

Examiners' Report
Principal Examiner Feedback

Summer 2024

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

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Summer 2024
Publications Code 8BI0_02_2406_ER
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The AS paper 2 allowed candidates to show their knowledge and understanding of the topics they have covered during their course. It also gave them the opportunity to apply this knowledge and understanding to new situations and novel contexts. Most candidates attempted all questions and there was no evidence of students being short of time. The examiners were pleased that all marks were achievable by candidates and a range of scores and attainment was observed on this summer's paper.

Question 1 asked about the emergence of bacteria that are resistant to some antibiotics.
In Q01(a)(i) and (ii) most candidates were able to identify what would lead to fewer resistant bacteria and what would cause an increase in resistant bacteria. In Q01(b) they were given a graph that showed the number of cases of MRSA in several US states from 2005 to 2016.
In Q01(b)(i) some candidates were able to explain why the number of hospital cases of MRSA is lower than the number of community cases of MRSA. They explained that more sterile precautions would be used in hospital and that patients would be screened before admission so less disease would be transmitted.
In Q01(b)(ii) more candidates were able to explain the changes in hospital cases and community cases from 2012 to 2016. Noting that community cases continue to fall whilst hospital cases level off and explaining that hospital staff had already taken precautions to prevent spread, whilst in the community, these precautions were now being taken.
In Q01(c) candidates were asked to describe how DNA sequencing of pathogens may help doctors to prescribe antibiotics more effectively. Most responses gained credit with the best reponses describing how DNA mapping of bacteria can identify resistance genes enabling antibiotics specific for that bacterium to be prescribed.

Q02(a) gave a photograph showing a section through a plant stem as seen using a light microscope.
In Q02(a)(i) most candidates were able to identify the xylem.
In Q02(a)(ii) most candidates were able to correctly calculate the magnification of the photograph.
Q02(b)(i) and (ii) were objective items asking about xylem function and transport. These were answered correctly by the majority of candidates.
Q02(c) required candidates to compare and contrast the structure of xylem and phloem tissues. This item had a range of scores with most responses gaining some credit. Only the best responses scored full marks for noting similariites such as both xylem and phloem have vertical arrangement of cells, contain fibres, are vascular tissue, and differences such as xylem has lignified cell walls, secondary thickening and that xylem has no end walls. Statements about phloem included reference to contains sieve tubes and companion cells.

Q03 described how a student investigated the rate of water loss by a seedling and gave a diagram showing the apparatus used in this investigation.
In Q03(a)(i) most candidates were able to state the hypothesis being tested by the investigation.
In Q03(a)(ii) most responses could explain one feature of the plants that should be controlled in this investigation. Suitable explanations included using the same species of plant that would have the same density of stomata and therefore the same transpiration rate.
In Q03(a)(iii) most candidates could state the function of the layer of oil in this apparatus.
In Q03(b) candidates were asked to explain why the rate of water loss may be different to the rate of water uptake. The best responses explained that the rate of water uptake may be greater than the rate of water loss as water is retained by the plant to maintain turgor, and some is used in photosynthesis.
In Q03(c) candidates had to describe how this investigation could be modified to determine the effect of humidity on the rate of water uptake by seedlings. Most responses gained some marks with the best describing how the experiment would use seedlings with roots. They gave a method of changing humidity and controlling a named abiotic variable such as temperature. The experiment would measure the rate of water loss for a stated time and the readings would be repeated to calculate a mean rate.

Q04 described an investigation into the biodiversity of a habitat. Students measured out a small area within woodland A. They then identified and counted the number of species present and the numbers of individuals of the different species in that area.
In Q04(a) candidates were given data from the woodland and were asked to calculate the index of diversity (D) for woodland A. The candidates did very well on this item with most gaining full marks.
In Q04(b) candidates were given data from another woodland and asked to comment on the biodiversity of each woodland. Almost all responses gained some credit with the best gaining full marks for noting a higher species richness and more species evenness in A as numbers of each species more similar in woodland A. Some candidates also noted that there was no measure of genetic diversity within each species.
In Q04(c) candidates had to describe how the students could modify their procedure to obtain a valid comparison of the diversity of each woodland. Many were able to describe using random numbers to produce coordinates to place several quadrats in different areas. They also noted that the counts should take place at the same season or be repeated in different seasons.

