

Examiners' Report January 2008

GCE

GCE O Level Biology (7040)

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PAPER 1

Question 1

Part (a) of this question required students to recall the names and functions of blood components. As hoped, the question was well answered by most candidates, serving as a gentle introduction to the paper. The carrying of oxygen by red blood cells and the phagocytic function of white blood cells were the most common responses for the cellular components. The role of platelets in the clotting process unfortunately posed the greatest difficulty, with many leaving a blank space. Part (b) of this question enabled candidates to show excellent understanding of the link between structure and function with reference to red blood cells. Most correct responses linked haemoglobin to the transport of oxygen and the biconcave shape to providing a large surface area.

Question 2

This question was designed to help students recall the main principles of eutrophication, a topic often answered poorly in past papers. Sadly, candidates still struggled to gain high marks. Many incorrectly quoted nitrogen as a mineral ion and very few recalled the technical term 'leaching'. Many believed that plants would not carry out respiration, as opposed to photosynthesis, when light is blocked by larger plants, and others were unable to quote the type of microorganism involved in decomposition. In the final space of the question, a surprising number of candidates named a terrestrial animal, or an animal highly unlikely to be found in rivers, such as an elephant!

Question 3

This question tested understanding of biological principles in a novel context and it was pleasing to read many references to vasoconstriction and its importance in preventing heat loss in (a). Part (b)(i) tested basic recall and yet many candidates struggled to get two marks, with water being the most common incorrect response. The fact that frostbite would make diffusion and blood flow very difficult was appreciated by a pleasing number of candidates.

Question 4

This question challenged students to recall characteristics of living organisms. Many students appreciated that growth involves an increase in cell number or an increase in the size of the organism. Many chose to describe the process of cell division, which was acceptable. Nutrition was well understood and answers discussing autotrophic or heterotrophic methods were accepted. Most correct answers relating to an example of a response discussed moving a hand off a hot object. Candidates lost credit by being vague with their answer relating to control. For example, vasodilation or sweating alone gained no mark: reference to the link to control of body temperature was required. Excretion was well understood, but many candidates made the error of describing egestion. Reproduction as the process that produces offspring was well answered, although a number of candidates described pollination or sexual intercourse - ideas that were not credited.

Question 5

Candidates have an excellent knowledge and understanding of sex inheritance and the organs that produce gametes for use in fertilisation. Occasionally, a few candidates would incorrectly write YY as the sex chromosomes found in a male body cell but, as stated, the vast majority scored highly throughout this question.

Question 6

Many candidates demonstrated sound ability in calculating, often gaining one mark in (a)(i) for the answer 0.07. The requirement for a + sign was waived by the markers. Giving the answer of 2.5 to (a)(ii) was sufficient to gain two marks. The percentage symbol was not required. Candidates who gave the wrong answer to (a)(i) could still gain full marks if they showed in their working that they had divided this number by 2.8 and multiplied the answer by 100. Part (a)(iii) was difficult for most candidates with only the very best appreciating that the potato cylinders used were of different starting masses and percentage change, therefore, makes it easier to compare values. It was pleasing to see the term osmosis in many answers to (b), and many candidates were able to explain its role in increasing the mass of the potato cylinders. Candidates need to be careful when discussing concentrations: stating the term 'high concentration' is not helpful unless clarified. The correct use of the term 'water potential' was accepted although it is not a term used in the specification. Weaker candidates believed it was the movement of ions that was responsible for the mass increase.

Question 7

Simple food chains and pyramids of biomass continue to confound weaker candidates. Common errors included arrows going in the wrong direction, food chains with more organisms than those provided, inverted pyramids or pyramids incorrectly labelled. However, most candidates understood what is meant by the term primary consumer and, as such, correctly chose the small fish. In (b), the roles of protease enzyme and hydrochloric acid in digestion were well understood, and there were many excellent accounts gaining full marks. Part (c) was more problematic because some candidates failed to read the question carefully and gave answers that explained how the loss of pike would impact on other organisms in the food web shared by the pike.

Question 8

This question challenged the ability of candidates to describe data presented in graphical form. Part (a)(i) was well answered, but (a)(ii) caused more difficulty. Candidates who simply described changes in the blood glucose of person B with no reference to the changes taking place at the same time in person A lost marks. In (b), the mark was awarded only if person A was selected and the explanation made it clear that the blood glucose in this person rose higher than that of person B. Most candidates appreciated that insulin or glucagon were the hormones involved with regulation of blood glucose, and that these hormones were produced in the pancreas. The most common error was the belief that these hormones were produced in the liver.

