



**General Certificate of Education**

**Biology 1411**

**BIOL1      Biology and disease**

**Report on the Examination**

*2010 examination - June series*

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## General Comments

The paper proved to be accessible across the full ability range and a wide range of marks was seen. There were some outstanding scripts at the top end of this range. These conveyed an excellent understanding of unit content and the ability to apply this to unfamiliar contexts. This was particularly pleasing to see in question parts relating to *How Science Works*. However, at the other end of the range, there were some candidates who were ill-prepared for this examination. They struggled with basic recall and found questions that required application of knowledge demanding. These candidates often failed to gain marks as a result of poor expression and from not reading questions carefully enough. Misconceptions were frequently seen. These are addressed in the comments on the relevant questions.

### Question 1

Parts (a) and (b) proved to be good discriminators.

- (a) Many candidates gained at least two marks for 'capsule', 'circular DNA', 'plasmid', 'flagellum' or 'small ribosomes'. Unfortunately, references to the bacterial cell wall were rarely qualified in terms of its composition, and this prevented some candidates from scoring full marks. Similarly, a minority of weaker candidates failed to score through failing to reading the question stem with sufficient care. They named structures that were absent in prokaryotic cells but present in eukaryotic cells.
- (b) Most candidates gained one mark for noting that the water potential in the lumen of the intestine would decrease. However, it was usually only better candidates that went on to describe the movement of water into the lumen by osmosis. Weaker candidates tended to express their answers in terms of water concentration rather than water potential. The direction of water movement was often unclear.
- (c)(i) