Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

January 2020

Pearson Edexcel International GCSE Level

In Biology (4BI1)

Paper 1B

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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 forest food web. In (a)(i) almost all candidates could identify how many producers were shown in the food web. In (a)(ii) most of the candidates could identify how many secondary consumers were shown in the food web. In part (b)(i) most of the candidates could name the sense that uses receptor cells in the retina. Part (b)(ii) required candidates to calculate the speed of this coyote in metres per second given the distance and the time taken. Almost all responses gained at least one mark with most of these scoring both marks. Some responses failed to gain full credit due to rounding errors. In part (c) candidates were required to explain why lactic acid builds up in the coyote's muscles when it runs. Almost all candidates scored with over half of responses gaining full credit for reference to a lack of oxygen leading to anaerobic respiration being used to release energy.

Question 2 examined candidates' knowledge and understanding of the structure of eukaryotic and prokaryotic organisms. In 2(a) candidates were asked to state three differences between eukaryotic and prokaryotic organisms. Many candidates did not recognise the terms, although they are clearly stated in sections 1.2 and 1.3 of the specification. This led to disappointing scores with few responses gaining credit and only the very best gaining all three marks. The best students were able to state that eukaryotic organisms have a nucleus, have organelles, have chromosomes and lack plasmids. Candidates did better in part (b) with about half of responses gaining some credit and the best naming the protoctist as plasmodium that causes malaria. Other correct examples were credited but malaria caused by a plasmodium is clearly stated in the specification.

Question 3 provided candidates with information about a squirrel and its diet. In part (a) candidates were asked to describe a method you could use to show that the nut contains fat. Most responses gained some credit with the best scoring

three marks for a description of the emulsion test or the Sudan (III) test. Weaker candidates wrote about the Benedict's test or measuring the energy content of a food sample. Other responses described feeding the squirrels some nuts and observing how plump they become. In part(b) candidates were given data about the substances found in two types of nut. In part (b)(i) most candidates were able to explain the role of fibre in a squirrel's diet, with the best responses gaining full credit for explaining that fibre aids peristalsis moving the undigested food through the gut. In part (b)(ii) candidates were asked to explain which nut is better at helping the squirrel make red blood cells. Almost all responses recognised that nut A contained more iron and the best responses linked this to greater haemoglobin production for red blood cells. In part (b)(iii) candidates needed to calculate the total mass of carbohydrate in nut A. Most responses gained some credit with many scoring both marks. Common errors involved failure to convert milligrams to grams. Part (c) gave students graphs showing the number of squirrels, foxes and trees in a woodland in 2010 and in 2018. They then had to use the information from the graphs and their own knowledge to discuss possible reasons why there is a decrease in the number of squirrels from 2010 to 2018. Almost all responses gained some credit but relatively few gained full marks. Most responses correctly linked the decline in squirrel population to an increase in foxes and to a reduction in trees. The very best responses also noted that other factors may have reduced the squirrel population. These factors included disease, arrival of a new predator, migration, hunting, change in temperature.

Question 4 asked candidates about enzymes. In 4(a)(i) almost all candidates could correctly state what is meant by the term catalyst. In (a) (ii) more had trouble in stating what is meant by the term metabolic. The best responses stated chemical reactions that occur in cells. In part (b) candidates were given data showing the effect of enzyme concentration on mean rate of oxygen production. In (b)(i) candidates were asked to plot a line graph to show the effect of enzyme concentration on the mean rate of oxygen production. Almost all responses gained credit with most gaining 4 or 5 marks. Responses that failed to gain full marks often plotted one data point incorrectly or extrapolated the line to 0. In (b)(ii) candidates were required to explain the effect of increasing enzyme concentration on the rate of oxygen production. Again, almost all responses gained credit with the best responses explaining that as enzyme concentration increases so does oxygen production up to 8 discs as more enzyme molecules are available to react with hydrogen peroxide to form enzyme substrate complexes. In part (b)(iii) most candidates could name a piece of apparatus suitable for measuring the volume of oxygen produced. In part (b)(iv) candidates were asked to explain why it is important for the teacher to keep the volume and concentration of the hydrogen peroxide constant. Most scored one mark for the idea of having only one independent variable and the best responses also explained that changes in the volume or concentration of hydrogen peroxide would also affect the rate of oxygen production. In (b)(v)

most candidates could name another variable the teacher should keep constant in his investigation, temperature being the most common answer.

Question 5 concerned the ways that a farmer can increase crop yield. In part (a)(i) candidates were asked to explain how increasing the temperature can result in an increase in crop yield. Most responses gained at least one mark with many scoring both for explaining that increasing temperature would increase the kinetic energy of molecules thus increasing the rate of photosynthesis. In part (a)(ii) many candidates were able to explain why farmers sometimes use a type of heater that burns gas or oil to raise the temperature of their glasshouse to improve crop yield. The best responses explained that these heaters release carbon dioxide which is required for photosynthesis and may be a limiting factor. In part (b)(i) candidates were asked to explain one mineral that should be added to chemical fertilisers. Most responses correctly named either magnesium or chlorophyll and gave their function. In part (b)(ii) candidates were asked to discuss why some farmers limit the amount of chemical fertilisers they add to their crops. Many candidates scored marks for explaining that these fertilisers can leach into rivers, leading to eutrophication, algal growth and death of aquatic organisms. Fewer candidates explained that excess fertilisers would not be absorbed by the plants and would increase the concentration of the soil thus preventing water uptake by osmosis and causing the plants to wilt. Some candidates also discussed the use of organic fertiliser such as manure. Weaker responses suggested that the fertilisers would poison the crops or the people who eat them.

