

Examiners' Report/  
Principal Examiner Feedback

January 2014

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

Edexcel Level 1/Level 2 Certificates  
Biology (KBI0) Paper 2B

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## 4BIO & KBIO (2B) Principal Examiners' Report – January 2014

### Question 1

The comprehension examined student understanding of the use of maggots to treat infections. In part (a), the examiners rewarded candidates who appreciated that antibiotics had a detrimental effect on bacteria or fungi. Answers that referred to pathogens (which could include viruses) or viruses were not credited. Candidates are advised to use technical language at all times and those who stated that antibiotics 'fight' bacteria or fungi were not credited.

Naming two antibiotics mentioned in the passage was straightforward for most candidates. MRSA was not accepted as an antibiotic. Most candidates in part (b) (i) appreciated that a sterile environment would reduce the risk of the maggots infecting a wound and the vast majority were able to name a digestive enzyme in part (b) (ii), though some did name antibiotics from the passage.

Part (d) required candidates to describe how the immune system kills bacteria. There were many excellent answers describing the role of phagocytes and lymphocytes. Some candidates confused the role of these white blood cells, writing that phagocytes produce antibodies and that lymphocytes engulf and digest. A few candidates misunderstood the question and discussed how maggot movement induced an immune response and thought the maggots released antibodies onto wounds. Part (e) posed little difficulty with most appreciating that maggot bags take longer to work or that they are more expensive. Student understanding of natural selection is pleasing. In part (f), there were many good answers using technical terms such as resistance, mutation and survival in the right context. Candidates need to know that the term resistant and the term immune have different meanings. As a consequence, candidates who stated that MRSA bacteria are immune to antibiotics lost credit. Some candidates misread the question and thought the maggots became resistant (or even humans).

### Question 2

This question examined understanding of genes and genetics. The best candidates were able to define a gene as a section of DNA that codes for a protein. Many candidates were able to recall 'guanine' as the name of the base in (b) (i), though the spelling often left much to desire. The calculation in (b) (ii) was more challenging with most stating the answer as 210, failing to read the stem of the question carefully.

Parts (c) (i) and (ii) discriminated well. Examiners were allowed to credit correct genotypes that failed to use the letter 'C'. For example, BB, BW and BW gained the mark. Many of the weaker candidates only put one allele in their genotype and lost credit. In genetic questions candidates are

encouraged to use the letters provided in the stem of the question. The probability of 0.5, however expressed, was known by many candidates.

### **Question 3**

This question examined student understanding of energy transfer and the digestion of starch. In part (a) (i), many were able to calculate 11.1 as the correct answer for the percentage of energy that would be transferred from plants to primary consumers. One mark was available for incorrect answers if, in the working, the numbers 11, 100 or 900 appeared. A large number of candidates did not read part (ii) carefully and wrote about the ways in which energy is not transferred from primary consumers to secondary consumers. The most common acceptable answers made reference to plant respiration and the idea that not all plants are eaten, or not all the parts of plants are eaten.

Many candidates were able to write concise, erudite accounts in part (b) to demonstrate excellent understanding of starch digestion. The role of amylase in the mouth, digesting starch into maltose was frequently seen in answers written by the better candidates. However, there were many candidates who struggled to express themselves clearly and there was significant confusion as to the site of digestion – many references to the stomach were seen and even the colon. Some candidates gave bland answers such as starch is digested in the gut.

### **Question 4**

This question examined understanding of the use of a calorimeter to measure the energy content of a food sample. It was clear that many students are familiar with this piece of apparatus and many good answers were seen. In part (a) (i), only the weaker candidates failed to appreciate that oxygen would help in the burning of the food sample. In part (ii), the increased surface area allowing better heat transfer to the water was understood by many candidates. Weaker candidates ignored the word 'coiled' in the stem and only mentioned that the pipe allowed waste gases to escape. The stirring of the water to improve the distribution of heat in the water was appreciated by most candidates. In part (b), most candidates were able to use the graph to show that the increase in temperature was 7.5 °C. Common incorrect answers were 8.5 °C and 23.5 °C. The rule of transfer error was applied to part (ii), so incorrect answers from (i) did not prevent students from gaining credit in (ii) by showing they could use the equation provided.

## Question 5

This question tested understanding of osmosis in plant and animal cells. The question challenged students and many struggled to express their ideas clearly. In part (a), credit was given for appreciating that the cells were plasmolysed because they had lost water. As a consequence, the cell membrane can be seen having moved away from the cell wall and the cytoplasm appears darker. Weaker candidates confused the cells they were making reference to and also discussed the movement of salt.

The definition of osmosis challenged students, with only the best appreciating it is the movement of water from a weak solution to a strong solution through a selectively permeable membrane. The examiners were kind in their interpretation of descriptions of concentration gradients, so much so, that an answer that stated that water moves from a high concentration to a weak concentration was credited. In this answer it is strongly implied that the high and low concentrations refer to water molecules. Answers that failed to make this implication lost credit. Only the better candidates gained full marks in part (c) by making reference to the loss of water from a weak solution to a strong solution causing the cell to become flaccid.

Part (d) challenged students because many did not appreciate that animal cells lack a cell wall and so their appearance when placed in distilled water differs from plant cells. The fact that they would burst because of the entry of water was only understood by the better candidates. The same was true when describing the crenated appearance of red blood cells in concentrated salt solution due to the loss of water.

## Question 6

This question examined understanding of the use of an industrial fermenter. Part (a) discriminated well with only the better candidates referring to the need to maintain an optimum pH to prevent the denaturation of enzymes which would result in a detrimental effect on production. Candidates who wrote about temperature rather than pH lost credit. In part (b), the best answers made reference to a cooling water jacket and a temperature recorder. In part (c), candidates needed to make reference to the use of oxygen for aerobic respiration. The term respiration alone was not credited. Credit was also given for answers that made it clear that the bubbling of oxygen into the fermenter would help to mix the contents. The benefit of using steam to clean an empty fermenter was appreciated by many candidates. They understood that steam sterilises, which prevents competition, and then cools to harmless water. Many struggled to express their ideas clearly even though they seemed to have an understanding of the advantages that steam has when compared to chemical methods of sterilisation.

## **Question 7**

This question examined understanding about sewage pollution. The question discriminated very well with only the best candidates gaining full marks. The most common error was to name the process by which fertilisers get into water as eutrophication rather than the correct answer – leaching. The examiners were strict about the name of a mineral that would be present in fertiliser. Nitrogen was not accepted and nor were mineral ions that are not main components of fertiliser.

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