Examiners' Report

Principal Examiner Feedback

January 2022

Pearson Edexcel International GCSE

In Biology (4BI1) Paper 1B and Science (Double Award) (4SD0) Paper 1B

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January 2022
Publications Code 4BI1_1B_2201_ER

This January series provided centres an opportunity to take the International 9-1 GCSE.

The examining team commented on the knowledge and understanding shown by the students during the January papers.

Students were able to apply their knowledge and understanding of biology to novel contexts. They were able to analyse and evaluate data and information from unfamiliar scenarios and experiments. Schools have worked 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 little evidence of students being short of time on this paper.

Question 1 gave students a diagram showing apparatus used to compare inhaled and exhaled air. In **(a)(i)** students had to explain which flask exhaled air passes through. Many students gained one mark for explaining that the tube from the mouthpiece in flask B had a longer tube. Some gained a second mark for stating that this tube went into the limewater. Some answers identified the wrong flask or did not explain their answer.

In **(a)(ii)** many students correctly explained that flask A would stay clear or turn cloudy slowly whilst flask B would turn cloudy quickly as exhaled air contains more carbon dioxide.

In part **(a)(iii)** many correct responses mentioned using hydrogen-carbonate indicator. In part **(c)** most students could gain marks for describing the role of the diaphragm and the intercostal muscles in inhalation.

Question 2 gave students a diagram of an insect pollinated flower. In (a) most students could correctly identify the anther, the petal and structure on which pollen grains germinate.

In **(b)** students were required to describe how the structures of P, Q and S would differ in a wind-pollinated flower. Most students answered this well, but a few confused anthers with pollen grains. Some thought the anthers were feathery whilst others thought that sticky stigmas were found only in wind pollinated plants. However almost students understood that petals were green or smaller in wind pollinated flowers. Some responses wrote about the nature of the pollen and its transfer rather than structures P, Q and S.

In **(c)(i)** most students could give one natural method that plants use to reproduce asexually usually giving runners or sometimes bulbs.

In **(ii)** most could give one artificial method that a plant grower may use to reproduce a plant asexually many giving cuttings or micropropagation as a method.

In **(iii)** the best students could suggest why a plant grower may choose to reproduce a plant asexually rather than allowing the plant to reproduce sexually. The best answers referring to no genetic variation so maintaining a desired phenotype and asexual being a quicker process.

Question 3 gave students a diagram of a cycle found in ecosystems. In **(a)** almost all responses identified the carbon cycle.

In **(b)** most responses could identify combustion and respiration as the labelled processes.

In **(c)** almost all students identified bacteria as the group of organisms responsible for decomposition.

Item **3(d)** was the experimental design item and those students who had practised such items scored well. A large variety of decomposing organic material was seen and there was an assumption that soil had a natural pH of 7 in many responses. Some students failed to recognise the question required the design of an investigation and merely wrote about the effect of pH on enzyme reactions or decomposition. Some responses failed to gain maximum marks by using imprecise language such 'a few days' when describing a time period or same amount of organic material' when giving a control variable.

Question 4 provided scientist's data on the age of mothers and whether they smoked during pregnancy it also recorded the percentage of the babies that had a low birth mass.

In **(a)(i)** Most students could correctly calculate the percentage of mothers aged 19 years and under who smoked during pregnancy and in **(ii)** correctly determine the ratio of non-smokers to smokers used in the study.

In part **(ii)** some responses failed to convert the ratio to a whole number even though this was stated in the question.

In **(b)** students were asked to comment on the conclusion that smoking is the main factor that causes low birth mass. Some students did not refer to the data given and wrote about the effects of smoking. The best responses gained full marks for referring to a higher % of low birth mass (at every age) in smokers. Noting that the study was a large one, so data is likely to be reliable. They also commented on a big age effect on birth mass, that smoking has a greater effect

on birth mass in older mothers, that no information is provided on mother's mass or whether the births were full term. Other points included explaining that smoking reduces oxygen transport so affects respiration.

Question 5 gave information about an experiment to see if reducing the availability of oxygen affects the production of yoghurt. They use increasing acidity as a measure of yoghurt production.

In **(a)** only the very best students were able to explain why increasing acidity can be used as a measure of yoghurt production. Most responses wrote about the effect of acidity on enzyme action and failed to realise that during yoghurt production lactic acid is produced.

In **(b)** most students could identify a suitable abiotic control variable with temperature being the most common correct answer.

In **(c)(i)** most gained some marks for plotting a line graph of the data. The most frequent error was failure to label the axes or labelling m for minutes.

In **(c)(ii)** the best students were able to explain why the changes in percentage acidity are different in the reduced oxygen level and in the normal oxygen level cultures. Their answers included that reduced oxygen means more anaerobic respiration so that the acidity rose quicker.

Question 6 gave a diagram of the gut of a rabbit.

In **(a)** most students could name the parts labelled but many misspelt oesophagus and stomach but were still given credit.

In **(b)** the best answers could explain how these bacteria releasing cellulase helps the rabbits with their diet of plant material.

In **(c)(i)** some students failed to express themselves clearly and wrote that humans do not eat plant material rather than humans eat less or do not just eat plant material and that is why the caecum and appendix are less developed.

