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Examiners' Report/ Principal Examiner Feedback

Summer 2016

Pearson Edexcel International GCSE in Biology (4BI0) Paper 1BR

Pearson Edexcel International in Science Double Award (4SC0) Paper 1BR

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Summer 2016
Publications Code 4BI0_1BR_1606_ER

Examiner's Report International GCSE Biology 4BI0 1BR

The examiners were, once again, impressed by the knowledge and understanding shown by candidates on the papers. Candidates were able to apply their knowledge and understanding, analysis and evaluation and investigative skills to some unfamiliar experiments and to new contexts. Centres have worked hard to prepare students for the examination and this was evident in the responses of candidates. Few candidates failed to attempt all questions. There is no evidence of candidates being short of time on this paper.

Q1 This question was a gentle introduction to the paper and tested candidate understanding of the function of parts of a yeast cell. In part (a), most candidates gained both marks. The most common error was to select D as the part that controls the movement of molecules into the cell.

Part (b) was well answered. The most common error was the belief that yeast can only reproduce inside living cells. Candidates lost credit if they selected the correct statements, but also selected other statements.

Q2 This question tested candidate understanding of the structure of a palisade cell in a leaf. In part (a), most candidates appreciated that the organ observed through the microscope was a leaf.

In part (b), credit was only given if candidates used the term 'tissue' in their answer together with the idea of a specific function. There were few weak answers in part (c). The drawings of cell X were pleasing, no doubt assisted by the diagram. The labelling was equally pleasing, though credit was not given for mitochondria or ribosomes. No credit was given if a drawn chloroplast was labelled 'chlorophyll'. A number of candidates mistook cell membrane for cell wall. A mean mark of 2.67 indicates sound knowledge of the structure of plant cells.

Q3 The vast majority of candidates were able to name grass as the producer in the food chain. Part (b)(i) was more challenging, but the correct answer of 1600 was evident in many scripts. Credit of one mark was available to candidates with an incorrect answer but with 96,000, 1.6 or a number divided by 60 in their working.

In part (b)(ii), many candidates appreciated that a limited oxygen supply would result in a change to less energy yielding anaerobic respiration and that this form of respiration produces lactic acid which would affect enzyme function.

Many candidates were able to demonstrate excellent understanding of natural selection in part (c). Examiners credited answers that made reference to mutation, variation, survival, reproduction and the passing on of the allele for striped coat. Some candidates failed to gain full credit due to imprecise language such as not stating the terms survive or mutation. Many also lost credit by referring to characteristics being passed on rather than genes.

Part (d)(i) was more challenging with only the better candidates appreciating that the light would reflect back through the retina again, thus stimulating more sense cells. Part (d)(ii) required a structural adaptation but examiners were allowed to reward a suitable physiological adaptation. Some correctly stated that there were more rod cells.

Part (e) discriminated very well with only the better candidates appreciating that meat is protein and that amylase cannot digest protein. Many candidates gained credit by making reference to the converse of these ideas. So, an answer stating that a lion does not eat starch and that amylase digests starch gained full marks. Many candidates lacked precision in their answers and lost credit by stating carbohydrate rather than starch.

Q4 Most candidates appreciated that the correct answer to part (a)(i) required the months of November and December to be named. Naming only one of these months lost credit. Candidates were able to interpret the data to name grass or yew as the species likely to have the greatest effect of causing hay fever. However, marks were lost by poor expression. An answer stating that grass is responsible because it produces lots of pollen for many months would gain no credit. The examiners rewarded answers that were precise. So, they would credit a candidate stating that grass produced the most pollen for the longest duration. Candidates who chose yew as their species could only gain one mark for duration.

The most common correct responses in part (b) were rain and wind. Temperature as an abiotic factor was also credited. Candidates who used less precise terms such as the weather lost credit.

Many candidates were aware of the events that take place from pollen grain germination to seed formation. However, the examiners noted many answers that were poorly constructed and confused. For example, many believe that pollen grains enter and fertilise ovules. There were also some excellent answers that gave a well organised account of events from the pollen landing on the stigma to the formation of fruit. These candidates also used very accurate vocabulary. Candidates are encouraged to plan their answers before starting to write.

