Examiners' Report

Principal Examiner Feedback

January 2020

Pearson Edexcel International GCSE Level

In Biology (4BI1)

Paper 2B

This January series was the first opportunity for candidates to take the new reformed Edexcel International 9-1 GCSE in a January series.

The examining team commented on the knowledge and understanding shown by many of the candidates on this January's papers. Some candidates were able to apply their knowledge and understanding of biology to analyse and evaluate data and information from unfamiliar contexts and experiments. Schools work hard to prepare candidates for the examination, and this was reflected in the responses of many of the candidates. Some candidates performed well on the new style of questions and on the new specification content. A few candidates were less well prepared and were not able to answer items on the new specification content. Others struggled with some of the new command words even though these were used in the June 19 series and had been introduced in the two sets of sample papers published on the Pearson website. There was little evidence of candidates being short of time on this paper.

Question 1 provided candidates with a comprehension passage on coppicing. The comprehension items resulted in a similar mean and mode to previous January questions. In part (a) most candidates were able to suggest what is meant by the term sustainable. In part (b) most candidates were able to explain that a developed root system makes regrowth quicker with many explaining that water and mineral ions can be absorbed. In part (c) candidates were asked to give similarities and differences in the use of biofuel compared with the use of fossil fuels. Most responses gained some marks with the best noting that both fuels release energy and carbon dioxide when burnt. They also noted that biofuels are renewable and have less effect on global warming as they are 'carbon neutral' and release the carbon dioxide they previously absorbed whilst growing. In part (d) almost all candidates could suggest one way to protect woodland from damage caused by deer. Most candidates suggested fencing the woodland whilst others suggested reducing deer numbers by culling. Part (e) required candidates to describe a method to investigate the effect of coppicing on the biodiversity of plants in a woodland. This item discriminated well between candidates with the best responses describing how coppiced and non-coppiced areas of the same woodland could be compared by counting the numbers of each species present in randomly placed quadrats. Part (f) described the effect of coppicing on insect numbers in the woodland. In part (f)(i) about half of the candidates were able to give a reason why more insects in the woodland might be an advantage for the farmer. Many wrote about the increased likelihood of pollination. In part (f) (ii) almost all candidates could give a reason why more insects in the woodland might be a disadvantage for the farmer. Finally, in part (g) some candidates were able to explain why a range of different light levels in a woodland leads to an increase in plant biodiversity. The best responses explaining that different plants are adapted to live in different light conditions so leading to an increase in the number of species present.

Question 2 was about insulin production. In part (a) almost all candidates could identify the pancreas as the organ that produces insulin. Also, in part (b) most could describe the role of insulin as converting blood glucose into glycogen that is stored in the liver. In part (c) most candidates could identify why cow insulin causes an immune response in humans. In part (d) candidates were asked to describe how bacteria are genetically modified to produce human insulin. Most candidates scored all three marks for describing how the human gene for insulin production is cut using a restriction enzyme and a bacterial plasmid is also cut with the same restriction enzyme. The insulin gene is then inserted into the plasmid using ligase enzyme. Part (d) described how an industrial fermenter is used to grow the genetically modified bacteria. Candidates were required to explain why the fermenter is cleaned using steam before the genetically modified bacteria are added. Most responses earned at least one mark with the best responses explaining that the fermenter is sterilised to remove any bacteria that could compete for resources and contaminate the product. Few students commented that steam would condense to water and therefore not leave a residue in the fermenter.

Question 3 described how the northern white rhino is facing extinction. In part (a) most candidates gained some marks with many scoring all three for calculating the population size of the northern white rhino in 1960. In part (b) candidates were asked to suggest two reasons why many eggs are needed for cloning to be successful. Most response wrote about fertilisation which is irrelevant for the cloning process. The best responses described that not all eggs would be viable and develop into embryos and not all embryos would implant successfully. In part (c) candidates were told that scientists are considering using semen from a southern white rhino to fertilise an egg from the northern white rhino. In (c)(i) almost all students could name the cell that fertilises the egg. In part (c)(ii) candidates were asked to explain what the scientists should do with the zygote so that it develops into a fetus. Most responses gained at least one mark. However, some wrote about inserting a zygote into the uterus. The best responses described how the zygote would divide by mitosis to produce an embryo. This embryo would then be inserted int the uterus of a Southern white rhino which would act as a surrogate mother.

