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Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel International GCSE Level In Biology (4BI1)

Paper 1BR

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Paper Summary

This was the first January sitting of the reformed Biology specification. The examiners commented on the generally high standard of answers and it was clear that many students had prepared thoroughly for the examination. Teachers have worked very hard to prepare the students for the new specification and it was clear to the examiners that the majority of centres have come to terms with the demands of the new specification. Some students found the newer command words, such as 'comment on' challenging – the specification gives clear definitions of these words and there are examples in the sample assessment materials. Data handling skills were generally very good, and the quality of graph plotting was excellent. Some students were not fully familiar with some of the questions about core practicals – these are an important component of the specification and students should ensure that they have a secure knowledge of them. In general, the students showed a good understanding of experimental planning and the scientific method and could apply their knowledge to different contexts.

In future series, students should try to:

- Ensure that they are fully familiar with all the core practicals in the specification
- Ensure they give full detail in answers and use key scientific vocabulary
- Ensure they are fully familiar with all the command words listed in the specification

Question 1

(a) Most students were able to correctly identify the liver as the site of bile production. Some students incorrectly stated the gall bladder or stomach.

(b) The majority of students were able to correctly select the ovary as the site of progesterone release. Where students did not gain credit, it was typically for identifying the pituitary gland. Students should have a firm knowledge of the sites of hormone production.

(c) This multiple choice question was found to be straightforward by most students with many correctly identifying both the kidneys and skin to be sites of excretion. A few students did not appreciate that the skin is a site of excretion.

(d) This question was well answered by many students with most gaining at least one mark and many gaining all three. Most were able to describe the digestion of protein by proteases and the presence of hydrochloric acid, although fewer students referred to the mechanical digestion that occurs in the stomach. The examiners were encouraged that only a minority of students referred to incorrect enzymes being present in the stomach or the digestion of starch.

Question 2

(a)(i) Most students were able to correctly select chambers P and S as the locations of deoxygenated blood. A few students confused the left and right side of the heart.

(a)(ii) Many students found this question challenging, with only a minority gaining both marks. A common error was for students to not relate their answer to the diagram, which clearly showed the semi-lunar valves as closed, and so many incorrectly referred to the valves preventing backflow of blood into the atria. Students should be careful to always relate their answers to the contexts given in the questions. Many were able to state that valves prevent blood flowing backwards but did not go on to give further details. A number of students thought that the purpose of valves is to prevent the oxygenated and deoxygenated bloods mixing.

(b)(i) Most students found this question straightforward and were able to recognise that the heart disease was higher in men and older age groups. A few students did not identify trends and quoted data points – the question was looking for conclusions rather than just references to data points.

(b)(ii) This calculation was found to be difficult by many students. Most were able to recognise that the heart rate was given as 5 per 1000 and then used this to calculate the heart disease rate for 65 million people. A significant number did not halve the 65 million as the population was evenly split between males and females. It is important to read questions thoroughly to identify all relevant pieces of data.

(c) This question required students to explain why heart disease occurs in terms of blockage of arteries and explain how this can affect someone's health. As this question used the command word, explain, it required students to explain why they would not be able to exercise as much in terms of reduced oxygen transport and reduced respiration rate. Most were able to refer to the reduced ability to exercise or becoming tired more easily but only about half went on to fully explain this.

Question 3

(a) Most students were able to correctly identify the lungs as the location of alveoli.

(b) Most students were able to correctly convert the number into standard form and it was clear that most centres had prepared students for the mathematical questions. Ten percent of marks are derived from mathematical questions and the skills required are given in the specification.

(c) This was a challenging question that differentiated well between students. The question required students to identify the features of an alveolus that enable gas exchange. Many students referred to increased surface areas – this was not relevant to the question as it was asking about the features of a single alveolus. Where students appreciated this, they often gained two or three marks, and many understood the need for alveoli to have a thin membrane for diffusion. Only stronger students referred to the need for constantly flowing blood to maintain a diffusion gradient.

(d) **(i)** This question required students to identify patterns in a graph that showed the respiration rates and alveolar surface areas of different sized animals. Many students were able to identify the positive correlation between respiration rate and alveolar surface area. Most were also able to identify that the alveolar surface area and / or respiration rate increased with the sizes of the animals.

(d)(ii) This question proved to be very challenging for most students with only the strongest gaining any marks. Students were required to give reasons to explain why the respiration rate per gram was higher for a mouse than a human. Only a few recognised that smaller animals have higher surface area : volume ratios and so lose heat faster. Some simply restated the information, describing the increased use of oxygen by humans when not measured per gram.

(e) This question required students to have studied a core practical on respiration. It is essential that students study all the core practicals listed in the specification. The question also asked how students could use the apparatus to generate reliable data, requiring them to explain how they could carry out repeats. Only stronger students correctly stated that the syringe could be used to reset the fluid and / or referred to the measurement of the distance moved by the liquid. A significant number of students mistook the equipment for a potometer or thought that the yeast would photosynthesise.

