Part (b) (iv) was more difficult with only the best responses being able to explain how changes in the indicator show that initial yeast respiration used up the oxygen so that the yeast then starts to respire anaerobically. In part (c) students were asked to explain why the rate of respiration in the yeast will change as the temperature is increased. Again, whilst most responses gained some credit only the best responses gained full credit. These explained that up to an optimum temperature increasing kinetic energy of the enzyme and substrate molecules leads to more collisions. Then as temperature increases the shape of the enzyme active site is changed and the enzyme is denatured with the substrate being no longer able to fit into the active site.

Question 9 was about photosynthesis. In part (a) most of the students were able to give the balanced chemical symbol equation for photosynthesis. In part (b) students were given a graph that showed the effect of light intensity on the rate of photosynthesis in a water plant. In part (b) students were told that the light intensity is calculated as $1 \div$ (distance in cm of lamp from plant)^2. Then in part (b)(i) they were asked to use the information from the graph to calculate the distance of the lamp from the plant when the rate of photosynthesis is 78 bubbles per minute. Despite this being a novel and challenging item, the examiners were pleased to note that many students gained credit with the best gaining full marks. In part (b)(ii) most students were able to describe the relationship between the number of bubbles per minute and light intensity, but only the best scored all three marks. In part (b) (iii) students then were asked to explain the change in the rate of photosynthesis between a light intensity of 0.4 arbitrary units and a light intensity of 0.8 arbitrary units. Most gained one or two marks with the best responses explaining that light is no longer a limiting factor and that for example carbon dioxide is limiting photosynthesis.

Question 10 part (a) gave students a table with some information about enzymes in the human digestive system. They were required to complete the table by giving the missing information. Most responses scored 3 or 4 marks. In

part (b) students were asked to design an investigation to discover the effect of vinegar on the digestion of starch. Those students who had practised such items scored well. The main issue was that some students chose not to suggest a laboratory study using starch, amylase and vinegar but fed volunteers starch and added vinegar to their diet. Whilst these designs could still gain full marks, they were more difficult to write about. There was a range of scores with most gaining credit on this item.

Based on their performance on this paper, students are offered the following advice:

- ensure that you read the question carefully and include sufficient points to gain full credit.
- identify the command word especially the difference between describe and explain and use it to inform you what you should include in your response.
- in calculations make sure to show all your working as if you make an error in your final answer you may still earn some credit.
- in discuss and comment items include as many points as there are marks available and remember to use all the information in the question and your own knowledge.
- in experimental design items ensure you write about how to conduct an investigation.
- write in detail and use correct and precise biological terminology.
- ensure that you are familiar with all the specification content including the core practicals.
- always read through your responses and ensure that what you have written makes sense and answers the question fully.

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