Examiners' Report

Principal Examiner Feedback

November 2020

Pearson Edexcel International GCSE

In Biology (4BI1) Paper 2BR

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Introduction

This November series was the third opportunity for students to take the new reformed Edexcel International 9-1 GCSE.

The examining team commented on the knowledge and understanding shown by many of the students on this November's papers. Some students 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 students for the examination, and this was reflected in the responses of many of the students. Some students performed well on the new style of questions and on the new specification content. There was no evidence of students being short of time on this paper

Question 1 provided students with a passage about Toystory, a famous bull that sired over 500 000 offspring.

In Q1(a) students were asked to suggest why Genex waited until Toystory was four years old before beginning to collect his semen. Many responses correctly wrote that Toystory would not be producing sperm or that he would not be sexually mature until age four.

In Q1(b) students were asked to explain how the semen from the bull is used to fertilise cows using artificial insemination. Answers that gained full credit explained that sperm would be injected into the vagina of cow. Some students confused artificial insemination with in vitro fertilisation.

In Q1(c)(i) most students were able to suggest that storing the semen in liquid nitrogen would keep the sperm viable and preserve the cells. Also, in Q1(c)(ii), most students were able to suggest why a dairy farmer would want to use sexed semen as it would ensure that sufficient cows are produced to maintain milk production.

In Q1(d) students were asked to determine the percentage success of Toystory's semen samples in producing offspring. Many students were able to use the data in the passage to correctly calculate the percentage.

In Q1(e) students required to describe how scientists could investigate which of two bulls is the best to use as a father in dairy farming. The best responses described using semen samples from the two bulls to fertilise a range of similar cows. Then, examining the milk production of the offspring to determine which bull's offspring had the highest average yield. Some students suggested examining the milk yields of the mothers of each bull.

In Q1(f) almost all students could gain credit for explaining why the composition of milk is important to consumers with most common answers referring to calcium and protein content.

In Q1(g)(i) students were asked to describe the stages that are required to clone a bull. Many excellent responses described inserting the nucleus from a diploid body cell from the bull into an enucleated egg cell. Using an electric shock to stimulate mitosis to produce an embryo that is then inserted into the uterus of a surrogate mother. Weaker responses described cloning Dolly without applying their knowledge to this context.

In Q1(g)(ii) most students could give two advantages of using cloning rather than selective breeding to produce offspring.

Question 2 described an experiment in which a student investigates the decomposition of leaves.

In Q1(a) students needed to explain the results for the leaves stored in four conditions. Poorer responses merely repeated the results from the graph. The best students were able to explain that increasing temperature caused faster decomposition by bacteria due to increased enzyme activity. They also explained that cutting the leaves into smaller pieces increased decomposition by bacteria due to increased surface area of the leaves.

In Q1(b) many students were able to use the data in the graph to calculate the difference between the rate of decomposition in two of the samples.

In Q2(c) most students were able to give two biotic variables that should be controlled in the investigation. Some answers indicated that some students do not know what the term biotic variable means.

Question 3 was on the topic of water transport in plants.

In Q3(a) most students could identify the process that is used to absorb water from the soil. Also, in Q3(b), most could correctly name xylem as the tissue that transports water to the leaves and in Q3(c) name transpiration as the process by which water vapour is moved into the air from leaves.

Likewise, in Q3(d), most students could identify the conditions that would reduce movement of water from the leaves into the air. Finally, in Q3(e), many students were able to give two uses of water in the plant, the most common correct responses being support and as a reactant for photosynthesis.

Question 4 described the method a scientist used to investigate the effect of growth hormone (GH) on the body mass of rats. The results of the investigation were presented in a graph.

In Q4(a) students were asked to suggest how the control solution differs from the GH solution. The correct answers suggested that the control solution would contain no GH. Some responses described the effect of the solutions.

In Q4(b) students had to calculate the average rate of growth of the rat given GH solution from 100 days to 500 days. Many correctly used the data in the graph to determine the change in mass and divide that by the number of days to calculate the growth rate in g per day. A common error was to divide by 500 rather than 400.

In Q4(c) many responses correctly suggested two abiotic variables that the scientist should control.

In Q4(d) the best students were able to explain why using more rats improves his investigation by increasing the reliability of the study, allowing a mean to be calculated and enabling anomalous results to be detected. Q4(e) examined knowledge and understanding of protein synthesis by asking students to explain why increasing transcription affects the growth of rats. The best responses explained that more mRNA would be made leading to translation and the production of more proteins for enzymes or muscle tissue.

Question 5 was about pathogens causing disease. In Q5(a) students were asked to describe the different types of pathogen and refer to a disease that each type of pathogen causes. The examiners saw some excellent answers in which students described bacteria as microscopic single-celled prokaryotic organisms with no nucleus. A common answer for an example of a disease caused by a bacterium was pneumonia. Students also described viruses as non-living small particles with a protein coat that rely on other organisms for reproduction. A common example of a disease was AIDs or influenza. Fungi were described as saprotrophic with hyphae and a cell wall made of chitin. A common example of a disease was athlete's foot or ringworm. Some students also described protoctists as microscopic single-celled organisms such as the plasmodium that causes malaria.

In Q5(b) most responses were able to make some attempt at explaining how vaccination protects humans from pathogens. The best responses described the provision of a weakened form of the pathogen causing production of memory cells leading to a faster secondary immune response with many antibodies being released.

Question 6 was about the different causes of variation in a population. In Q6 (a) many students could identify that asexual reproduction would not lead to an increase in genetic variation in a population of plants.

In Q6(b) only the best students were able to adequately explain how a change in the DNA of a microorganism can reduce its ability to digest a substance. The best answers explained how a different sequence of <u>bases</u> in DNA would lead to changes in mRNA during transcription, this would then change tRNA and the amino acid chain produced during translation. The shape of the active site changes so the enzyme is not functional as no binding or enzyme substrate complexes are formed.

In Q6(c) these better students were also able to explain why a change in DNA may not affect the phenotype of an organism. They explained that some triplets code for same amino acid so there is no change in the protein or enzyme produced and the active site is unaffected. Others gained credit for suggesting that the change in the DNA may be recessive and so may not expressed in the phenotype. Others suggested that the DNA changed may be non-coding, which went beyond the specification but was worthy of credit.

Finally, **Question 7** was about gas exchange in plants. In Q7(a) students were required to complete a passage about gas exchange. Most responses scored credit, appreciating that light availability affects the balance between photosynthesis and respiration and so oxygen and carbon dioxide levels.

In Q7 (b) students were examined about a practical from the specification content. They were asked to describe how you could use hydrogen-carbonate indicator to investigate the effect of light intensity on net gas exchange in a leaf. The best responses described using leaves of the same size from the same species, in sealed test tubes with the same volume of hydrogen-carbonate indicator. These were exposed to different light intensities by wrapping the tubes in foil or muslin or with no wrapping or by having the tubes at different distances from a lamp. The tubes would be left for an hour and the changes in the colour of the indicator would show that in bright light photosynthesis would proceed quicker than respiration and the concentration of carbon dioxide in the tube would decrease. In dim light respiration would be quicker than photosynthesis and the concentration of carbon dioxide would increase.

Summary

Based on their performance on this paper, students are offered the following advice:

- ensure that you read the questions carefully and include sufficient points to gain full credit.
- 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.
- make sure you have practiced calculations especially percentages and know the relationship between units.
- write in detail and use correct and precise biological terminology.
- ensure that you are familiar with all the content, including the practicals included in the specification.

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