Question 4

(a) Most students were able to correctly identify the structure as a plasmid. A few gave ambiguous spellings such as plasma or plasm – spelling of technical words is important, especially if the words can be mistaken for other technical terms.

(b) This question required students to explain the increase in antibiotic resistance in a population of bacteria. Many students gave excellent, detailed answers that referred to the mutation of the bacteria, their increased survival, reproduction and the passing on of the resistance gene. Students should be careful to state that the gene, rather than the resistance, is passed on and should be clear that the bacteria reproduce rather than increase in population size.

(c) **(i)** Over half of students were able to correctly calculate the percentage increase. Many students find the calculation of percentage increases challenging and often divided 10.0 by 0.7 rather than finding the actual change. The calculation of percentage changes is an important mathematical skill in biology and students should be familiar with it.

(c) **(ii)** This was a very challenging question that many students found difficult. Students were required to comment on the claim that reducing the use of antibiotics would reduce the number of deaths. The command words 'comment on' requires students to synthesise a number of variables from information or data to reach a conclusion, so all aspects of a question should be considered, and a conclusion reached. Students who gained more than two marks on this question considered both the positive and negative effects of stopping using antibiotics. Common correct answers included the stopping of antibiotics would reduce the selective pressure for antibiotic resistance and that patients could still die from infections.

Question 5

(a) **(i)** This question related to core respiration practicals which students should be familiar with. Most were able to recognise that the yeast would be undergoing respiration or fermentation although a few incorrectly stated that the yeast would be photosynthesising.

(a) **(ii)** Most students were able to correctly state that the gas produced by yeast respiration was carbon dioxide. A few students mistakenly thought that the yeast was photosynthesising and would thus produce oxygen.

(b) **(i)** Graph drawing skills were generally excellent. Many students gained at least four marks and produced fully labelled graphs that had linear scales, accurate plotting and neat, straight lines that joined the points. Most students chose linear scales for the vertical axis that had sensible increments that enabled easy plotting of the points. Students are far less likely to miss-plot points if the scales selected are 'user-friendly.' It was pleasing to see that most students take a great deal of care to label axes and join points with straight lines. Most students correctly did not try to plot a point for 50 ^{o}C.

(b)(ii) This question required students to look at the data and the graph and explain why the rate of reaction had fallen at 55 ^{o}C. Many excellent answers were seen that correctly stated that the enzymes had denatured and then referred to the loss of shape of active sites and / or substrates no longer fitting. Some students gave very vague answers, such as the yeast dying or that respiration had stopped. A few students described the fall in bubble production rate rather than explaining it – students should always consider the command word carefully.

(c) Many students found this question very challenging and did not fully appreciate the meaning of the term 'accurate' and instead suggested carrying out further repeats (which would affect reliability.) Accuracy could have been improved by using a syringe to collect a volume of gas or using finer temperature increments. The question also asked for a modification – this requires a reference to the given method rather than simply stating that gas volume could be measured instead of counting bubbles.

Question 6

(a) This question required students to look carefully at the diagram and determine the process by which energy is lost from the food chain. Most students were able to correctly identify respiration or heat loss, although a few referred to decomposition or decay.

(b) Most students were able to complete this calculation of how much energy was transferred to secondary consumers when given the amount of energy that was lost.

(c) **(i)** This question tested students' knowledge of saprotrophic nutrition from Topic 1 of the specification. Many students were clearly very well prepared and gave excellent answers that referred to the use of extra-cellular enzymes to digest dead, organic material. Where students did not gain credit, it was clear that they did not fully understand what is meant by saprotrophic nutrition.

(d) **(ii)** This question was very challenging and required students to explain the higher transfer of energy to decomposers from producers than from primary consumers. Some excellent answers were seen explaining that less of decomposers is digestible and so is not passed on to the primary consumers, resulting in a higher proportion being lost to the decomposers. Some students also correctly explained that the primary consumers would use more energy in respiration and movement / heat loss. Some students did not fully appreciate that more energy was lost from the producers and so thought that more energy would be passed from producers to primary consumers.

Question 7

(a) Most students were able to correctly give the balanced chemical symbol equation for photosynthesis. A few students gave the equation for respiration or did not balanced the equation correctly.

(b) **(i)** This question required students to look at the apparatus and explain how it could be used to test for the need for carbon dioxide in photosynthesis. This is a core practical in the specification and students should be fully familiar with it. Many students were able to correctly explain how iodine solution is used to test for starch although some gave red as the colour change. Fewer students explained that the plant would require destarching by placing in the

dark before the experiment. When describing practicals, students should give full detail to gain maximal credit.

(b)(ii) Only a few students were able to recognise that by cutting a leaf into many smaller pieces it would enable more repeats to be done and reduce the number of leaves used.

(c) Similarly, to part (b)(i), this question required students to be familiar with a core practical from the specification. Some students showed excellent awareness of the need to test variegated leaves and supply all other factors for photosynthesis such as carbon dioxide. The question also asked for a modification of the method given in the question and so students needed to recognise that the sodium hydroxide would need to be removed. Many students gave inappropriate methods such as boiling leaves in ethanol to remove the chlorophyll before then exposing them to light. Students should be fully familiar with all the core practicals listed in the specification.

