Examiners' Report

Principal Examiner Feedback

January 2017

Pearson Edexcel International GCSE in Biology (4BI0) Paper 2B

Pearson Edexcel Certificate in Biology (KBI0) Paper 2B

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Examiner's Report International GCSE Biology 4BI0 2B

Q1 The comprehension this series was about plant breeding. The questions varied in demand and allowed for good discrimination between candidates.

Part (a)(i) required recall of a method of asexual reproduction used by plants. The most common response was runners, the example used in the specification. Examples of plant asexual reproduction used by humans were not credited. Many candidates, in part (a)(ii), deduced that plants revert to sexual reproduction when environmental conditions change in order to produce offspring with genetic variation that would assist survival. Candidates who quoted variation without use of the term 'genetic' lost credit.

Part (b) asked candidates to explain how dioecy, an unfamiliar term from the passage, ensures outbreeding. Credit was given for appreciating that the flowers were unisexual, however expressed, and for understanding that this means cross-pollination, however expressed, is essential. Many candidates scored with the first idea but only the better candidates scored for both ideas.

Part (c) challenged most candidates. Marks were awarded for the use of Benedict's test and then for appreciating that the intensity of a named colour would reflect the glucose concentration. Several candidates opted to describe calorimetry, not appreciating that the energy content measured is not solely due to glucose. Others wrote about the number of visits made by insects or tasting the nectar for sweetness. These ideas were not credited.

Part (d) required candidates to apply their knowledge about wind-pollinated flowers in order to describe how the pollen they produce is adapted. Credit was given for appreciating that the pollen has less mass, is smaller, is smoother and is produced in larger quantities than might be expected from pollen from an insect-pollinated flower. Candidates did not have to give these terms as a comparison, so light, small and smooth were acceptable responses. Candidates who failed to read the question carefully wrote about the features of wind-pollinated flowers as opposed to the pollen, gaining no credit.

Part (e) required candidates to describe how to estimate the population size of the primroses. There were many good answers that showed all the features of quadrat sampling that would produce valid results. Candidates are encouraged to spell the term quadrat correctly and to appreciate that random placing of several quadrats is important, as is counting within each quadrat, and scaling up to the total area of the woodland. Many candidates failed to include the latter idea in their answer and a surprising number failed to recall the name 'quadrat'.

Part (f) required candidates to suggest how the structure of the primroses helps to prevent self-pollination. Credit was given for recognition that the anthers and stigmas were at different positions within each flower making transfer of pollen within the same flower problematic. This question challenged many candidates and weaker students simply wrote about how cross-pollination could occur, or simply described the structure of the flowers.

Q2 This question examined lung structure and function.

Part (a) asked candidates to suggest how goblet cells and ciliated cells protect the lungs from infection. Marks were awarded for understanding that the mucus traps microorganisms which are then moved out of the lungs by the ciliated cells. Candidates who made reference to trapping or moving infection were not credited. Marks in part (b) were awarded for understanding that coughing is needed to remove the mucus that builds up, a result of the effect smoking has on the movement of the ciliated cells.

Part (c)(i) required students to use the information in the graph to describe the effect of the solutions on the movement of the cilia. Credit was given to those who appreciated that the solutions both reduced the movement of the cilia and that brand A reduced movement less than the reduction seen with brand B. Many candidates struggled to express these ideas in a coherent fashion and many seemed to struggle with the analysis of graphical data. Candidates are encouraged to use comparative words when dealing with this type of question.

The vast majority of students were aware in part (c)(ii) that the control should be water. Answers that stated no tobacco were also rewarded. The most common error was quoting ideas linked to fair testing.

Part (c)(iii) challenged most candidates. The question required students to offer criticism for the conclusion, derived from the results, that smoking reduces the movement of cilia in human lungs. The examiners rewarded students who appreciated that the investigation described used a limited number of cigarette brands, involved a solution rather than smoke, used *Paramecium* rather than humans, gave no indication of replication or the control of significant abiotic and biotic variables, and did not explore the degree to which humans actually participate in smoking. There were some excellent responses but the examiners noted that many candidates struggled to offer acceptable prose to express the ideas anticipated. Candidates need to be encouraged to be more critically aware of any described experimental design.

Q3 This question examined ideas linked to bacteria.