Q05 gave a diagram showing some of the components present in a sample of blood.
In Q05(a)(i), (ii) and (iii) most candidates could correctly identify the components involved in blood clotting, the immune response and which are lymphocytes.
In Q05(b) candidates were given tables showing the relative number of lymphocytes and neutrophils in different blood conditions. They were also given a table showing some of the possible symptoms and medical advice for patients with each condition. The candidates were required to analyse the data in the tables to explain the consequences for patients with these conditions. This level-based item produced a similar range of scores to previous series. The best answers gained full credit for a response that included reference to increase and decrease in number of cells and linked each to symptoms and explains medical advice. These responses referred to the role of lymphocytes in producing antibodies in response to infection and linked this to the symptoms and advice about vaccination. They also referred to the role of neutrophils in engulfing bacteria and preventing bacterial infection.

Q06(a) gave a definition of a species as a group of organisms with similar characteristics that interbreed to produce fertile offspring. Candidates were asked to explain the limitations of this definition. Most responses gained some credit with reference to sexual dimorphism, geographical isolation preventing breeding, some sibling species producing fertile offspring and some species producing asexually. In Q06(b) most candidates were able to correctly identify the statement that describes the movement of DNA fragments in gel electrophoresis.
In Q06(c)(i) candidates were given a diagram showing the results of gel electrophoresis of DNA samples from the new plant and the four known plant species, A, B, C and D. They were asked to analyse the data to assess whether the new plant is a new species. Candidates did well on this item with many scoring three or four marks. The best answers observed that unknown species has 5 bands of DNA none of other species has 5 bands so is a new species. They also noted that most bands are in same position as species C so the new species is most closely related to species C. They also noted that species D is next most closely related and that species B has no bands in common so is unrelated based on this evidence.
In Q06(c)(ii) many candidates could describe two other pieces of information the scientists could use to confirm if the new plant is a new species.

Q07 showed a graph with the pressure changes in the left side of the heart and in the aorta during the cardiac cycle.
In Q07(a)(i) candidates were asked to draw on the blank grid, an ECG recording for this cardiac cycle and label the parts P, Q, R, S and T. Most responses could get the shape of the ECG correct but fewer could align it correctly with the cardiac cycle.
In Q07(a)(ii) only the best candidates were able to use the graph to correctly determine how many cardiac cycles there are in one minute.
In Q07(b) candidates were asked to explain what is happening at each point, labelled A, B, C and D, on the graph. Many struggled with this question and did not refer to either the pressure changes in the heart or the subsequent opening or closing of the heart valves. Most of the grade A candidates gained full marks for correctly describing the pressure changes leading to the valves opening or closing at each point in the cardiac cycle.
In Q07(c) candidates did better, most could gain credit for describing the myogenic stimulation of the heart. Many responses gained full marks for describing how the SAN acts as pacemaker causing impulses to travel through heart and atrial contraction. How the AVN delays transmission of impulse so contraction of ventricles occur after the atria. The impulse spreads through Purkinje fibres via bundle of His and impulses travel from the apex of the ventricles.

In Q08(a) most candidates could correctly describe three named methods of passive transport by which substances can enter or leave a cell. They described diffusion, facilitated diffusion and osmosis.
In Q08(b) candidates were told about an investigation into the properties of cell membranes using samples of tissue from a beetroot.
In Q08(b)(i) and (ii) most candidates could state the purpose of washing the beetroot discs but did less well in explaining why they were placed in a water bath at 20^{o}C.
In Q08(b)(iii) candidates were required to calculate the standard deviation for the results at 60% ethanol. Those candidates who had practised these calculations had little difficulty in gaining full marks. Candidates are reminded that they should show stages in their working so that these may be credited if they make a mistake in calculating the final answer.
In Q08(b)(v) most candidates could partially explain that standard deviation is a better measure than range noting that standard deviation uses all of the data but only the best responses also noted that standard deviation is less influenced by extreme values.
Finally, item Q08(b)(vi) required candidates to explain the effect of increasing ethanol concentration on membrane permeability. Many responses gained credit with the best explaining that ethanol can pass through the cell membrane, dissolves the bilipid layer increasing the permeability of the cell membrane and allowing the pigment to diffuse out of the cells.

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

- ensure that you read the question carefully and in level-based items ensure that you refer to all of the information provided in the question
- in compare and contrast items include both similarities and differences and make sure that, for example, the comparison is explicit
- write in detail and use correct and precise biological terminology
- carefully revise core practical work and methods
- remember to use the knowledge and skills acquired during practical work to help in indirect practical skills items
- make sure you are familiar with the maths skills associated with the specification section and understand and have practiced using formulae
- in calculation items show each stage of your working
- always read through your responses and ensure that what you have written makes sense and answers the question fully.

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