Question 4 described how a student uses a potometer to investigate the effect of windy conditions on transpiration. In part (a) candidates were asked to explain how the student sets up and uses this apparatus to measure the water loss. Although most candidates scored some marks, few gained all four. The best explanations included cutting the shoot underwater and ensuring the potometer is airtight. Then lifting the tube out of the beaker allowing an air bubble to form. Then returning the tube to the beaker to seal the bubble and noting the distance the air bubble travels in a set time. The tap is used to reset the bubble on the scale so further readings can be taken. The distance the bubble moves can be

converted to volume of water lost using the formula distance moved times πr^2. In part (b) most candidates were able to correctly name two abiotc factors that the student should control in his investigation. In part (c) only the best candidates were able to calculate the time in minutes for the plant to take up 1.0 cm^3 of water without a fan. In part (d) candidates were required to Evaluate the student's conclusion that plants will grow better in windy conditions. This item also discriminated well between candidates with most gaining some marks but only the best responses scoring all four marks. These responses referred to both positive and negative aspects of increased water loss. Including increased cooling of the plant and additional provision of minerals such as nitrate for amino acids or magnesium for chlorophyll. They also mentioned negative aspects of increased wind speed such as damage to plant stems, drying out of soil and plants wilting. Some candidates mentioned stomatal closure leading to reduction in photosynthesis. Other points credited were about the experimental method such as not repeating the experiment, not referring to other factors that might influence growth and using only one species of plant.

Question 5 examined some of the new topics in the specification such as the structure of nucleic acids and protein synthesis. In part (a) most candidates were able to give two differences between the structure of a DNA molecule and the structure of an RNA molecule. In part (b)(i) candidates were asked to give the sequence of bases in the mRNA that would be produced from a DNA strand. About half of the responses were correct with a common error being the inclusion of T in the mRNA sequence. In part (b)(ii) candidates needed to calculate the number of bases required to code for an amino acid chain of 1400 amino acids. Less than half of the response were able to recognise that each amino acid would require three bases. In part (c) candidates were told that a mutation results in a change in the sequence of bases in a DNA strand. They then had to discuss what effect a change in the sequence of bases could have on the functioning of the enzyme produced. Most candidates scored some marks with the best discussions explaining that some changes in base sequence could change all the amino acids and thus the whole protein. This would lead to a change in the shape of the active site so the substrate would no longer bind so the enzyme would not function. If, however, only one base changed this might lead to no changes in the amino acids as some codons code for more than one amino acid. Or only one codon changes so one amino acid changes but the enzyme would still function. In part (d) almost all candidates were able to give one way that the incidence of mutation could be increased.

The final question, 6, gave students a diagram showing some structures in the human abdomen. In part (a) almost all candidates were able to identify the structure is used to store urine and in (b) the structure which produces adrenaline. In part (c)(i) most candidates could also identify two substances that would be carried in the ureter. Part (c)(ii) asked candidates to explain the

difference in function of the urethra in males and in females. Some responses were able to explain that in females only urine is carried in the urethra and that a separate passage, the vagina, is used for reproduction and as a birth canal. Finally, item (d) required students to explain how very warm weather results in a change in the concentration and volume of the urine. Most candidates scored marks, with many gaining full marks. The best responses included an explanation of more water loss by sweating increasing blood concentration. This triggers release of ADH from the pituitary gland causing the collecting duct to reabsorb more water into the blood. This leads to the production of a lower volume of more concentrated urine.

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
- in evaluate items include points for and against a statement and include as many points as there are marks available
- 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.
- questions require students to make links between different parts of the specification, so when considering an item remember to use all the knowledge and understanding you have gained throughout the specification
- make sure you have practiced calculations especially percentages
- write in detail and use correct and precise biological terminology
- always read through your responses and ensure that what you have written makes sense and answers the question fully
- ensure that you are familiar with all the specification content.