Question 6 asked candidates about liver function. In part (a) most could gain some credit for explaining the role of bile in digestion. This item discriminated well between candidates with a range of scores from 1 to 4. The best answers explained that bile neutralises stomach to provide an optimum pH for enzymes and that it emulsifies lipid into small droplets to increase surface area. In part (b) candidates had to identify how many blood vessels transport deoxygenated blood from the liver. Most candidates could correctly identify that only the hepatic vein transports deoxygenated blood from the liver. In part (c) candidates were given a table that showed the concentration of glucose in blood samples in the hepatic portal vein and the hepatic vein one hour and five hours after a meal. In (c)(i) candidates were asked to explain why, after one hour, the concentration of glucose in the hepatic portal vein is higher than the concentration of glucose in the hepatic vein. This item proved challenging to many candidates. Only the very best candidates made the link between glucose levels and the role of the liver in the regulation of blood sugar. The best responses noted that the meal would have increased blood glucose and thus stimulated insulin release. This explains why glucose is absorbed from the blood and stored in the liver as glycogen. The candidates did equally poorly on (c)(ii). They had to explain why, after five hours, the concentration of glucose in the hepatic vein is higher than the concentration of glucose in the hepatic portal vein. Only the best recognised that after 5 hours blood glucose will have

dropped. Insulin would no longer be released thus stimulating the conversion of glycogen to glucose in the liver, so the blood leaving the liver will have increased glucose.

Question 7 described a genetic cross between two Fruit flies that produced different numbered long-winged and short-winged flies. In (a) about half of the candidates were able to correctly identify that both parents needed to be heterozygous in order to produce a 3:1 phenotypic ratio. In part (b)(i) most candidates were able to complete the genetic diagram to show how equal numbers of male and female offspring are produced. In part (b)(ii) candidates were asked to explain why the results of the cross might not produce exactly equal numbers of male and female offspring. Although some candidates appreciated the role of chance in the cross outcome only the best responses explained that fertilisation is random. In part (c) candidates were required to design an investigation to find out if the smell of decomposing apples attracts fruit flies more than the smell of decomposing bananas. Almost all responses gained credit with many scoring full marks. Some weaker responses suggested measuring the mass of fruit consumed rather than recording the number of flies landing on each fruit. This CORMS item produced similar scores to previous years and discriminated well between candidates.

Question 8 gave a diagram showing a section through a leaf with different parts labelled. In (a) almost all candidates could identify which part of the leaf transports amino acids, absorbs the most sunlight, transport the products of photosynthesis and reduces the amount of water escaping. In part (b) candidates were asked to explain how the structure and position of cells in the palisade and spongy mesophyll help the leaf to photosynthesise. This item also discriminated well between the candidates. Whilst most scored some marks, only the best clearly explained that the palisade cells are near the upper surface to absorb as much light as possible. The palisade cells contain many chloroplasts and are densely packed to capture as much light energy as possible. The spongy mesophyll cells have air spaces between them to allow diffusion of gases and are near to stomata to enable efficient absorption of carbon dioxide. Some responses merely described the cells structure and position without providing an explanation. Part (c) gave the magnification of the diagram and asked candidates to determine the actual thickness of the leaf. Most could gain one mark for correctly measuring the diagram, but some made errors in the division or conversion to mm. The examiners allowed a range of measurements for the leaf thickness as some chose to measure at thickness at a position away from the line A-B. In part (d) most responses could correctly suggest why the leaves of the water lily only have stomata on their upper surface.

Question 9 concerned the immune response. In (a) candidates were required to explain the role of lymphocytes. Most candidates were able to obtain full credit for explaining that lymphocytes recognise specific antigens on pathogens and produce antibodies to destroy them. In part (b) most responses could also

explain what happens to bacteria after they have been ingested by phagocytes. In part (c) information was provide about an experiment looking at how vitamin C affects ingestion of bacteria by phagocytes. in part (c)(i) some candidates could identify the rate of ingestion of bacteria in the control. The control was the rate when no vitamin C was added. In part (c) (ii) most candidates could correctly state the independent variable in this investigation. In part (c)(iii) most responses could state at least one biotic variable that the scientist should control. Finally, in part (iv), candidates were asked to comment on the conclusion that vitamin C in a person's diet will protect people from pathogens. This item discriminated well between candidates with most gaining some credit. The very best answers commented that vitamin C increases ingestion by phagocytes but that the experiment was only done once and not repeated. They also noted that it was carried out 'in vitro' and not in the human body and at a temperature below body temperature. Other creditworthy comments included that the scientists would need to test with other species of bacteria that are pathogenic and that not all pathogens are bacteria.

Finally question 10 gave a diagram showing some of the structures involved in fertilisation in a flowering plant. In part (a)(i) most responses could correctly name the parts labelled as the stigma, style and ovary. In part (a)(ii) most candidates could draw the path the pollen tube takes after the pollen grain has germinated, although some failed to complete the path through the micropyle. In part (a)(iii) many responses could not describe what happens to the structures in part C after fertilisation. Part (b) provided data from an investigation into the effect of four different storage conditions on the germination of grass seeds. In part (b)(i) about half of the responses gained some credit for calculating the percentage increase in the number of seeds that germinate in wet and cold conditions compared to the number of seeds that germinate in wet and warm conditions. Part (b)(ii) required candidates to suggest why fewer seeds germinate when they are stored in wet and warm conditions than in the other conditions. This was the most difficult item on the paper and only the very best candidates linked the warm and wet conditions as being favourable for bacterial or fungal growth thus digesting the seed contents and reducing germination. Finally, in (b)(iii) most candidates could give one observation that shows a seed has germinated.

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 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 and know the relationship between units such as milligram and gram
- 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.

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