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Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel International GCSE
In Biology (4BI1) Paper 1BR and Science (Double
Award) (4SD0) Paper 1BR

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Introduction

The examiners were very impressed with the high standards of many of the scripts. Many students have clearly worked hard in very difficult circumstances to prepare for this examination series. It was also clear that most centres are preparing students thoroughly for the examinations in terms of both factual content and exam technique. Most students were able to tackle all the questions on the paper and understood the meaning of the command words, although a few found the command 'discuss' challenging. Practical skills questions were well answered with many students demonstrating good planning and evaluation skills. Factual knowledge of core practicals, such as testing leaves for starch was excellent. Mathematical questions were generally well answered although a few students found calculating a rate of change from a graph challenging.

Question 1

(a) (i) and (ii) Most students were able to correctly identify that the structure labelled S (a chloroplast) contained chlorophyll for part **(i)** and often went on to correctly recognise that chlorophyll contains magnesium for part **(ii)**.

(a)(iii) Most students gave a correct description of the role of chlorophyll, often stating that it absorbs light energy for photosynthesis. A few students simply stated that chlorophyll is important in photosynthesis but did not give further detail.

(b) Many students were able to correctly identify that plant stems growing towards light is an example of positive phototropism.

(c) This question was answered well by most students. Many correctly identified lipase as the enzyme that digests fats, although a few confused this with bile. Many correctly stated that neurotransmitters diffuse across a synapse and many also correctly recognised that vitamin C prevents scurvy. A few students incorrectly stated that vitamin D prevents scurvy or gave lists of several vitamins.

Question 2

(a) Many students were able to correctly identify the adrenal gland as organ Y

(b) Many students correctly defined an organ as a structure with a defined function that is made of a collection of tissues. Where students did not gain the mark, it was for typically only referring to a collection of tissues or giving a definition for a tissue.

(c) Many excellent answers were seen to this question and students often demonstrated an excellent understanding of the function of adrenaline in preparing the body for danger. Many correctly stated that dilation of the pupil would let more light into the eye and went on to explain that there would be faster blood flow to muscles. Strong answers went on to explain that the blood

would carry more oxygen and glucose to the muscles enabling faster respiration, energy release and increased muscle contraction. A few students referred to blood flow but did not mention oxygen or respiration.

Question 3

(a) (i) and (ii) Many students were able to identify the stomach as producing hydrochloric acid and the rectum as the area that stores faeces.

(b) Most students had a very strong understanding of the role of bile in digestion. Many were able to state that it neutralises stomach acid, often going on to explain how this produces an optimal pH for enzyme activity. Many students also gave good, detailed answers that explained the process of emulsification.

(c)(i) This question tested students' understanding of how villi are adapted for the function of absorption. Many strong answers were seen that described the presence of microvilli and explained how the villi create a large surface area. Many students stated that the villi play a role in absorption but often did not state that digested food, molecules, or correct molecules such as glucose, are absorbed. Students should be careful to name correct molecules when referring to absorption. Many also showed an excellent understanding of the role of the capillaries in maintaining a diffusion gradient and the thin wall that provides a short diffusion path. A few, very strong, answers also gave a correct explanation of the role of lacteals in fat uptake.

(c)(ii) This question required students to recognise that the absorption of digested food is reduced if villi are shorter, and then explain why a reduction in absorption of named molecules such as glucose and amino acids would lead to slower growth and tiredness. Many students gave excellent, detailed answers but some did not refer to named molecules that would not be absorbed as effectively. A significant number of students referred to reduced absorption of protein and many only referred to the reduced surface area without going on to explain why growth would be slowed.

Question 4

(a)(i) This question required students to explain why a plant must be placed in the dark for 24 hours before investigating the effect of light and carbon dioxide on photosynthesis. Many students were able to correctly explain that the plant was destarched. Several excellent answers were seen that stated that the starch was used up when the plant respired.