Question 8

(a) Many students were able to correctly identify all the structures. Some students mistook the cornea for the conjunctiva, and a few confused the iris and pupil.

(b) (i) The examiners commented on how well many students understood accommodation in the eye. Many excellent accounts were seen that fully explained the roles of the suspensory ligaments and ciliary muscles in making the lens thinner. Some students incorrectly referred to the contraction of the ciliary muscles when looking at distant objects. Another common error was for students to confuse the circular muscles in the iris with the ciliary muscles around the lens.

(b) (ii) This question tested students' knowledge of the role of the retina in a novel context. Many students understood that loss of the retina would lead to blindness and many excellent accounts of the role of the fovea in detecting colour and seeing detail were seen. Some students tended to give vague answers such as unclear focusing which implied that the retina focuses light rather than detecting it.

(c) Many students were able to recognise that the sample size for testing the new eye treatment was insufficient and that the scientists would need to extend the experiment to more people. Many also went on to explain that the duration of the experiment would need to be increased and that side effects should be monitored. When tackling questions about experimental methods, students should always assess factors such as sample sizes and control variables when deciding on the validity of the method.

Question 9

(a)(i) This question required students to note that the condition of syndactyly is caused by a dominant allele. In order to produce a chid without syndactyly, the father without syndactyly would have a genotype of dd, whilst the mother would have a genotype of Dd. It also required students to produce a genetic diagram. Many excellent genetic diagrams were seen that had fully labelled parental genotypes, gametes and the child's genotype. Some students did not clearly state the phenotype and genotype of the child – students should always be very clear with labelling. Some students gave the wrong parental genotypes and so were unable to complete the cross correctly.

(a)(ii) Most students were able to correctly determine that the probability of producing a child with syndactyly was 0.5. Many did go on to multiply this by 0.5 probability of the child being a girl to give a correct answer of 0.25. Some students incorrectly gave ratios – students should be careful to read questions carefully.

(b) This question was found to be very challenging by many students. It required students to give differences in how recessive and dominant alleles are inherited. Some students gave excellent answers that explained that to have a recessive condition, two alleles must be inherited but only one dominant allele is required to have a dominant condition. Other students explained that recessive alleles can be carried but dominant alleles cannot. Many students did not fully understand the significance of the terms dominant and recessive and so did not gain any credit.

(c) Many students recognised that the genetic control of most phenotypic features is polygenic so that many genes are involved. Where students did not gain credit, they frequently confused the idea of multiple alleles with many genes. Multiple alleles refers to the number of different forms of a gene within a population and is not the same as polygenic whereby several different genes affect a phenotype.

Question 10

(a) Most students were able to gain at least one mark for part (i) and then go on to correctly use their value to give the BMI in part (ii). Where students did not gain both marks for part (i), it was typically due to not recognising that the height of the person was given in centimetres and the formula for BMI had height in metres. Students should always be careful to use units consistently.

(b) This question required students to predict the effect of having high density muscle on BMI. Most students appreciated that this would increase body mass and so increase the BMI.

(c) Many students found both parts (i) and (ii) challenging. Part (i) required students to recognise that carbohydrates and lipids are energy rich molecules

and so if less food is consumed, the energy demand exceeds the energy taken in and so body mass will decrease. In part (ii), students had to link the reduction of energy in food to the increased respiration rate and energy use of muscles during exercise. Many students did not give enough detail in their answers to gain full credit, with many not referring to energy or respiration. Students should always try to give full detail and use scientific vocabulary.

Question 10

(a)(i) The majority of students were able to recognise the cycle as the Carbon cycle.

(a)(ii) This question required students to identify that process A was photosynthesis and so took carbon dioxide in from the environment. Most students correctly identified process A from the list.

(a)(iii) This question asked the students to identify two groups of decomposer microorganisms. Most were able to identify one of fungi or bacteria but some suggested animals or gave specific species or types of bacteria. The question asked for groups of micro-organisms – students should be careful to read questions.

(b) This question was the experimental planning question and it followed a similar format to previous series. Many students were clearly very well prepared for this type of question and gave detailed, accurate experimental designs. It was very pleasing to see that many gave full experimental details rather than just listing variables. Most were able to state that a range of temperatures would be investigated and that the change in mass of plant material would be measured. Most students appreciated that the experiment would need repeating to ensure reliability and that there were biotic and abiotic variables that need to be kept constant. Marks were often lost due to not giving a stated time for the experiment – it is not enough to suggest the 'same time.' Some students gave vague references to 'keeping all other factors constant' – they should always state the relevant factors that need to be controlled. It is also good practice to refer to volumes / masses / lengths etc rather than referring to 'amounts.' Some students did not appreciate that the question was asking for an experimental plan and unfortunately gave explanations for the decomposition of wood.