



Examiners' Report Principal Examiner Feedback

Summer 2019

Pearson Edexcel International GCSE
in Biology (4BI1) Paper 1BR

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Q1 This question tested knowledge and understanding of feeding relationships and energy transfer.

Part (a) was a multiple choice question asking candidates to identify the secondary consumer in a food chain. Only the more able candidates chose the correct answer, owl, with many opting for rabbit, despite the stem of the question referring to 'hunted' by 'predators'.

Part (b) examined understanding of why the producer in the food chain contained energy. The examiners gave credit to candidates who appreciated the role of photosynthesis in converting light energy into chemical energy in the form of carbohydrate or a named carbohydrate. Most candidates made reference to photosynthesis, but only the better candidates extended their answer to gain full marks.

In part (c), the examiners noted some excellent answers gaining full marks for stating the ways in which energy in rabbits is not made available to the owls for their growth. Credit was lost if the processes of excretion or egestion were incorrectly used. So, the statement 'excretion of faeces' could only be awarded one mark. The mark scheme gave credit for five ideas: respiration, egestion, excretion, uneaten and death with valid alternatives for each idea.

Part (d)(i) examined knowledge of feeding by fungi. A pleasing number of candidates were fully aware of extracellular digestion after the secretion of enzymes from hyphae onto the corn. The absorption of the digested products gained credit, as did mention of saprotrophic nutrition or parasitism.

In part (e), most candidates appreciated that it would take longer to digest a whole mouse. The better candidates then made it clear that a whole mouse provides a smaller surface area to volume ratio than a chewed mouse.

Q2 This question tested knowledge and understanding of experimental design and seed germination.

Most candidates were able to successfully complete the graph in part (a). One mark (S) was given for using a linear scale that resulted in a graph that occupied at least half the grid. One mark (L) was given for drawing straight lines through all the points. One mark (A) was given for making sure the axes had the independent variable on the x axis and the dependent variable on the y axis and both axes were fully labelled. One mark (P) was given for the correct plotting of all the points. One mark (K) was given for indicating which line represented exposed to pollution, and which line represented free from pollution. The most common error was to extrapolate a line to the origin which lost the L mark. A non-linear scale lost the S and P marks.

Part (b) was a multiple choice question which resulted in a pleasing number of candidates appreciating that the dependent variable is the number of cells.

Most candidates recalled mitosis as the type of cell division in part (c)(i) with the correct spelling. The most common correct responses in part (c)(ii) linked temperature to enzymes and oxygen to respiration. Other acceptable linked responses were water and enzyme activation, pH and enzymes. The examiners accepted light as an abiotic variable with phytochrome as the linked idea. The answers needed to relate to events while a seed is germinating, as stated in the question, so responses that discussed photosynthesis were not credited.

Many candidates incorrectly named abiotic variables in the answer to part (c)(iii), demonstrating the need to read questions carefully. Credit was given for answers that showed how the seeds should be controlled, such as species.

Q3 This question tested knowledge and understanding of plant responses to stimuli.

Most candidates scored highly. The most common error was thinking that shoot response to gravity is positive geotropism.

Q4 This question tested knowledge and understanding of mineral ion pollution.

Most were able to note, in part (a), that nitrate is needed to make amino acids which are then needed to make proteins for growth. Credit was also given for naming nucleic acids, chlorophyll or ATP. Most candidates gained at least one mark. A common error was to write that nitrates contain amino acids or protein. The multiple choice question in part (b) was well-answered with most candidates recalling the small soluble properties of mineral ions absorbed by an animal's gut. In part (c)(i), candidates were rewarded for appreciating that there would be more fish in the rivers because less phosphate would reduce eutrophication, therefore allowing more light to allow plants to photosynthesise. Credit was also given for appreciating that there would be less decomposition and more oxygen in the river water, and that the process of respiration would be affected in bacteria, plants or fish. The scenario of the question seemed to confuse weaker candidates who often wrote generalised answers about the benefits of GM animals.

In part (c)(ii), candidates were challenged to recall the role of restriction enzymes in cutting DNA and ligase enzyme in joining DNA. This question was well-answered, though the spelling of 'restriction' was sometimes 'restrictive' and some confused the role of each enzyme. A surprising number discussed the role of enzymes as biological catalysts, or their role in digestion, which gained no credit.

Q5 This question tested knowledge and understanding of blood circulation and temperature regulation.

The multiple choice question in part (a) posed little difficulty with most candidates recalling that arteries have thicker walls than veins.

The calculation in part (b)(i) was much more of a challenge. Candidates needed to measure the diameter of the lumen of the coronary artery and measure the fat deposit at its thickest point. Some failed this simple task. Examiners accepted measurements in cm or mm. Those who measured correctly then had to find the decrease in diameter, divide this number by the original diameter of the lumen and then multiply this answer by 100 to obtain a percentage. A range of correct answers was accepted, with 42 and 41.7 being the most common acceptable responses. If the correct answer was not evident, then examiners were allowed to give one mark for seeing certain number combinations in the working: 36 and 15; 36 and 21; 3.6 and 1.5 and 3.6 and 2.1. One mark was also available if the candidate had divided by 36 or 3.6. This latter mark was also given to those candidates who failed to measure the lumen diameter correctly, within a range of 35 to 45 or 3.5 to 4.5.

In part (b)(ii), most appreciated that the fat deposit would reduce the oxygen supply to the heart muscle and the better candidates appreciated that this would instigate a change from aerobic respiration to anaerobic respiration.

Part (c) was well-answered with many candidates scoring both marks. The most common correct responses were smoking, lack of exercise and stress. Clearly, candidates are well aware of the factors that increase the risk of heart disease.

In part (d) a small number of candidates gained no credit, usually because the entirety of their answer only described the data and offered no explanation. The perennial error of stating that blood vessels move up or down in the skin was noted in some answers. The better candidates used the term vasodilation and explained how this allows more blood to reach the surface of the skin to enable heat loss by radiation or convection. Credit was also available for making a sensible reference to enzymes, but this was seldom seen.

Q6 This question tested knowledge and understanding of the manufacture of yoghurt.

Candidates needed to give the name of a bacterium used to make yoghurt to gain the mark for part (a). Most gave the correct answer of *Lactobacillus*, though the spelling was often rather bizarre. Examiners accepted answers that phonetically read as the correct answer. *Streptococcus* was also accepted. The specific names of both types of bacteria were not obligatory. The most common incorrect response was to name yeast as the organism.

In part (b) the majority of candidates were able to recall that lactic acid is produced when making yoghurt.

Calculating the rate of acid production in part (c)(i) posed few problems for most candidates. The candidates need to read the correct values of 0.7 and 0.3 from the graph, then subtract 0.3 from 0.7 to obtain a value of 0.4, which when divided by 2 gave the correct answer of 0.2. Part (c)(ii) was more challenging to candidates as many described the trends on the graphs without offering clear conclusions. The examiners rewarded answers that commented on the effect temperature and oxygen had on the rate of acid production. While most concluded that the higher temperature produced acid faster than the lower temperature, many believed that the higher oxygen produced acid faster than the lower oxygen.

Q7 This question tested knowledge and understanding of genetics and the mathematical terms mode and median.

Part (a)(i) was poorly answered with many not able to state the meaning of the term polygenic. Answers that made it clear that 'many genes' contributed to the phenotype were credited.

Candidates were also challenged by part (b)(ii), showing both lack of understanding of the mathematical terms mode and median, and that these have the same value in a normal distribution. The examiners accepted a range of 163 to 164 for the mode and median for females and a range of 176 to 178 for the mode and median for males. The first mark was credited for the correct modes for both sexes and the second mark was credited for the correct median for both sexes.

Part (b)(i) was well-answered with most gaining three marks, often from a Punnett square, for giving the correct parental genotypes, the correct gametes and the correct offspring genotypes. The final mark was only given if the answer made it clear that the first child was hh, or that the second child was HH or Hh. A pleasing number of candidates appreciated that the doctor could assess the patient's family pedigree in part (b)(ii), or carry out a DNA test. The better candidates also realised that if there is no history of piebaldism in the family pedigree the patient is most likely to have vitiligo.

Q8 This question tested knowledge and understanding of ventilation.

Most candidates were able to gain the mark in part (a)(i) by stating that the rubber sheet or the ring needed to be pulled down. The direction was needed to secure the mark. In (a)(ii), most candidates appreciated that an increase in volume would decrease the pressure and the pressure gradient would cause air to enter the balloons.

Part (b) challenged students to evaluate the bell jar apparatus as a means of demonstrating ventilation. The arguments against gave credit for appreciating that the

bell jar lacked intercostal muscles and a ribcage and that no movement of the glass occurs as a result. The arguments for gave credit for recognising that the rubber sheet represented the diaphragm; the balloons represented the lungs, and that the glass tubes represented the trachea and bronchi. Only the better candidates gained full marks by making reference to arguments for and against.