(a)(ii) Many students found this question challenging. In the experiment shown, both leaves had a strip of black paper blocking light; one leaf was placed into a flask with no carbon dioxide whilst the other leaf was placed in the air. The question required students to explain that leaf Y was used as a control; it would show that the leaf was capable of photosynthesis when carbon dioxide was

present and could be used to see the effect of light on photosynthesis when carbon dioxide was present.

(a)(iii) Most students had an excellent understanding of how to test leaves safely for the presence of starch. A few students suggesting using Benedict's reagent instead of iodine. Many excellent accounts were seen that gained all four marks.

(b) This question required students to explain the results that would show that light is required for photosynthesis. Many did not relate this to the experiment shown and so did not explain that leaf Y would show the results (as leaf X would not photosynthesise at all). Strong answers stated that for leaf Y the area under the black strip would have no starch and so would not turn black in the presence of iodine solution.

(c) This question was found to be very challenging by many students. It required students to use their knowledge of starch to suggest a reason for why it is used as a storage material instead of glucose. Strong answers referred to the insoluble nature of starch that means it would not affect osmosis. Several students stated that glucose is insoluble, and others incorrectly stated that glucose would have to be broken down.

Question 5

(a)(i) In this question, students were required to look at a karyotype and explain how the sex of the person could be identified. Many were able to correctly recognise that the person was male due to the presence of a Y chromosome.

(a) (ii) Many students correctly stated that the example in the diagram represented a diploid number of chromosomes, having 46 chromosomes or two sets. Many other students correctly stated that the karyotype was not haploid as this is the term used for one set of chromosomes. Several students incorrectly stated that haploid refers to 23 pairs of chromosomes.

(b) (i) Many students were able to correctly state that the karyotype in Diagram 2 had an extra X chromosome.

(b) (ii) This question was found to be very challenging, although many did recognise that a mutation had occurred. A few excellent suggestions were seen that referred to a mutation occurring during meiosis or gamete formation.

(b) (iii) Mathematical skills were generally very good across the whole paper. In this question, many students were able to correctly calculate the number of males in the UK with Klinefelter syndrome. The main error made by students was converting 66 million into numerals.

(b) (iv) This question required students to use their knowledge to suggest a reason for the higher incidence in Klinefelter syndrome in children from females

over the age of 35. Only stronger students correctly recognised that the gametes would be older.

Question 6

(a) (i) Many students were able to correctly state that transgenic organisms have genes from other species. Where students did not gain both marks, it was typically for simply referring to genetic modifications, or referring to genes from other organisms rather than different species.

(a) (ii) Many students correctly gave the names and functions of DNA ligase and restriction endonucleases (enzymes). Some students correctly named the enzymes but did not give the roles of the enzymes or gave roles with no named enzymes.

(b) This question required students to read the information given to them about the use of GM crops and discuss views that were for or against the use of GM crops. The question gave examples of pest resistant and herbicide resistant crops and stated that people think that there are benefits and drawbacks of these crops on ecosystems. Many students gave generic benefits and drawbacks of GM crops rather than relating their answer to the impacts on ecosystems. Strong answers suggested that the GM crops would lead to a reduction in use of pesticides so that there would be less bioaccumulation and other negative effects of pesticides. Other answers correctly stated that the GM crops could spread the genes to wild species and possibly affect food chains. Students should be careful to explore all aspects when asked to 'discuss' in a question.

Question 7

(a) (i) Graph drawing continues to be a strength of many students. This question required students to produce linear scales on both axes, label the axes, plot the points, and then join the points with straight lines. Students should take care to use linear scales that use more than half of the grid, fully label all axes, and join points with straight lines.

(a) (ii) Many students correctly stated that the increased temperature caused an increase in the rate of snail growth. Stronger students then went to give a correct explanation that referred to increased kinetic energy and increased frequency of particle collision. A significant number of students gave descriptions rather than explanations – students should read command words carefully.