In **(c)(ii)** the best responses could explain how having no appendix may increase the likelihood of bacterial infections of the colon. These answers referred to the absence of useful bacteria reducing competition with pathogenic bacteria thus leading to the pathogenic bacteria multiplying.

Question 7 provided a food web from a woodland ecosystem.

In **(a)** most students could correctly identify the producer and the organism that is both a secondary and tertiary consumer.

In **(b)** students were given data bout energy transfer along a food chain.

In **(b)(i)** only the very best response correctly noted that some light energy is reflected by plants or does not fall on the chloroplasts or on the leaves so cannot be absorbed. Many responses wrote about energy loss between trophic levels rather than energy absorption by the plant.

In **(b)(ii)** the best students recognised the command word determine and calculated the energy transferred between producer and primary consumer and between primary and secondary consumer. Those who failed to recognise the command word did not do a calculation.

In **(c)** students were given a photograph of a woodlouse and in **(i)** most cold state what is meant by a reflex response.

In **(ii)** many correct responses could give a reason why the reflex benefits the wood louse by protecting it from predators.

In part **(iii)** students had to explain how reflex behaviour could have evolved by natural selection. Many responses gained full marks, but some students wrote about the trait being passed onto offspring rather than the allele and so failed to gain full credit.

Question 8 was about photosynthesis.

In **(a)** many students could correctly convert 0.04% to parts per million.

In **(b)** most responses described the effect of increasing the concentration of carbon dioxide on the relative rate of photosynthesis at 5 °C as increasing but only the better response went on to describe the levelling off at 0.1%.

In **(ii)** students were asked to describe how the effect of increasing the concentration of carbon dioxide on the relative rate of photosynthesis changes when the temperature is increased. The best students wrote that the increasing carbon dioxide increases the rate at all temperatures. The greatest effect and steepest increase occur at higher temperatures.

Students did better on item **(b)(iii)** as most responses could explain that increasing temperature leads to an increase in the rate of photosynthesis as the reactants have greater kinetic energy and this results in more frequent collisions.

In part **(c)(i)** most students could explain how lacking a named mineral might affect plant growth. With the effect of magnesium or nitrate deficiency being the most given.

In part **(ii)** most responses could correctly explain how a named factor can affect the rate of photosynthesis, other than carbon dioxide concentration, temperature and minerals absorbed. The most named factor was light intensity which provides energy for the chloroplasts to absorb.

Question 9 described alkaptonuria an inherited condition caused by the presence of recessive alleles.

In part **(a)(i)** many responses correctly stated that a recessive allele is only expressed when homozygous.

In **(b)** students were told that a woman and a man who do not have alkaptonuria have a child who has the condition. The item asks the students to use a genetic diagram to show the genotypes of the woman and the man, the gametes they produce and the possible phenotypes and genotypes of a second child. Many responses used a Punnett square and gained at least three marks. Marks were sometimes not awarded as the gametes were not clearly shown.

In **(ii)** the best students could correctly calculate the probability that the second child is male and does not have the condition.

Part **(c)** described a drug treatment to alleviate some of the symptoms of alkaptonuria.

In **(i)** most students could describe what is meant by a control group.

in **(ii)** students were given a table compares the control group with the drug treatment group in terms of improved symptoms. Students had to evaluate whether the new drug should be recommended as an effective treatment for alkaptonuria. The better responses often included reference to improvement in symptoms in the drug group such as quicker to stand and being able to walk further. They also wrote about the relatively small numbers of patients studied, the side effects of the drug and the death of one patient. Also mentioned were no information on age or mass or health of the patients.

In part **(d)** many responses included that avoiding foods with tyrosine and phenylalanine would be difficult as they are in many proteins, and it is not obvious which proteins contain these. Other responses credited wrote about protein being required for growth and repair.

Question 10 gave information about using biological control.

In part **(a)** almost all students could correctly give specific as an advantage of biological control over chemical control.

In part **(b)** students were told about aphids feeding from plant phloem vessels.

In **(i)** some responses could identify amino acids and sucrose as two substances that aphids would obtain from these vessels.

However, in **(ii)** only the best responses gained marks for explaining how aphids feeding from the phloem of crop plants can lead to a reduction in yield. If students did not know what is transported in the phloem, they could not answer this item. The best responses gained full marks for explaining that less sucrose would be available for respiration so resulting in less energy for growth. They also wrote that less amino acids would be available so less protein would be synthesised. Other credit worthy points are given in the mark scheme.

Finally, part **(c)** described an investigation into silverflies and hoverflies two species of insects whose larvae feed on aphids. The method was described, and the results were shown in a graph. Students were asked to discuss the scientists' conclusion, referring to information in the graph and the scientists' method in your answer. Student responses had a wide range of scores , some gaining full the credit: for noting that hoverflies eat more aphids at all temperatures so fewer hoverflies would be needed to control the aphid population. They also commented on the method, noting that only one larva was used. They noted that the experiment was done in an artificial setting and that only two species were compared.

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.
- Identify the command word and use it to inform you what you should include in your response.
- In this examination some students did not perform a calculation when the command word determine was used.
- 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.
- In experimental design items ensure you write about how to conduct an investigation.
- 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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