

Examiners' Report

GCE O Level Human Biology (7042)

June 2006

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HUMAN BIOLOGY 7042, CHIEF EXAMINER'S REPORT

Paper 1

General comments

Most candidates appeared to find the paper accessible, with very few leaving areas unanswered. A number of candidates scored in excess of 70% but there were also some very low scoring scripts. The overall standard seemed to be less extreme than in previous years. A few candidates failed to gain credit on an individual question, but they usually attempted each question. There was some evidence of candidates not reading the questions with sufficient care especially in Q 2, 3 and 7. This sometimes led to responses that were on the general topic but failed to answer the question. The drawing was poorly attempted and some candidates found difficulty with the calculations. This year, most candidates fitted their responses into the spaces provided.

Question 1

- (a) The majority of candidates scored well on this section and obeyed the rubric.
- (b) Most candidates identified the process as peristalsis, but few gave details of this to gain the second mark. A few misread the question and described absorption in the ileum, rather than the movement of food along this tube.

Question 2

Candidates found this question very difficult. Many failed to make use of the completed boxes to judge the type of response expected in each column; or tried to write long descriptions in each box when only a word or phrase was required. The function of each of the three types of cell was poorly known. The unstriated muscle brings about long, sustained or wave-like contraction. The term involuntary was unlikely to be sufficient as it was used in the question. Relay neurones do not join sensory and motor neurones but pass impulses from one to the other. Cilia do not trap dust or bacteria but their movement moves mucus, containing particles, up the trachea.

Question 3

This question presented problems for many candidates and there was evidence of careless reading of the question and lack of basic knowledge of the topic.

- (a) Only about 50% of candidates identified the two structures correctly, but the route of the impulse across the middle ear was well known.
- (b)(i) Most candidates noted that a build-up of pressure would occur but were unable to take this further. This inability to explain why hearing would become difficult applied to each of the other situations.
- (c) In this section, candidates were expected to apply their knowledge of the functioning of the major areas of the brain and of the ear. The poorest responses were to (iii) where a significant minority thought the main area dealing with balance was the medulla.

Question 4

Most candidates scored well on the first part of this question but explanations were weak.

- (a) Candidates used their knowledge of processes taking place in living things and in the environment to identify the four processes, and were able to name one group of organisms that bring about decomposition. The term 'decomposers' was considered too vague. Most candidates identified two fossil fuels but a few listed wood or peat, which are not considered to be fossils.

- (b) Many candidates thought they could answer this question by counting the number of processes adding to or removing carbon dioxide from the air. They did not seem to be aware that the rise is occurring now and most of the processes have been going on for thousands of years and would not account for present concerns. In (ii), any consequence of global warming such as melting of the ice caps, increased risks of flooding, or changes in patterns of weather were acceptable but not just 'summers are getting hotter'.

Question 5

- (a) Most candidates were able to extract the data they needed from the graph, although there was some confusion over the amount left in the lungs after breathing out, at rest. Most identified the changes in the pattern of breathing that occurred during exercise, but fewer could explain why these changes took place.
- (b) A significant number of candidates gained maximum credit here, but a number appeared to have no idea where to start their calculation or the importance of the table showing composition of inhaled and exhaled air.

Question 6

Those candidates who understood genetics - and who read the question with care - scored well on this question, but many failed to gain more than minimal credit.

- (a) About 50% identified Carol as the source of the colour blindness gene inherited by Paul. Some assumed it must be from David as both are males and, in spite of the question, some named one of Paul's grandparents as the source. Some did not appear to have made use of the information in the stem, which stated that the condition is caused by a recessive allele carried on the X chromosome. Too many candidates failed to label the genetic diagrams in (iii) and some only showed the parents and the offspring, not the gametes or their alleles.
- (b) Many forgot that the male genotype is XY and, from the key, they should have identified James as a male. Most realised that if Susan was a carrier for this condition some of the children might inherit the colour blindness allele, but most did not develop this any further.

Question 7

This question was poorly answered with several candidates gaining only minimal credit.

- (a) Some candidates failed to identify the two bones and others did not recognise the types of joints or the muscles that would extend the leg. In (iv), candidates were asked how the action would be affected but few explained that muscle S would become ineffective.
- (b) The completion of the diagram was very poor. Many forgot to label the structures they drew. Cartilage frequently failed to cover the articular surfaces and ligaments did not clearly link one bone to another.

Question 8

A number of candidates gained full credit for this question. The commonest error was to list two or more nutrients in (b)(i) leaving the examiner to "select" the correct response.

Question 9

Those candidates who attempted the sections in the order set normally had few difficulties. Most identified group 2 as the carbohydrates giving a logical reason such as digestion beginning in the mouth. Few commented that digestion of this food group is completed in the ileum, while many continued while in the stomach. In (a)(ii), a number failed to note they had to write in the names of the other food groups as well as the end products of digestion.

Question 10

- (a) Most candidates realised that excretion was getting rid of waste, but many forgot to specify that this was metabolic waste; and others invalidated their response by quoting faeces as an example. In (ii), the only common errors were to suggest that proteins rather than amino acids were deaminated in the liver, and to name the bladder instead of urine as the excreted material.
- (b) Most candidates described osmoregulation with suitable references to the secretion of ADH by the pituitary gland, but a smaller number described temperature control and sweating instead.

Question 11

- (a) Candidates showed good knowledge of the heart and were able to identify the parts required.
- (b) In (i), virtually all candidates knew that valves prevent backflow, but candidates should have realised that repeating this as a response to (ii) and (iii) was unlikely to gain further credit. They were expected to explain how the valve operates and what problems would be caused if it did not operate correctly.

Paper 2

General Comments

There were some very high quality papers seen once again, with candidates displaying a commendable level of knowledge and understanding. There were, however, a number for whom this examination was clearly inappropriate. Drawing skills were quite good. There was no evidence that candidates did not have sufficient time available to complete the paper. Some candidates failed to answer the parts of some questions in the order in which they were set and compounded the problem by not always making it clear which section of their answer applied to which question. The examiners would be pleased if centres could draw this to candidates' attention.

There were a number of cases where the rubric of the paper was infringed and candidates answered more (usually all) of the questions, rather than the number prescribed. This is somewhat surprising since the format of the paper has remained constant for many years.

Question 1

Part (a) was very well answered, with the majority of candidates presenting competent drawings. The examiners do expect drawings to be of a reasonable size and centres are asked to advise candidates that a minimum size would be of ten line spaces. There is also an advantage in using a sharp pencil. Most candidates were able to label six appropriate cell organelles, but some failed to score marks because the structures they had labelled bore little or no resemblance to the structures named. Some candidates drew a light microscope diagram rather than that seen under an electron microscope.

In (b), few candidates were able to describe effectively the role of the nucleus in protein manufacture via amino acid assembly and the production of enzymes, through which the activities of a cell are controlled. However, many were aware that the nucleus is surrounded by a membrane and that chromosomes are present within it.

The sequence of events associated with mitosis were often confused in (c), with a number of candidates knowing the events but incapable of presenting them in the right order. Terminology proved to be an obstacle to many candidates achieving maximum marks with confusion between chromosomes and chromatids and uncertainty over the role and attachment of the spindle fibres.

Question 2

The majority of candidates produced competent answers to (a)(i). A common misconception is that it is the capillaries of the skin that constrict, which is not only incorrect but demonstrates a lack of understanding of the structure of capillaries. Candidates need to be reminded that vasoconstriction is caused by the narrowing of the arterioles supplying the skin capillaries, leading to a reduction of blood flow through the capillaries, resulting in less heat loss from the skin surface. Most candidates were unable to cope with (a)(ii). A few appreciated that respiration of food resulted in heat generation, but fewer recognised that food is a store of energy or that a shortage of food would lead to a failure to generate enough heat to sustain body temperature levels. Accounts in answer to (a)(iii) often discussed what happened on wet and windy days rather than the role of clothing in preventing these occurrences. Even where a candidate was able to explain the role of waterproof clothing, they invariably failed to appreciate that in being windproof the clothing prevented the removal of warm air surrounding the body and instead chose to discuss how it prevented the removal of a layer of evaporated water.

The whole of (b) was poorly answered with few candidates progressing in (b)(i) beyond the denaturing of enzymes. Those that did referred to the pronounced effects on brain cells. The answers to (b)(ii) were even less good, with only a few making reference to a reduction in metabolic activities and even fewer making any reference to hypothermia.

Question 3

Part (a)(i) often yielded full marks for candidates, though many failed to make the obvious point that arteries carry blood away from the heart and veins carry blood towards the heart. Many candidates failed to distinguish between muscle tissue in the wall and elastic tissue; instead they rolled them both up into elastic muscle. There was a distinct lack of understanding of the roles of capillaries and lymphatic vessels. There were vague references to substances moving out of capillaries and the occasional reference to substances moving back in again. There was no real understanding of their significance in the formation of tissue fluid and the subsequent draining of excess fluid by the lymphatic system. Usually, the only relevant point made with respect to the lymphatic system was a reference to the absorption of the products of fat digestion.

The transport of oxygen in (b)(i) was usually well explained, though a number of candidates failed to mention the formation of oxyhaemoglobin or the location of oxygen absorption. Few candidates referred to the absorption of glucose as taking place in the small intestine, though most knew it was transported in the plasma. Part (b)(ii) was often mark yielding, though common omissions included the increased delivery of oxygen and glucose to the muscles as a result of increased heart rate, and increased oxygen uptake as a result of an increased rate and depth of breathing.

Question 4

This question was usually well answered, although the major difficulty in all parts was the location of the glands. This was particularly true of (a), where candidates located these glands in some interesting places. 'In the breasts' was the commonest accepted answer but usually only one of the location marks was awarded - this was true for the other structures as well. The position of the adrenal glands was usually described in terms of the kidneys but it was unusual to read any reference to the abdomen. The functioning of the glands was usually well described. Candidates found difficulty in locating the pituitary gland in (c). Various parts of the brain were mentioned but references to the hypothalamus were rare. The role of the pituitary was well known. The endocrine functions of the pancreas were well documented by candidates, although they were less clear about its digestive role. Once again, the precise location of the pancreas caused uncertainties with it being variously located under the liver, in the thorax, or at the side of the stomach. Locations of structures in the body is clearly an area for further emphasis.