Part (a) examined knowledge of the structure of bacteria compared to viruses. Many candidates scored at least one mark. Many seem to wrongly believe that bacteria possess a nucleus. Weaker candidates quoted parts that belong to plant cells such as chloroplasts and vacuoles.

Part (b) expected candidates to recall the role of this particular white blood cell in providing immunity. Marks were awarded for appreciating that phagocytes ingest and then digest using enzymes. Many candidates incorrectly thought the cell was a lymphocyte and wrote about antigens and antibodies.

Part (c) required students to write continuous prose to explain how bacteria are important in cycles within ecosystems. The term ‘cycles’ should have guided candidates to concentrate on the carbon cycle and the nitrogen cycle. Many did, but many also wrote all they knew about bacteria, often omitting their role in cycles within ecosystems. Candidates need to be encouraged to read questions carefully.

Those who wrote about the carbon cycle were rewarded for appreciating the role of decomposition by digestion with the release of carbon dioxide. Those who wrote about the nitrogen cycle were rewarded for naming or describing the processes of nitrogen fixation, denitrification and nitrification. Naming one of these processes and then giving the wrong description lost the mark.

It was anticipated that answers to part (d) would demonstrate the impossibility of a colony growing to the size of the Earth because food or resources would run out and the bacteria would produce toxins that inhibit growth. The former idea was often seen but the latter idea was seldom noted. Many candidates struggled to apply these straightforward principles to this novel situation.

Q4 This question examined understanding of the role of lipase in digestion.

In part (a), most candidates successfully recalled the pancreas or the small intestine as parts of the digestive system where lipase is released. Candidates who hedged their bets by writing pancreas and liver lost the mark, as did those who spelt pancreas as if it were an enzyme called pancrease. Part (b) was more challenging, though there were many correct responses that made it clear that lipase inhibition would mean less lipid digestion and therefore less absorption of fatty acids or glycerol. The examiners only accepted 37^0C as the temperature to use in the investigation and the recognition that this temperature was the optimum for human enzymes, or that it reflected human body temperature.

In part (d)(i), examiners accepted any answer within the range 73 to 75. Candidates who gave a value outside this range could still gain one mark if a number between 79 and 80, or between 5 and 6, could be seen in the working. Surprisingly, many candidates found this question challenging, suggesting that this maths skill is seldom practised. Candidates struggled with part (d)(ii), often failing to answer the question by making reference to use of the actual apparatus. Those who understood the biology appreciated that if lipase was inhibited less fatty acids would be produced and this could be indirectly measured by the pH meter. Part (d)(iii) was equally challenging with many failing to appreciate that there is no need to use the drug at a higher concentration because there is very little improvement in the percentage inhibition. Credit was also given for ideas linked to possible side effects of increased dosage.

Q5 This question examined ideas about water regulation in the human body.

The examiners gave credit for the term osmoregulation or the term homeostasis being used in part (a). Credit was allowed if the spelling was incorrect providing it was phonetically clear that one of the two acceptable terms was being used. The most common incorrect answers used the terms osmosis or ADH, probably as a result of not reading the question carefully.

Most candidates scored both marks for part (b). If an incorrect answer was given, examiners were allowed to award one mark if the number 200 appeared in the working in whatever context. The most common error involved the division of 2500 by 200.

Part (c) was well answered demonstrating excellent knowledge and understanding. Many candidates gained at least two marks for stating that sweat production would increase leading to more water loss in sweat and stating that there would be less water loss in urine. The better candidates also made mention of less water in blood and the role of the pituitary gland in releasing ADH to increase the permeability of the collecting duct. Candidates often confused the effect of ADH on collecting duct permeability, often thinking that less ADH would be released.

Q6 This question examined understanding of the role of a fermenter in the growth of microorganisms.

Many were able to describe the role of the air supply in part (a)(i). Marks were given for understanding that oxygen is supplied for aerobic respiration. Failure to quote 'aerobic' lost the respiration mark. Weaker candidates believe that the air supply also provides carbon dioxide. In part (a)(ii), the better candidates understood that the air filter prevented the entry of other microorganisms. Weaker candidates showed poor understanding, often writing that the air filter cleans the air or that it prevents gases gaining access. Part (b) was well answered with many appreciating that if the temperature regulation fails, the temperature in the fermenter would rise and this would denature the enzymes in the microorganisms. Denaturing of microorganisms or ideas about temperature fall and the impact of this on kinetic energy of enzymes were not credited.

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