

Examiners' Report

GCE O Level Biology (7040)

June 2006

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BIOLOGY 7040, CHIEF EXAMINER'S REPORT

General Comments

The examiners were once again impressed by the knowledge and understanding shown by the candidates sitting the papers this summer. They displayed a good range of biological knowledge and were able to explain as well as describe relevant facts and principles.

Paper 1

Section A

Question 1

The questions on a printed passage this summer looked at the topic of using viral bandages as a way of reducing bacterial infection. In (a), candidates needed to give two ways that bacteria and viruses differed in structure. Many candidates correctly stated that viruses are smaller than bacteria and lack a cell wall, membrane, cytoplasm etc. Weaker candidates mentioned the presence of a nucleus or described viral functioning rather than structure. In (b), most responses described how the fungi gain an advantage by killing the bacteria with which they compete for food. In (c), some candidates confused resistance to antibiotics with immunity and therefore failed to earn credit. For (d), the examiners wanted a description of how viruses reproduce inside host cells. We were impressed by many answers yet candidates from some centres wrote vague descriptions about cells splitting. In (e), credit could be earned by quoting from the passage that different phages attack different bacteria and by explaining that using a specific phage prevents the body's cells from being attacked, and ensures that only the harmful bacteria are targeted. Finally almost all candidates were able to identify two bacterial diseases named in the passage.

Question 2

This question provided candidates with data on the distribution of stomata on the upper and lower surfaces of different species of leaves. In (a), the candidates were asked to identify the species with the most stomata, the greatest difference in distribution and calculate the number of stomata on the upper surface of a leaf of a certain size. The first two proved straightforward, but many candidates struggled to perform the calculation correctly and often the answer quoted was out by a factor of 10. However, some of these attempts will have picked up marks for their working, even when the final answer was wrong. Therefore, we encourage centres to continue to ask candidates to show their working in such questions. In (b), only the best responses earned full credit, describing the greater number of stomata on the lower surface reducing transpiration by avoiding exposure to the heat and light of the sun. In (c), the best candidates noted that as a monocotyledonous plant, maize has vertical leaves so both surfaces are equally exposed to light. Finally, (d) illustrated the difference between candidates who had used a microscope or had seen a photomicrograph and those who had not seen such a preparation.

Section B

Question 3

This was quite a popular question being attempted by 71% of the candidates.

In (a), most candidates were able to describe how damage would affect the medulla oblongata and the cerebral hemispheres. Candidates often struggled to find two problems associated with damage to the cerebellum. While disturbance to balance was often given, fewer recalled the role of the cerebellum in coordinating motor patterns. However, candidates from some centres gave excellent examples such as describing how walking would be affected. We were disappointed with the drawings of the elbow joint produced in (b). These often lacked any detail of the joint such as showing synovial membranes, fluid or cartilage; often the ligaments and tendons were incorrect. Candidates did not fair much better at describing the events when the arm bends, with incorrect muscles and bones being given. The descriptions of the withdrawal reflex were very much better and often full marks were obtained. In the experiment design item (c)(ii), some interesting suggestions were made. Many candidates once again used *CORMS* as a prompt. The hot object did not, however, need to be so hot as to produce injury. While such answers were credited, we suggest in going through the paper with candidates that teachers describe a method that would not result in the participant becoming injured.

Question 4

This was the least popular question being attempted by only 31% of the candidates.

In (a), several candidates failed to earn full credit as they did not state that a community consists of different species living in the same habitat. In (b), most were able to gain high marks for describing how light is absorbed by chlorophyll and that this energy is used in photosynthesis to combine water and carbon dioxide to produce glucose. Only the best candidates were able to describe how some light is reflected from the leaves, some energy is used in respiration by the tree, some of the leaves are not eaten, and some of the eaten leaves are not digested or absorbed. For the experiment design item in (c), candidates were able to describe the experiment they would carry out. As in other questions those who used a prompt such as *CORMS* were able to gain most marks. In (d), some candidates confused tissue culture with genetic modification but others were able to describe how cells could be grown on sterile agar containing suitable minerals and plant growth substances. Candidates were also required to describe the effect of deforestation on the balance of gases but many described all the effects of deforestation rather than restricting their answer to changes in carbon dioxide, oxygen and water vapour due to reduction in photosynthesis and transpiration.

Question 5

This question also proved to be unpopular with 45% of candidates attempting it.

