**General Certificate of Education (A-level)
June 2011**

Biology **BIOL1**

(Specification 2410)

Unit 1: Biology and Disease

Report on the Examination

General Comments

A wide range of marks was seen and there were very few blank spaces on the answer paper. At the top end of the range there were some excellent scripts with candidates having a detailed knowledge of this unit and an ability to apply their knowledge to new situations. Most were able to answer the questions relating to practical work demonstrating that many had carried out the required activities.

There were, however, candidates who were under-prepared for the examination. These candidates often failed to read the question carefully and, in particular, confused the terms "describe" and "explain" and frequently failed to use appropriate scientific terminology. Questions involving mathematical concepts were often less well done.

It would be helpful to both the candidates and the examiners if centres were to remind candidates to write their answers in the space allocated to that question.

Question 1

(a)(i)   Most candidates correctly named the type of reaction as hydrolysis.

(a)(ii)   Most candidates correctly named glucose.

(b)(i)   Most candidates gained full marks for describing the test for reducing sugars accurately. Some did not mention the need for heat, and a few could not recall the correct test – the biuret test being the most common error. A few candidates lost credit because they described the non-reducing sugar test and hydrolysed with hydrochloric acid first.

(b)(ii)   The majority of the candidates could explain the idea that one molecule of lactose was being hydrolysed to give two molecules of product, both of which were reducing sugars. The commonest reason for missing the mark was when students paraphrased the stem of the question, stating that the reason there was a higher concentration of reducing sugar was because there was more reducing sugar present. A surprising number of candidates gave answers relating to an increase in surface area.

(c)   Although many candidates gained full marks on this question there was a significant number who were confused about the position of the active site, placing it on the sugar rather than the enzyme. A number of candidates thought that galactose would bind to lactose rather than lactase.

(d)   The effect of an increased concentration of lactose in the intestine was well understood by candidates and many gained both marks by using the correct scientific terminology. A number of weaker candidates suggested that fermentation of the lactose in the gut produced gas and that this somehow led to diarrhoea, although they did not explain how.

Question 2

(a)   Candidates often failed to appreciate that point **A** referred to just one of the 24 countries represented on the graph. The graph showed two points with 35% fat that had different death rates. A number thought that 20 in 100 000 was the same as 200 000.

(b)   This question proved to be challenging for many with only the more able gaining the mark. Some suggested a suitable method but then failed to multiply their answer by 100 000. There were many vague answers such as use hospital records, or reading the answer from the graph.

(c)   The majority gained two marks for evaluating the data on the graph, although many simply repeated a stock answer along the lines of there being 'a positive correlation but correlation does not mean causation'. Unfortunately, some candidates failed to gain the first mark by failing to state that the correlation was positive. The better candidates actually looked at the data and gave examples which did not fit in with the pattern – for example, the widely differing death rate with 35% fat in the diet.

Question 3

(a)(i)   Candidates answered this question well, often referring to the optimum temperature of 30/31°C. Weaker candidates did not use the graph and those who did not do so failed to score. Some candidates explained the effect of temperature on the rate of reaction rather than describing it.

(a)(ii) This part of the specification is well understood by candidates and many gained all three marks. A large number failed to answer the question asked and explained the shape of the curve between 20 and 30°C. Although many of these candidates went on to score full marks, they wasted valuable time. It was pleasing to see that many candidates had understood the more difficult concept of more enzyme molecules being denatured as the temperature increased.

(b)(i)   Most candidates correctly suggested using a buffer solution to maintain pH, but some answered in a different way by suggesting checking the pH at the end of the investigation using a pH meter or universal indicator. This also gained credit. Other indicators such as litmus would not give a precise enough measure of pH and so were not accepted. Surprisingly, common errors were to suggest keeping the temperature constant or sealing the plates.

(b)(ii) Most students suggested a temperature near the optimum to give a fast rate of reaction or a temperature lower than 30°C to avoid denaturation. Both of these answers gained credit. A small number of candidates suggested a temperature but failed to give a reason.

(b)(iii) Most candidates gained credit here, but a minority were uncertain as to whether high or low pH was acidic. Weaker candidates did not make the link between the size of the cleared area and the activity of the enzyme.

Question 4

(a)   The vast majority of the candidates answered correctly.

(b)   This question differentiated well with many correctly calculating the rate as 1.4 dm^3s^{-1}. However a significant number were only able to calculate the volume of air breathed out during the time period rather than the rate. Weaker candidates often did not attempt the calculation.

(c)   This question was generally well answered although some candidates did not make clear that the difference was that **B** had more air left in his lungs after exhalation. To state that the volume of air in the **B**'s lungs was greater was insufficient as **B** might just have been a much larger individual. The best answers compared volume of air exhaled or rate of exhalation.

