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General Certificate of Education

Human Biology 1406

HBIO1 The body and its diseases

Report on the Examination

2010 examination - June series

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General Comments

There was no evidence that candidates were short of time. There were very few blank spaces left, with most candidates attempting every question. As in previous years, some candidates do not understand the difference between the command words 'explain' or 'describe', and therefore fail to gain marks by giving an inappropriate response. While most candidates wrote their answers in a clear black pen, a few did not, or used permanent black pens that made an impression on both sides of the paper. These answers were very difficult to mark. Some wrote in the margins where they were told not to write. There was evidence that some key parts of the specification are not well understood by many candidates. These include the immune system; the events leading up to a myocardial infarction; and confusion between antibiotics and antibodies.

Question 1

(a) This part proved challenging for candidates. Most candidates scored one mark, usually for knowing that proteins contain amino acids.

(b) In this part, despite the examiners viewing the answers generously, many candidates failed to score marks. Many seem to believe that fibre is a valuable source of nutrients, energy or vitamins.

Question 2

(a) Most candidates were able to identify structure **P** correctly in (i), although a few thought it was a capsule or a cell wall. Fewer candidates were successful in identifying **Q**, and despite being told that it is an enzyme, gave answers such as 'ribosome' or 'nucleus'. In (ii), many candidates knew that this carries genetic information, but others simply guessed and gave answers such as 'supplies energy'.

(b) This question showed that there is widespread lack of understanding of how HIV affects infected cells. Many described the viral RNA pairing with a single strand of DNA to become double-stranded DNA. More worryingly, many candidates think that the helper-T cell becomes HIV once the HIV has invaded it.

Question 3

(a) Most candidates understood that the forceps were passed through a Bunsen flame to sterilise them or to kill bacteria on them. However, some thought that flaming 'cleaned' the forceps. A few thought that flaming would denature the antibiotics or even antigens or antibodies on the forceps. Few candidates explained that flaming would ensure that other bacteria were not introduced, or that only one kind of bacterium was present on the plate.

(b) Many candidates scored three or four marks and wrote clear answers here. However, a significant minority misinterpreted the diagram and thought that the clear regions round some of the discs were areas where bacteria had grown, showing they were resistant to the antibiotics. Quite a number of candidates confused antibiotics and antibodies, so described the clear zones as areas where antibodies had bound to antigens. Others

thought that the antibiotics were growing, and thought that some of the antibiotics were resistant to the bacteria.

Question 4

(a) This was well answered by many and one or two marks were frequently awarded. However, about half of the candidates failed to score marks, often because they simply repeated the terms in the question, saying that 'membranes are fluid' or 'have fluid round them'. Some referred to the whole membrane being able to move rather than molecules within the membrane. Similarly, comments such as 'it looks like a mosaic' could not gain credit since an explanation of the term 'mosaic' was needed.

(b) Many good answers were seen here, although weaker candidates gave answers such as 'growth and repair' or 'supply energy'.

(c) This part was challenging for the majority of candidates. The commonest answer was osmosis, closely followed by diffusion. Only the better candidates correctly noticed that the ions were moving against a concentration gradient and, therefore, must be moving by active transport.

Question 5

This question was poorly answered by many candidates, often because they did not understand the need to 'explain'.

(a) Answers to (i) were frequently a simple description of the graph. Others attempted to explain, but only stated that hydrogen peroxide decreased protein activity without referring to denaturation or changes in shape, and how this would render alpha-1-antitrypsin unable to bind to trypsin. The same description was often offered in (ii), where most candidates failed to score any marks. Some candidates understood that the more hydrogen peroxide there was, the more alpha-1-antitrypsin would be inhibited, but there was no reference to amino acids being affected or antitrypsin molecules changing shape.

(b) Here, many candidates failed to use the information they were given, and simply wrote about the damage caused by smoking in general. Only the best candidates could explain that long-term smokers inhale more hydrogen peroxide, so they would have more active enzyme, resulting in a reduced gas exchange surface.

Question 6

(a) Many candidates scored one mark for recognising that the artery has the highest pressure, so the lining of the artery could be damaged, causing atheroma formation. However, weaker candidates focused on the smaller lumen of the artery (even though this information was not on the graph) and explained that it would be more prone to blockage.

(b) About half of the candidates failed to score any marks. Many candidates did not understand the difference between total cross-sectional area and cross-sectional area, so they tried to invent advantages of having wide capillaries. Some candidates thought that blood can flow either way in a wide capillary.

(c) Only the very best candidates scored two marks. The commonest correct answer was that the veins have a smaller (total) cross-sectional area, so the flow must be faster. Weaker candidates focused on trying to explain the advantage of veins being narrower than capillaries, because they had not understood the information on the graph.

Question 7

(a) Part (i) was well answered by most candidates, although a few were let down by poor expression, such as 'excretion, to get rid of the poison out of the body', or by offering two terms for the same symptom, e.g. 'nausea' and 'sickness'. In (ii), it was clear that many candidates think that Salmonella bacteria are present naturally in the air, and will fall onto food that is left uncovered. Only the best candidates realised that Salmonella is present in faeces, either of a chicken or a human carrier. Many candidates did not read the question properly, so explained that you can get Salmonella by not cooking meat thoroughly, even though this is not a means of contamination.