Part (c)(i) required answers that made it clear that the airways would be widened to allow air to get to the lungs. Stating that bronchi would be dilated was not credited as the term 'dilator' was in the stem of the question. Many weaker candidates referred to bronchodilators helping to clear mucus or containing oxygen. In part (c)(ii), most candidates appreciated that breathlessness is a result of lacking oxygen for respiration.

Q9 This question tested knowledge and understanding of photosynthesis.

To gain both marks in part (a) candidates needed to write a balanced chemical equation for photosynthesis which most were able to do successfully. A few wrote the equation for respiration, or the word equation for photosynthesis, which lost both marks.

In part (b)(i) many candidates appreciated the need to destarch the plant by ensuring no photosynthesis occurs. However, only the better students wrote about both ideas. Most appreciated that potassium hydroxide absorbs carbon dioxide in (b)(ii), though some thought it was an indicator, or thought that it absorbs oxygen. The multiple choice items in part (c) were well-answered with most candidates appreciating that the colour of the leaves from plant X after the test would be orange and that the colour of the leaves from plant Y after the test would be blue-black.

Part (d) was more challenging. The examiners rewarded those candidates who recognised that replacing potassium hydroxide with water provides a control which allows the plant to have carbon dioxide or demonstrates that the bell jar allows photosynthesis. Many candidates thought the water is needed for photosynthesis or provides a humid atmosphere for the plant. These ideas were not credited.

Q10 This question tested knowledge and understanding of a balanced diet.

10a The stem of the question mentioned that two components in a balanced diet are vitamins and minerals, so these components were not credited in candidate answers. Many candidates failed to gain full marks as a result. The examiners credited answers that named the five components carbohydrate, lipids, proteins, water and fibre and offered a specific function for each component. Candidates mostly lost marks by struggling to name all five components or to offer an acceptable function for water. Some weaker candidates think that 'dairy' is a component and that fibre is involved in the digestion of food.

In part (b), a vast number candidates wrote answers that lacked detail, merely concentrating on the idea that minerals and vitamins are needed for 'healthy growth of

the baby', or that the mother is 'eating for two'. The examiners only credited responses that linked a named vitamin or mineral to its function. 'Scurvy' and 'rickets' were not credited in isolation as these deficiency diseases are less relevant to a foetus where connective tissue and bones respectively are still developing.

In part (c)(i) many candidates failed to appreciate that the values in the table were per kg of body mass. These candidates gave the incorrect answer of 126 kJ, failing to multiply this value by 70 to get the correct answer of 8820 kJ. The calculation in part (c)(ii) also posed problems. Most were able to determine the difference in energy requirement which gained one mark but many failed to do the correct multiplication to obtain a percentage of 98.8. Other acceptable correct answers were 98.81 and 99. In part (c)(iii), credit was given for making it clear that body mass decreases because a named source of stored energy would be used in respiration. Many answers lacked detail and simply stated that 'energy would be used'.

Q11 This question tested knowledge and understanding of experimental design.

The candidates were challenged by this question which asked them to design an investigation to find out if the smell of wasp venom attracts other wasps. A range of marks between 0 and 6 was noted by the examiners. Candidates were credited (C) for the idea that wasps needed to be exposed to a range of venom concentrations or to venom and a non-venom control solution. The (O) mark was awarded if the wasps used were all of the same species, or equivalent. Candidates who counted the number of wasps (M1) attracted in a stated time period (M2) gained credit. A mark was available to those candidates who appreciated the need to make the data collected reliable by repeating (R) their investigation. Two marks (S1 and S2) were available for giving indications about the need to standardise abiotic variables such as temperature, or the time of day, when the investigation took place. Standardising the source, volume or concentration of the venom, as appropriate for their chosen independent variable, were other ways in which these marks could be obtained.

Many candidates wrote in abundance about wasps stinging prey and injecting venom. This was accepted for the C mark as long as wasps were presented with a stung prey and a prey that had not been stung. Many candidates failed to get the C mark because they only used a dish containing venom, forgetting to also use a dish containing water as the control. The M1 mark was not given for responses that lacked detail, such as 'see if the wasps are attracted over a period of time'. Candidates cannot get the R mark if they state that they would 'set up a dish containing venom and repeat this using a dish containing water'. The R mark is for repeating a controlled investigation, with all variables unchanged. Some candidates are not specific enough when detailing controlled variables, seeming happy to generalise with 'keep everything else the same' rather than giving creditworthy examples for the S marks.

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