(d)   Many candidates gained all 4 marks here. Most candidates knew that surface area was reduced although many were unclear about how this happened. They often wrote about gas exchange in general terms and failed to mention diffusion. There was some confusion between different lung diseases with candidates referring to excess mucus and the narrowing of the airways.

Question 5

(a)   Most candidates were well prepared for this question and were able to differentiate between active transport and facilitated diffusion with many gaining both marks. Some candidates were unclear when referring to concentration gradient. Phrases such as 'along the gradient' or 'across the gradient' were not accepted. The specification terms 'carrier protein' and 'channel protein' were often not used.

(b)(i)   The question asked why a control group was used '*in this trial'. C*andidates needed to apply their knowledge to an unfamiliar context and were required to do more than simply define the term. It was, therefore, not enough to say 'to allow comparison'.

(b)(ii)   This question was well answered with many candidates gaining both marks. A large number referred to a placebo tablet being used, although this term was not required. Some candidates failed to gain the first marking point as they stated that no drug would be given without appreciating that a tablet would still need to be administered. Most explained that both groups should be treated in the same way.

(c)   This question required the candidates to look carefully at the graph and describe it. Many incorrectly stated or implied that the volume of acid secreted per hour would decrease for 4 hours, failing to notice that the treatment started 1 hour after volumes were recorded. More able candidates realised that the acid secretion would decrease for 3 hours, or from 1 – 4 hours.

Question 6

(a)   Candidates did not answer this question well. Only the most able understood that the valve would be closed when the ventricular pressure exceeds that in the atrium. Many simply stated that the pressure in the ventricles was high or increasing, making no comparison with atrial pressure. Consequently few gained the first marking point for giving the times the valve would be closed.

(b)   Many candidates did not explain what causes the higher pressure in the ventricle with many trying to relate the answer to the distance the blood 'has to travel'. More able candidates were able to relate the higher pressure to the increased thickness of the wall of the ventricle which would be able to contract more strongly. As in previous unit tests, credit was only given to answers referring to muscle contraction and not to "pumping".

(c)   A large number of candidates answered correctly, although many did not seem to know how to use the data in the table to calculate the rate and left this question blank.

Question 7

(a)   Many candidates described the formation of atheroma in great detail rather than explaining how this could lead to a heart attack. Those that answered the question appropriately often went on to gain all three marks. A large number of candidates realised that a blockage in the coronary artery was relevant to the question, although weaker candidates referred to blockage of capillaries, veins or even the pulmonary vessels. Some incorrectly conveyed the idea that the major vessels of the heart would be blocked so the heart itself would not receive blood rather than the blood supply to the heart muscle would be reduced. More able candidates went on to explain how the heart muscle would be deprived of oxygen preventing respiration.

(b)(i)   Many candidates gave a generic answer, failing to refer to the passage as instructed. These candidates often scored only one mark for explaining that an antigen causes an immune response. Candidates who scored both marks used the information given to explain that, in this example, the antigen was a protein on Chlamydia.

(b)(ii)   In this question, candidates were more confident in using the information from the passage and most gained at least a mark for explaining that the proteins on the Chlamydia cell and the heart were similar. There were candidates who confused antigens with antibodies and even enzymes but many candidates gained a second mark, usually by explaining that antibodies would attack the heart muscle cells. There were a number of excellent answers that showed a clear understanding of the immune response.

(c)   A number of candidates did not go further than the information given in the question, simply stating that the vaccination would prevent Chlamydia infection. This was not credited. Candidates who considered the information in the passage wrote about the possibility of preventing atheroma or, if the human proteins were similar to those in the mouse, the risk of causing heart disease. There were also creditworthy references to the cost of a vaccination campaign being higher than alternative methods of reducing the incidence of Chlamydia. Unfortunately, many limited their answer to just one factor rather than evaluating the suggestion as instructed.

Question 8

(a)   Phagocytosis was well understood by candidates and many gained full marks. Many, however, wasted time by describing antigen presentation which was not required. Almost all candidates knew that the bacteria would be engulfed and many referred to their inclusion in a phagosome or vacuole. Weaker candidates failed to gain marks through imprecision, e.g., not realising that the lysosomes fuse with the phagocytic vesicle and just writing about them releasing enzymes or not specifying what sort of enzymes and then repeating the stem by saying the bacteria were destroyed without any mention of digestion or hydrolysis.

(b)   Many candidates failed to realise that this question was about cell adaptation. There was a lot of confusion between adaptations of the cell and of the intestine wall generally, with many answers focusing on factors such as a good blood supply and maintaining a steep concentration gradient. Such responses were not relevant to this question. Many candidates had a good understanding of glucose co-transport and described this in detail, usually gaining two or three marks, even though their answers were not focused on cell adaptation. Most scored one mark for understanding a large surface area was involved but many attributed this to villi rather than to microvilli. Better candidates gained a further two marks for explaining the cells would have a large number of mitochondria that provide the ATP for active uptake.

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