Question 9

This question tested knowledge about diseases, their causative organism and their method of transmission. Candidates showed sound knowledge about HIV and AIDS and were mostly able to recall a disease caused by a bacterium, with cholera being the most popular choice. Malaria was also well understood, but a surprising number of good candidates wrongly believed the disease to be caused by a virus.

Question 10

Candidates often struggle to recall the principles that underpin the practice of fish farming and this paper was no exception. Answers were poor, lacked detail and were often confused. Oxygenation of water, protection from predators, control of disease, separation of different aged fish and regulation of feeding with high protein food were all credited, as were ideas relating to selective breeding. In (b), kwashiorkor was the anticipated answer, which most candidates recalled. Marasmus was also allowed.

Question 11

Most candidates named the nucleus as an organelle, with mitochondria also mentioned by many. Cytoplasm and vacuole were common wrong answers. Accurate recall of the word equation for photosynthesis pleased the examiners, but the ability to recall Benedict's test disappointed, many confusing the procedure with the starch test. Part (c) was challenging as students were asked to suggest an explanation for an unfamiliar context. Many were aware of the absorption of red light by chlorophyll, but other sensible suggestions that had an element of biological support were accepted. Many candidates were able to recall the role of photosynthesis making glucose.

Question 12

This question tested simple recall and also the functioning of the human lung in a novel context. The recall of the named structures posed little difficulty, and most candidates were aware of the role the ribcage has in protecting vital organs and its role in ventilation. However, the role of the diaphragm was less well known and often answers were confusing the direction the diaphragm moves on contraction and how this affects the chest volume. Part (b) was very challenging, and only the best candidates appreciated that a stab wound would make the lungs collapse and make it very difficult to ventilate the lungs because pressure changes cannot be achieved. Many candidates discussed the pain involved with breathing or discussed the reduction in gas exchange due to damaged alveoli, answers that were not credited. A surprising number of candidates gave the impression that they thought the lungs were like a balloon and would burst on being stabbed.

Question 13

This question discriminated extremely well. The number of cells produced by cell division posed greatest difficulty, though a surprising number of candidates believed that there are 46 chromosomes in a red blood cell. Also challenging was to recall that glucose has three elements and that the number of trophic levels expected was four. Most recalled that the heart has four chambers.

PAPER 2

General Comments

Once again the examiners were impressed by the range and depth of knowledge and understanding shown by the candidates this summer. This series was the second time that the revised specification and new format papers were used. Candidates seemed to cope well with the new system with only a few papers in which candidates failed to follow the rubric.

The new format and structure of Paper 2 had been widely promoted on the Edexcel International web site and through INSET training over the last two years. It broadly follows the structure of the previous Paper 1, containing comprehension, data analysis and interpretation and longer essay type questions.

Section A

Question 1

This question consisted of a passage on the application of gene therapy on which most candidates were able to gain marks. In (a), many candidates were able to produce a genetic diagram to explain how two heterozygous parents could produce a homozygous recessive individual with cystic fibrosis. Almost all candidates could name bacteria in (b). Some candidates were unable to gain credit in (c) as they wrote in vague terms about DNA. All that was required was an explanation that recombinant DNA contains a different 'human' gene inserted into the viral plasmid. Most candidates could give coughing or difficulty in breathing as symptoms of the condition in (d). Candidates had no difficulty with the meaning of pathogenic in (e). In (f), the best candidates could name phagocytes and lymphocytes and describe their different roles. Some weaker responses confused antibiotics with antibodies. In (g), most candidates could describe how the air entering the bubble needs to be sterilised so that it is free of harmful bacterial. Likewise, most could name mitosis as the type of cell division that produces white blood cells in (h).

Question 2

This question asked candidates to design an experiment to determine the effect of fertiliser on the growth of a cereal crop. Many candidates used the CORMS prompt to earn credit. Some failed to earn full marks by not choosing a suitable time scale for a cereal to grow in or described a period of 'a few days'; others did not specify how they would measure growth rate. Centres should encourage students to be specific in these cases so 'height after four weeks' would earn credit while 'growth after a few days' would not.

