Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2019

Pearson Edexcel Advanced Subsidiary In Biology (8BI0) Paper 02 Core Physiology And Ecology

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Summer 2019
Publications Code 8BI0_02_1906_ER

This AS paper 2 gave students the opportunity to show their knowledge and understanding of the topics they have covered during the course. It also enabaled them to apply this knowledge and understanding to new situations and novel contexts. Most studenst attempted all questions and there was no evidence of students being short of time. The examiners noted that all marks were achievable by students and a wide range of scores and attainment was observed on this summer’s paper.

Question 1 provided students with a diagram showing an ECG trace and pressure changes in the aorta and in the left side of the heart. In Q1(a) most students were able to correctly identify the semi-lunar valve but in (b) very few could identify T as the correct wave on the ECG trace that occurs when the pressure in the left ventricle is highest, even though the wave was clearly shown just above the peak in ventricle pressure. Almost all students could correctly name the pacemaker in (c). In (d)(i), the question asked students to state what is meant by the term myogenic. Students struggled to express the meaning clearly. The best responses stated that myogenic means initiated within the muscle itself without external stimulus or innervation. This was expressed by students in a variety of ways. In Q1(d)(ii) students needed to comment on the advantages of the newer pacemaker models that can change the heart rate depending on circumstances. Most responses gained credit with the very best explaining that the new pacemakers would enable heart rate to increase during exercise by increasing cardiac output to deliver more oxygen and glucose for respiration. They also commented on the ability to lower heart rate when resting.

Question 2 gave students a diagram showing a model of the structure of the cell membrane. In Q2 (a), nearly all responses correctly identified part X as allowing facilitated diffusion to take place. In Q2 (b) fewer responses correctly identified part Y as making the membrane more fluid. In Q2(c), most responses were able to explain how the properties of molecules affect their transport through the cell membrane with most students gaining 2 or 3 marks. Part (d) gave students a description of an experiment to investigate the effect of ethanol on cell membranes. This item was designed to examine the knowledge and understanding of student practical work. In Q2 (d)(i), students needed to give a reason why the beetroot discs were placed in the same volume of ethanol solution. Many responses wrote about a fair test but were unable to link the volume changes to an effect on pigment concentration or absorbance. Likewise, in Q2 (d)(ii) students often did not explain why the boiling tubes were kept in a water bath. The best responses explained that changes in temperature would change the rate of diffusion of the pigment and thus membrane permeability and absorbance. In Q2 (d)(iii), students were required to calculate the standard deviation for absorption at the ethanol concentration of 20% using the formula provided. Some were able to do this, but many had no idea what to do with the formula. In Q2 (d)(IV), more students could state why the standard deviation is a better measure of variation than the range. In Q2 (d)(v), most students were able to explain the effect of increasing ethanol concentration on membrane permeability with the best responses attributing the effect to changes in the phospholipid bilayer.

Question 3 provided diagrams which showed blood samples from two adult patients using a microscope. In Q3 (a)(i), many students were able to calculate the magnification correctly. In Q3 (a)(ii), almost all responses were able to gain credit for comparing the two blood samples. Most answers scored at least two marks usually for the differences in numbers of erythrocytes or lymphocytes. Fewer students included a similarity in their response such as both samples had more erythrocytes than other cell types. In Q3 (a)(iii) most students could explain the increased number of lymphocytes in adult 2 but fewer offered an explanation for the reduced number of erythrocytes. In part (IV) only the very best students were able to give the volume of the blood sample as the assumption that is made to enable a valid comparison between these two samples. In Q3 (b), almost all responses gained credit with the best linking a reduction in erythrocytes with less transport of oxygen to enable aerobic respiration to release more energy or produce more ATP.

Question 4 described an experiment using a mass potometer. In Q4 (a), many students were able to draw the correct conclusion from the data on mass lost and water added. Almost all responses could in Q4 (b) identify the conditions in which water uptake would be the slowest. In Q4(c)(i) students were required to compare and contrast the mass potometer with the bubble potometer as methods of measuring the rate of transpiration. The method for the mass potometer was described in the question and students will have had experience of using a bubble potometer for Core Practical 8. Despite this, although most responses gained credit only a small percentage of these responses scored more than two marks. The best responses noted that both methods measured water uptake and that a bubble potometer uses a cut shoot whilst a mass potometer uses a whole plant and a bubble potometer only measures water absorbed whilst a mass potometer also measures water loss. Many responses also correctly commented on the bubble potometer producing results in a shorter time period. In Q4 (b)(ii), most students were able to score two or more marks by describing how a bubble potometer can be used to investigate the effect of wind speed on the rate of water uptake. Those responses that did not score well often referred to putting a plant in a windy place or by a window rather than using for example an electric fan different distances from the plant or set at different speeds.