Question 5

Surprisingly few candidates were able to relate the whole story as required in (a). Common omissions included the site of sperm production and the involvement of meiosis in the process. Few candidates made reference to the fact that the sperms, in the guise of semen, were ejaculated by contractions of the muscles of the sperm ducts. Many candidates gave the impression in their accounts that that penis was a hollow container that became filled with blood, thereby causing an erection, rather than a spongy tissue whose spaces become engorged with blood.

Part (b)(i) was often not fully answered, with only pus emission and a burning sensation on urination being well documented. Sterility was often mentioned but the blocking of the sperm ducts was sparingly included in the account. Preventative precautions were well understood, except that tracing of contacts was rarely mentioned and the use of antibiotics was sparingly included. The benefits of breast feeding were well described, although few candidates made reference to the milk being at an appropriate temperature or not requiring sterilisation.

Question 6

The transmission of polio was not well known by many candidates, with water contamination being the most common form. Treatment was often given as vaccination or the use of antibiotics. The possible use of an iron lung was very rarely mentioned. The transmission of tuberculosis was better known, with many references to droplet infection and its spread via contaminated milk. Treatment regimes were also better understood. Public health measures for polio were usually limited to the use of the Salk or Sabin vaccine. Few candidates mentioned the use of effective sewage treatment facilities or the simple measure of fly control. Many candidates wanted to vaccinate cattle as a way of dealing with the spread of TB. Few made reference to mass X-ray programmes or the use of skin testing. The reasons for increased levels of TB infection were not well explained. Few candidates appreciated the emergence of strains that are resistant to antibiotics; even fewer candidates discussed social upheaval and war as a likely cause.

Question 7

The role of the skin as a barrier was not widely understood, although the presence of a cornified layer was often mentioned. The lining of the airways was a more mark-yielding question but, as usual, there was considerable confusion over the roles of the mucus and the cilia. Although the question referred to microorganisms, many candidates chose to discuss the trapping of dust by either the mucus, the cilia or both.

The causes of the symptoms of disease were poorly described in (b). Few candidates made any reference to the conditions in the body as being ideal for rapid reproduction of bacteria. Furthermore, few candidates recognised that it was the toxins produced by pathogens that gave rise to the symptoms. Bodily responses to invasion were well described. Similar questions have been set in the past and candidates have been well practised at dealing with them. However, there are still many candidates who fail to distinguish between lymphocytes and phagocytes or fail to describe one or the other. Details of phagocytosis were sometimes lacking, with only a minority going beyond the process of engulfing to include detail of digestion of pathogens by enzymes.

Question 8

This was the least popular of the questions and was not well answered by many. Although (a) proved less taxing than the other parts, even here it was rare for a full account to be given. The role of yeast in beer and wine production was well described, although often without reference to anaerobic respiration. The involvement of yeast in baking was often mentioned, but not always with an appropriate reference to its function in the process. There were relatively few references to edible fungi or to the role of bacteria in the making of yoghurt and the flavouring of cheese. In answering (b), candidates often struggled to list the types of organisms involved and very few made reference to the secretion of enzymes and recycling of nutrients.

The production of drugs in (c) was also not well known with few references to penicillium and even fewer to the role of antibiotics in destroying bacteria without harming human cells. The answers to (d) contained the usual confusion with sewage treatment and consequently, answers were muddled and yielded very few marks. Questions on the two topics make regular appearances in these papers, yet candidates do not equip themselves with sufficient detailed knowledge to do themselves justice.

Question 9

The sources and problems attributable to sulphur dioxide were generally well known, though it was rare to find a reference to emissions from power stations. Often, there was a vague reference to 'factories' as being the source. There were a large number of erroneous (in the context of the question) references to acid rain which has featured in previous papers. Candidates should be advised to read the question in front of them very carefully. The use of alternative energy sources as a method of reducing emissions was hardly mentioned at all. The majority of candidates could state that car exhaust fumes were a source of carbon monoxide, but few made any reference to cigarette smoking. Many failed to mention that the gas is produced when insufficient oxygen is present; although most were aware that it combines with haemoglobin reducing oxygen carriage. Despite this, few stated that it was poisonous. Details of the production of oxides of nitrogen and their effects were sparse with many making reference to nitrogen-containing fertilisers rather than car exhaust fumes as being the source.

The effects of depletion of the ozone layer in (b) were usually well known, but many candidates chose to describe the effects of global warming rather than health matters. References to skin cancer were common, but there were far fewer comments about sun burn, and the mutagenic capacity of ultra violet light was seldom mentioned. A common failing amongst candidates was to state the function of the ozone layer rather than the effects of its depletion.

HUMAN BIOLOGY 7042, GRADE BOUNDARIES

Grade	A	B	C	D	E
Lowest mark for award of grade	127	108	90	80	64

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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