Q5 The graph was done well by most candidates. Credit was given for a suitable scale on the y axis that used at least half the grid, plotting points accurately, drawing a neat line through the points, putting the independent variable on the x axis and the dependent variable on the y axis. Marks tended to be lost by failing to label the axes or by not providing a key. Part (b) credited those who understand the term 'explain'. Sadly, this command word continues to challenge candidates. Examiners gave no credit to candidates who described the pattern in the data. An explanation was required which included reference to pests initially being killed by the pesticide and then explaining that those not killed had a mutation that provided resistance. Therefore, they reproduced and passed on the allele for resistance to their offspring. Credit was also given to those candidates who suggested that the pesticide may not have been reached all parts of the area being treated or that the pesticide was biodegradable or washed away. The mean mark for this question part was 1.02.

In part (c), candidates seldom mentioned the credit worthy ideas of greater decrease in pest numbers or that the decrease lasted longer. Most candidates made reference to the specificity of biological control and that unlike pesticide there is no reapplication needed and pest resistance cannot happen.

Most candidates scored highly in part (d). The mean mark was 3.30. The use of many quadrats placed randomly to count organisms is well understood. Only the better candidates realised the need to multiply their average value by the total number of quadrats that could be placed in an area to gain an estimate of the population. Credit was given for the idea of random placing, replication, counting and multiplying with any sensible apparatus that could be used in an ecological survey of this type. For example, the use of baited traps or pheromone traps was accepted.

Q6 Most candidates were able to recall in part (a) that ultrafiltration occurs at part A and that glucose reabsorption occurs at part B.

In part (b), the role of ADH in the regulation of the water content of the blood was more challenging. The best candidates appreciated that the diuretic would travel in the blood to the pituitary and inhibit the release of ADH. As a result, the walls of the collecting duct would be less permeable and less water would be reabsorbed in the blood. Candidates who simply recalled the role of ADH lost some credit because they wrote about an increase in permeability and more reabsorption of water. This question discriminated well with a mean of 2.58.

Q7 This question tested candidate understanding of the structure and function of the heart. Part (a) revealed a range of understanding with only the better candidates expressing their answers correctly and clearly. Candidates gave credit in (a)(i) for a correctly named blood vessel attached to the right side of the heart, or by stating that the ventricle wall was thinner. Candidates were not credited if they wrote that the right side of the heart had thinner walls, again stressing the need to be precise. The vast majority of candidates recalled that chamber A is the left ventricle but correctly labelling the pulmonary artery posed more of a challenge. In (a)(iv), examiners rewarded candidates who explained that the thicker wall was a result of more muscle tissue which enables the left ventricle to pump blood with more force over a longer distance.

In part (b)(i), about half the candidates named structure C as the tricuspid or atrioventricular valve. The most common incorrect response was to name the valve as the biscuspid. The vast majority of candidates appreciate that the atrioventricular valves prevent backflow of blood into the atria.

Part (c) asked candidates to suggest how a hole in the septum might affect a baby. The examiners were impressed by the number of students who understood that deoxygenated and oxygenated blood would mix and many students commented on the consequence of this mixing by commenting on the lack of oxygen transport to body cells. Marks were also awarded to students who made reference to the change in cell respiration and that the growth of the baby would be affected.

In part (d), the best candidates understood the need to feel a pulse on a named body part and to count the beats per minute. Weaker candidates tended to refer to only one of these ideas or they failed to name an acceptable body part or failed to correctly quantify the heart rate measurement. In part (d)(ii), most suggested the idea of replication, but only the better candidates offered another acceptable response such as controlling the duration of the exercise, or controlling something specific about the people such as age.

Q8 This question tested candidate understanding of air pollution. Candidates usually perform well with this style of question, no doubt helped by the considerable scaffolding in place. The examiners were impressed by most answers, though it was noted that methane production by cows and CFC production from old refrigerators seemed less well known. Most candidates were aware that burning of fossil fuels releases sulphur dioxide into the air which leads to the formation of acid rain. Candidates who wrote that carbon monoxide combines with red blood cells lost credit as the examiners only accepted haemoglobin. Most candidates were aware that greenhouse gases contribute to global warming.