(a) (iii) Many students were able to correctly state that the height of the snail shell was the dependent variable. Some students confused the dependent, independent and controlled variables.

(a) (iv) Most students recognised that the experiment had been repeated and that this would improve the reliability.

(b) (i) The mathematical skills of most students were excellent and so most were able to correctly use the formula to calculate the assimilation efficiency.

(b) (ii) This question required students to understand the difference between primary consumers and secondary consumers, and the reasons for loss of energy in food chains. Only stronger students recognised that primary consumers eat plants and that plants have a higher proportion of indigestible material. A significant number of students suggested that the secondary consumers would have a diet with more indigestible material.

(c) Many students found this question very challenging and did not relate the different production efficiencies to respiration rates of animals. Many gave generic answers referring to digestibility or size of organisms. Strong answers referred to the increased heat loss or activity of a mammal that would lead to increased respiration rates.

Question 8

(a) Many students were able to correctly identify the anther as the part of the flower that contains pollen grains.

(b) (i) Only a minority of students suggested that the style tissue would contain nutrients that the pollen tube could use for an energy source.

(b) (ii) Many students were able to correctly calculate the increase in length of the pollen tube and then go on to divide this by 60 mins. Where students did not gain full marks, it was frequently due to dividing by the wrong time period or misreading the graph.

(c) This question asked students to produce an experimental plan. Many were able to correctly state what they would change, measure, and keep constant. Students should be careful when stating what they intend to measure that they do not just rephrase the question, e.g. state the mass of apples produced rather than the yield (which was in the question stem). Students should also be careful to suggest control variables that are relevant to the investigation.

Question 9

(a) Most students were able to correctly give the equation for aerobic respiration. A few students confused respiration with photosynthesis and suggested that glucose would be produced.

(b) Many students were able to explain that mice are smaller than humans, but fewer went on to explain that this would result in mice having a larger surface area to volume ratio and so lose heat faster. A significant number of students

suggested that the surface area to volume ratio of humans would be larger than mice.

(c) (i) and (ii) Many students were able to correctly identify blood vessel X as the pulmonary vein. Many were also able to give a difference between the structure of the frog heart and a human heart. Common correct answers were the lack of a septum, the presence of only three chambers and the presence of only one ventricle.

(c)(iii) This challenging question required students to look at the diagram of the frog heart and then use it to explain why a frog cannot sustain long periods of activity. Some excellent answers were seen that recognised that the presence of only one ventricle meant that oxygenated and deoxygenated blood would mix, resulting in less oxygen supply to muscles. A few students noted that the absence of semi-lunar valves would result in back flow into the heart. Some students stated that the frog had a single circulation system, which was not true as some blood is pumped to the lungs separately to the body.

Question 10

(a) This question required students to describe the function of plasma in transporting named substances. Many students did not gain credit as they only gave a list of substances which did not describe the function. Many others stated that the function of the plasma was to transport blood cells. Strong answers gave correct named substances such as carbon dioxide, urea, amino acids and glucose and also described where they are transported from or where they are transported to.

(b) (i) Many students were able to correctly calculate the magnification of the phagocyte. Where students did not gain both marks, it was typically due to not converting a length that had been measured in centimetres into millimetres.

(b) (ii) Most students were able to correctly identify the nucleus although a number suggested that the structure was an endocytosed bacterium.

(b) (iii) Many students gained both marks for this question and were able to correctly state that phagocytes ingest pathogens and then digest them with enzymes. A few students confused phagocytes with lymphocytes and others did not refer to a form of pathogen or microbe.

(c) Most students were able to correctly state that the biuret test can be used to test for the presence of protein. The most common error was to refer to the Benedict's test.

Summary

In future series, students should:

- give answers that explore all aspects of a question when asked to 'discuss'
- be fully conversant with all mathematical requirements of the specification
- ensure that full detail is given in answers, and that terminology is used accurately