(b) About a fifth of candidates scored both marks, for suggesting water, so that it could be shown that the effect was due to sugars. However, others suggested a different sugar, such as glucose, or milk. Some candidates who correctly identified water could not explain the reason for their choice.

(c) This question discriminated quite well, with excellent answers from the best candidates, but very poor answers from the weakest. Many of the weakest candidates did not read the question properly, and supposed that the scientists had suggested that humans should drink water containing sugars to avoid food poisoning. These candidates wanted human trials to be carried out. About half of the candidates gained a mark in this part of the question, usually for realising that the treatment reduced infection in chickens. However, few went further than this. Some gave a rehearsed set of answers such as 'we do not know the sample size', 'there are no repeats', and 'there may be other variables that have not been controlled'. These did not gain credit, as they were told the sample size was large, and candidates should assume the investigation is done properly unless there is evidence to the contrary. The very best candidates recognised that mannose is more effective than lactose; that chickens are not the only source of food poisoning in humans; and that the treatment might not work on older chickens.

Question 8

(a) The calculation was correctly carried out by about two thirds of candidates. A few, who may have had no calculator, gained one mark for showing how to carry out the calculation. Very few left it blank.

(b) Part (i) was quite poorly answered by weaker candidates, often due to poor expression of ideas. Many candidates seem to think that elastic stockings contract and relax around the leg, or somehow stimulate the contraction of the muscles surrounding the veins. There were many vague references to the stockings forcing blood to flow through the veins, without reference to prevention of pooling, or the need for blood to flow back up the leg, that were not able to gain credit. In (ii), about half of the candidates could suggest a suitable method for achieving random groups, but the weakest often simply repeated the term, giving answers such as 'choose names at random'. Others suggested incorrect methods, such as all the men in one group and the women in the other, or described a non-random method such as matched pairs.

(c) This question discriminated well across the range. Some candidates did not understand the data properly and thought that those patients who developed blood clots were not the same patients as those who developed DVT. Better candidates, however, gained credit for noticing that the pump reduced the incidence of DVT; that the pump caused fewer large blood clots; that the sample size was very small; and that other factors can predispose to DVT.

Question 9

(a) Although part (i) asked candidates to describe the graph, about a third of candidates were unable to do this. Some tried to explain it, while many gave an incomplete description such as 'the effect of the spray got less over time'. Only better candidates compared the line for the enzyme spray with the line for the placebo. A significant number of candidates wrote the same answer again in (ii) even though this asked for an explanation. Weaker candidates either described the graph again or ignored the graph and gave answers about CFTR and chloride ion transport. Vague answers such as 'the thinner mucus made it easier to breathe' were frequent. Only the very best candidates understood that thinner mucus could be coughed up more easily, or moved by the cilia, so that the airways were less likely to be blocked.

(b) The better candidates scored two marks for realising that this allowed comparisons, since there were different group sizes or different FEV_1 values. However, some candidates simply thought this made it easier to understand or made the results more accurate. About a third of candidates scored no marks.

(c) About half of the candidates scored at least one mark for recognising that older people with CF may have more lung damage or they may be exposed to another factor, such as smoking.

Question 10

(a) Most candidates scored two marks in (i) although some were careless and gave a non-lifestyle factor, such as age, or gave a dietary factor. 10(a)(ii) was a good discriminator and the full range of marks was awarded. The best candidates clearly knew this well, but many candidates are still confused about what happens in a myocardial infarction. Weaker candidates did not identify atheroma forming in the wall of an artery. There were frequent references to blood vessels of all kinds, and blood vessels going both to and from the heart. The pulmonary artery was often named as well as the coronary artery. Many candidates gave descriptions of the blood vessels to the heart (or even lungs) getting blocked, so the heart had to 'work harder' to pump the blood, resulting in its complete failure. However, there were some excellent answers by the best candidates, referring to lack of glucose and oxygen getting to heart muscle cells for their respiration, resulting in cell death.

(b) In (i), too many candidates simply repeated the term 'specific' so it was not clear that the shape of the antibody was important. There were also many references to active sites, or the antibody being the 'same shape' as the antigen. Part (ii) was a good discriminator, although a third of candidates failed to score any marks. Weaker candidates' errors included poor sequencing, with antibody production occurring before lymphocyte activation or clonal selection. Another common error was having antibodies (and sometimes antigens) replicating, forming plasma cells and memory cells.

(c) Part (i) was well answered by many better candidates, who recognised that injecting antibodies gives passive immunity, so the individual does not make their own antibodies and memory cells are not made. Some also recognised that the individual might mount an immune response against injected antibodies. However, about half of the candidates failed to score any marks, having apparently mis-read the question as an invitation to evaluate the scientific methodology. In (ii), most candidates only attempted to support one side of the argument. Many went no further than saying that the treatment seems to be effective in mice. The commonest additional correct response was that this may not work in humans, so needs trials in humans. Many said that the sample size was too small, or that it was unknown, even though they were told that a large sample size was used. The usual 'there should be repeats' response was also commonly seen.