Most answers in (a) gained marks for describing how yeast ferments the sugars in fruit to produce ethanol and carbon dioxide, and that this is an example of anaerobic respiration. Part (b) required them to describe how genetic engineering can be used to produce human insulin from bacteria. The responses tended to vary between centres with some excellent accounts given. Other weaker candidates did not earn many marks as they could not recall the enzymes involved and their roles. In (c), candidates struggled to explain the terms gene, allele, chromosome and nucleus succinctly. The mark scheme illustrates the answers the examiners were expecting. The poor explanations for gene and allele in particular show the need for centres to give clear definitions to their students. Part (d) again allowed candidates using prompts to access high marks for their experimental design.

Question 6

This was the second most popular question, being chosen by 76% of candidates.

Almost all candidates were able to gain marks for their description of the structure and function of the male reproductive system in (a). Many candidates were able to write confidently about this and gain full marks. In (b), the candidates did less well. They were often able to describe menstruation but could not explain its importance in preparing the uterine lining for implantation. Some candidates tried to explain copulation in terms of degeneration of the corpus luteum suggesting that they had never heard of this term. They were more knowledgeable about fertilisation but again only the best candidates could explain its importance in terms of allowing genes to combine and produce variation. In (c), many candidates were still unable to describe the differences between sexual and asexual reproduction. The examiners expected statements about gamete formation, fertilisation and genetic variation. Vague descriptions about offspring being similar or only one parent gained no credit. For the second part of (c) we expected answers describing a suitable environment that is not likely to change and where the plant is well suited. Few candidates were able to describe this. The answers to (d) were better, with good explanations of the procedure and controls that could be used.

Question 7

This was the most popular question being attempted by 77% of the candidates.

The candidates who chose this question generally scored highly. A few failed to gain full credit in (a) because they were unclear of the role of the left and right side of the heart or the position and functioning of the chambers. In (b), lots of good answers were seen, with candidates stating clearly the role of the red cells in using haemoglobin to transport oxygen from the lungs to the body cells. A few responses suggested that carboxyhaemoglobin has a role in the transport of carbon dioxide and centres should correct this belief. The experimental design item in (d) produced many good responses and it was evident that candidates are being better prepared for such questions.

Paper 2

Question 1

The vast majority of the candidates were able to recall two other components of a balanced diet. A smaller number, perhaps the nervous candidates, failed to read the question carefully and gave carbohydrate, fat or protein as their answers. In (b)(i), lipase was well known as the enzyme responsible for fat digestion. Part (b)(ii) was more challenging. Credit was given for appreciating that lipid digestion produces fatty acids and glycerol, but candidates were expected to note that less absorption of fat - or more egestion - would occur if lipid was prevented from being digested and that, as a consequence, less storage would be possible. Many candidates failed to read the question carefully and tended to give an account of fat digestion in general. Many candidates were able to calculate correctly that 3.6 g of lipid would be digested. Incorrect answers could gain one mark if the number 12 appeared anywhere in the working and a number of candidates benefited from this application of the mark scheme.

Question 2

Again, candidates are encouraged to read questions carefully. Examples of unicellular organisms were anticipated, so candidates who named multicellular examples lost marks. In a similar way, candidates who named a non-parasitic protozoan also lost credit. Understanding of the structure of the organisms and their ability to carry out photosynthesis discriminated the better candidates from the less knowledgeable.

Question 3

This was a challenging genetics question but many candidates correctly identified the allele 'O' as the recessive allele, and alleles 'A' and 'B' as being codominant. Explanations tended to be less secure, and occasionally convoluted, but many were able to express acceptable responses to explain their choices. The layout of (b) helped candidates to score highly. The most frequent mistake was to omit giving the genotypes of the gametes.

Question 4

Most candidates were able to identify the endocrine glands. An unclear diagram meant that either 'pituitary' or 'thyroid' were accepted for the gland labelled L. Candidates who named the hormones secreted by the glands were not given credit. In (b), marks were lost if the role of hormones was described. The question asked for the role of endocrine glands and responses had to make reference to the secretion of hormones by these ductless glands into the blood in order to achieve homeostatic or long-term developmental effects. Many candidates appreciated that insulin lowers blood glucose levels and that a lack of the hormone would cause blood glucose levels to rise, with consequent detrimental osmotic effects on cells. Named damaging effects on the health of body were mentioned by the better candidates, as well as recognition that glucose would be excreted in the urine. In (c) (ii), candidates were encouraged to appreciate the importance of being precise in their answers. As such, stating that glucose intake should be regulated did not impress the examiners as much as a statement that said that glucose intake should be reduced.