Question 5 was about taxonomy and speciation. Q5(a) required students to recognise the correct hierarchy and almost all could do this. In Q5(b)(i), most responses could gain at least two marks for describing the information that scientists use to classify an organism as a new species. Many students referred to using morphology, observing behaviour, using electrophoresis to compare DNA and investigating if the new organism can produce fertile offspring with an existing species. In Q5(b)(ii), only the best responses gained credit for explaining that some species can interbreed to produce young and or that this is very difficult to determine, and that morphology may vary within a species such as sexual dimorphism. Few students commented on the fact that all species are evolving so classification is not static. In Q5(c), students were asked to explain how speciation could have arisen in species of the apple and hawthorn fly. Students were given information about their location and different feeding habits. Most students gained credit with many explaining sympatric speciation due to reproductive isolation following behavioural change. In part (d) students were given another case of speciation, this time involving changes in chromosome number. Most responses recognised that this was due a mutation that resulted in the two species producing incompatible gametes.

Question 6 presented a graph that shows the total number of endangered species and the number of new species listed as endangered from 1985 to 2015. In Q6(a)(i), many students were able to calculate the rate of change in total number of endangered species from 1985 to 2015. In Q6(a)(ii), students were asked to explain how the total number of endangered species and the number of new species listed each year have changed. Whilst most responses were able to gain some credit for describing the changes only the best responses earned higher marks for explaining that the number of species listed as new each year leads to an increase in the total number of endangered species. In part (b), most students could gain credit for evaluating the statement that ‘zoos are successful at protecting endangered species
from extinction’. The whole range of scores were seen with most responses scoring at least three marks. The best responses gained full marks for a detailed and balanced account of the opportunities and challenges faced by zoos in their task.

Question 7 described a mathematical model used to represent the effect of surface area on diffusion in lungs. In Q7(a), students had to use the given formula to calculate the surface area of a sphere with a diameter of 180 mm, and then calculate the surface area to volume ratio. Even though this is listed in the specification, many students were unable to correctly calculate the area. Many candidates could apply the formula but struggled to be able to convert the units. In Q7(b)(i), most could gain credit for explaining that having many alveoli increases the surface area to volume ratio but only a few responses went on to link this to diffusion of oxygen from air to blood or of carbon dioxide from blood to air. Q7(b)(ii) asked students to explain how other features of the alveoli enable efficient diffusion in the lungs. Again, most students scored some credit but only the best responses gained all three marks for explaining how the thin alveoli and capillary walls reduce the diffusion distance, the blood flow in the capillaries maintains a steep concentration gradient and how the moist lining of the alveoli enable gases to dissolve. Some students wrote about the presence of surfactant preventing alveolar collapse.

In Question 8, students were told that locusts ventilate their tracheal systems by muscular contractions of their abdomen. They were then asked to devise an investigation to determine the effect of carbon dioxide concentration on the rate of ventilation in locusts. Most responses earned some credit with only a few students describing how to dissect a locust. The very best responses earned full credit for suggesting a sensible range of carbon dioxide concentrations, using the same locust throughout, counting the number of abdominal contractions in a stated time period, allowing the locust time to recover between concentrations, controlling temperature and repeating with several locusts.

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 compare and contrast items, include both similarities and differences and make sure that, for example, the comparison is explicit

- make sure you have practiced calculations and understand and know how to apply any formulae

- write in detail and use correct and precise biological terminology

- make sure you have expressed your answer in the correct units and ensure you know the relationship between linear squared and cubed units such as mm^3 and dm^3

- remember to use the knowledge and skills acquired during practical work to help in indirect practical skills items

- in experimental design items, always be able to name the independent variable and give the range of values, the dependent, and how you are going to measure it and the control variables and explain how these will be controlled

- always read through your responses and ensure that what you have written makes sense and answers the question fully.

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