Question 3

This question required candidates to examine data on the oxygen levels in aquatic mammals. In (a), most candidates could identify which mammal had the highest volume of oxygen in its lungs and in its blood. They were also mostly able to calculate the volume of oxygen present in the blood of a 50 kg human. A few candidates were unable to calculate the percentage of oxygen contained in the blood of a sperm whale. In (b), most responses described how oxygen diffuses down a concentration gradient from the alveolar air into the red blood cells where it combines with the haemoglobin. However, in (c) only a few responses gained full credit for suggesting that the lower volume of oxygen in the lungs would enable these animals to dive and the higher volume of oxygen in their blood would enable aerobic respiration to continue.

Question 4

This question required candidates to plot a graph to show the effect of stomatal aperture on transpiration rate. Most gained high marks in (a) for plotting the lines but a few did not gain full credit as they failed to include units or label the lines for still air and wind. In (a)(iii), only the best candidates could describe that although the rate of transpiration increases with increasing width, it increases steeply for low widths but begins to level off as aperture increases. Candidates fared better in (c) and were able to explain how wind removes the humid air and restores a diffusion gradient so water evaporates faster. In (d), the best candidates earned credit for explaining the role of transpiration in cooling the plant and how the transpiration stream enables water to be drawn up from the soil by the roots and carried into the leaves.

Question 5

This question described a familiar experiment in which the energy value of bread is determined. In (a), candidates needed to explain how the chemical energy from the carbohydrate is released as the bread is burned and this heat energy is transferred to the water molecules and the water temperature rises. Those candidates from centres where this experiment had been carried out would have found this much easier. In (b), candidates had to calculate the energy using the formula provided and then convert this to an energy value for 100 g of bread. Most were able to do this. In (c), candidates needed to suggest reasons why the energy value given on the packet was different from the value calculated by the simple experiment. While most were able to explain heat loss, few candidates could describe how the bread may not be fully burned and, therefore, have energy left. Finally, candidates were asked to suggest ways that the experiment could be improved. Most gained some credit for suggesting insulation of the tube as a way of reducing heat loss; other suggestions involved burning the bread in oxygen so that it is fully combusted and igniting the bread closer to the tube so less heat is lost as you move the bread. Candidates also suggested repeating the experiment to obtain a more reliable result, although some incorrectly suggested that this would improve accuracy.

Section B

This provided a choice of short answer questions for candidates.

Question 6

This question was answered by 90% of the candidates. In (a), most were able to describe the difference between plant and animal nutrition. The commonest answers included plants using photosynthesis which is autotrophic and requires sunlight. In (b), candidates did much less well with their attempts to explain why asexual reproduction leads to less variation. The better responses included asexual reproduction comes from one parent cell, that no formation or fusion of gametes takes place and that, therefore, no genetic variation results.

Question 7

This question was answered by 91% of candidates. In (a), candidates were asked the meaning of the terms stimulus, receptor and response. Many could describe stimulus as a change in the external environment which is detected by the receptor which in turn causes the effector to respond. In (b), most candidates could describe the role of the suspensory ligaments and the ciliary muscles in changing the shape of the lens. Better candidates could remember that the lens becomes flatter due to the relaxation of the ciliary muscles and that this pulls the suspensory ligaments tight.

Question 8

This question was answered by only 14% of the candidates. Those who chose this question tended to do less well. Many gained only a few marks in (a). The examiners expected a contrast between selective breeding and genetic modification. They could have been compared with regard to same versus different species, chosen phenotype versus gene transfer, many generations versus one generation and sexual reproduction versus using a vector. Candidates did no better in (b) and most seemed to have no idea about transgenic animals so could not evaluate their potential.

Section C

This contained a choice of long answer prose questions.

Question 9

This question was the most popular, being answered by 98% of candidates. Many candidates scored highly with an excellent account of the digestion of carbohydrate and lipid in the mouth and small intestine. They named the appropriate substrates, enzymes and products and showed good understanding of the processes involved in absorption of digested food.

Question 10

This question was answered by 39% of candidates. Some candidates were able to write at length and with confidence about fossil fuels, the gases that can lead to acid rain and its effects, carbon monoxide and its effect on oxygen transport, greenhouse gases and global warming. Others described gases causing harm but no specific gases or effects were described so these candidates earned no credit.

Question 11

This question was answered by 76% of candidates. This was often well done with many candidates showing excellent knowledge and understanding of the processes that occur in the kidney, their location and function.

BIOLOGY 7040, GRADE BOUNDARIES

Grade	A	B	C	D	E
Lowest mark for award of grade	148	128	109	99	73

Note: Grade boundaries may vary from year to year and from subject to subject, depending on the demands of the question paper.

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