Q9 Defining diffusion in (a)(i) posed little difficulty for most. Incorrect responses tended to state that ‘substances’ are moved from a high concentration to a low concentration. Candidates who made reference to diffusion gradient had to state ‘down’ rather than ‘along’ or ‘across’ to gain credit. Most were able to measure the 3mm distance moved by the dye in (ii) and also to complete the diagram correctly in (iii). A surprising number of candidates shaded outside the border provided or fully shaded the cube.

In (b) most were able to show that the dye would travel further but again some shaded outside the border provided or fully shaded the cube.

Part (c) was a challenging question, but most candidates were able to recall that temperature could affect the rate of diffusion by its effect on the kinetic energy and movement of molecules. The second most popular correct response was that of the concentration of the dye as this would affect the concentration gradient. The examiners also credited the concentration of the agar.

Part (d) challenged the most able students but the examiners were pleased to note a good number of knowledgeable responses. These candidates effectively linked the observations of the diffusion experiment to the problems facing a large organism. As such, they made correct reference to inadequacy of diffusion to supply oxygen to all body cells in large organisms with their small surface area to volume ratios. Weaker students were unsure as to whether large animals would have a large or small surface area: volume ratio.

Q10 This question tested understanding of some of the basic principles linked to fish farming. Part (a) offered a gentle introduction and many candidates scored highly by making reference to acceptable ideas such as the ability to control the quality of the fish, the possibility of farming genetically modified fish, the reduction in overfishing, the possibility of having fish available all year and the fact that risk to fishermen is reduced. The better candidates in ((b)(i) appreciated that water from underground is unlikely to be polluted by pathogens, fertiliser from run off or sewage. Many candidates lost credit, yet again, by failing to be precise. Examiners did not reward ideas that lacked detail such as the water being cleaner or less polluted.

Many candidates gained both marks for the calculation in part (c)(i). The most common answer was 37.9, though 38 was also accepted. Candidates who gave a different answer still had the opportunity to gain one mark if 1.1 as a numerator, 2.9 as a denominator or 37.93 could be seen in their working. The experimental design question in part (c)(ii) was attempted by most and discriminated very well between candidates. The mark scheme allowed marks to be credited for an ecological approach or a laboratory based approach. As such, the use of waste from both types of farm was credited as was the source of this waste being from the same species of fish. A mark was given for measuring pollution not waste

production. There were many acceptable methods including turbidity, nitrate level, oxygen level and biodiversity. A mark was available for making a sensible reference to time. This could be how long the waste was left in a tank of water or how long the oxygen probe should be left in a sample of water. There were many acceptable variations on this theme. Marks were available for standardisation of abiotic factors including diet, sampling distance along a river or using the temperature of water in a fish tank. As ever, one mark was available to those candidates who appreciated the need to replicate their experiment to achieve reliable data.

Q11 Most candidates were able to recall the chemical symbol equation for photosynthesis in part (a). The weaker candidates lost credit for not balancing their equation or writing a chemical symbol equation for respiration. A word equation was not given any credit. Care should be taken to use correct chemical notation and not to use superscripts.

Part (b)(ii) tested understanding of how changes in abiotic factors during the day affect the rate of photosynthesis. Two marks were available for naming two of temperature, light or carbon dioxide as the abiotic factors; one mark for stating how one of these factors affected rate of photosynthesis, and one mark for noting how the level of one of these factors changed during the day. The latter idea posed most difficulty for candidates. In part (b)(ii), candidates displayed good understanding of how very high temperatures could reduce growth of plants. The most common correct response for two marks noted that enzyme denaturation would reduce photosynthesis. The better candidates gained another mark by stating that transpiration would increase and that this would affect cell turgor, or acknowledged that stomata would close and this would reduce carbon dioxide uptake.

Q12 This question tested candidate understanding of cell division. In part (a), most were able to recall that cell division A was mitosis. Examiners were instructed to only accept the correct spelling of this term. Part (b) was more challenging but most were able to note that the diagram showed that cell division A produced two daughter cells in one cell division, each containing the diploid number of chromosomes. Common errors were to refer to aspects of mitosis and meiosis not seen in the diagram, such as cell division B occurs in the gonads, or that cell division A is involved in asexual reproduction. Some of the weaker candidates made reference to the number of chromosomes found in human cells rather than the number found in the cells shown in the diagram. Part (b) surprisingly revealed that candidates are not fully aware of where mitosis and meiosis take place in a flowering plant.

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