Question 5

Full marks were often awarded for this question. Clearly, the biology of flowers is well understood. Specific names were required in (a) and, therefore, naming part H as a stamen was not credited: it had to be named as an anther. Pollination as a process where pollen is transferred from an anther to a stigma is well known, as is the way in which the features of insect pollinated flowers help in attracting insects.

Question 6

External mammalian features were known by many. Unfortunately, some candidates lost marks by naming internal or behavioural features. The destruction of crops by rats and the possibility of the rodents spreading disease were problems that are appreciated by many candidates. Part (b) was more challenging, with a number of unacceptable relationships being named. However, a pleasing number of students was well aware that parasitism is a feeding relationship which causes harm to a host. Most candidates understand the terms producer, primary consumer and secondary consumer, and scored highly in (c)(i). High marks were also seen in (c)(ii), with the most frequent error being making the bar for the fleas smaller than the one for the rats.

Question 7

Recognition that both tubes are renal blood vessels was credited, with another mark available for correctly identifying that A was the artery and that B was the vein. The weaker candidates struggled with the demands of this and gave incorrect names. The definitions produced in answer to (b) were pleasing, with most candidates appreciating that excretion involves removing harmful substances from the body, and that osmoregulation involves controlling the level of water in the blood.

Question 8

This fairly straightforward question produced a wide range of responses and, as such, served as a good discriminator.

Question 9

Most of the better candidates appreciated that respiration causes the body temperature to rise and were able to write about surface area to volume ratio and heat loss when explaining why the bushman is more able to lose heat than the kudu. Candidates are encouraged to be precise when referring to the difficult concept of surface area to volume ratio. Marks were lost if the concept was appreciated but was incorrectly described by, for example, stating that the bushman had a smaller surface area to volume ratio. Sadly, answers to (c) contained the perennial error of stating that blood vessels move closer to the surface to assist heat loss. The best answers described how vasodilation would help to increase the blood flow near the skin surface and how this would help heat loss by radiation or convection. Most candidates were able to appreciate that breathing and sweating are two ways in which the bushman would lose water while he was running. A decision was made **not** to accept urination. Candidates who understood osmosis produced excellent answers to (e), appreciating that the blood plasma would contain less water and the red blood cells would consequently crenate as they lost water to the plasma. Again, there were some excellent answers describing what happens to protein in the gut. Indeed some reflected a depth of knowledge more akin to A Level!

Question 10

The graph was marked using four criteria. One mark was available for using a scale that was linear and using at least half of the grid. Weak candidates tended to lose this mark by producing non-linear scales. One mark was available for joining the points with a straight line. Weak candidates lost this mark by drawing a straight line which missed many of the points. One mark was available for getting the axes correct both in terms of position and labelling. A larger number of candidates struggled with this skill, with many putting the axes the wrong way round and many forgetting to label the axes. Complete labelling was not essential, but the words 'radiation' and 'mutation' were expected as the bare minimum. Finally, one mark was available for plotting all the points correctly. This skill was done well with the 3000, 8.5 coordinate causing greatest difficulty. Describing the relationship was successfully achieved by most. The correct answer of 5500 was frequently seen in (a)(iii), and different responses could also gain credit if they could be derived from the graph drawn by the pupil. Part (a)(iv) challenged many candidates, with the correct response of 1000 seen most often on scripts belonging to the better candidates. The vast majority of students appreciated that DNA is the molecule used to make genetic material. A large number of candidates understood how the mutation would affect the growth of the plant by reducing light absorption or reducing photosynthesis, although a surprising number failed to state the obvious: that the growth would be impeded.

Question 11

Many understand that respiration produces carbon dioxide and that limewater or hydrogencarbonate indicator can be used to detect this gas. Candidates are encouraged to look at the mark allocation to question parts. Had they done so they would have noted that two marks were available for (a)(iii): one for the colour before the change, and one for the colour after the change. The concept of a control was known by many students and there were some good answers explaining the purpose of setting up a control. Boiling seeds to kill them is also known by many students. In (c), the role of photosynthesis in reducing carbon dioxide levels and increasing oxygen levels posed little difficulty for a large number of candidates.

BIOLOGY 7040, GRADE BOUNDARIES

| Grade | A | B | C | D | E |
|--------------------------------|-----|-----|-----|----|----|
| Lowest mark for award of grade | 142 | 121 | 100 | 90 | 63 |

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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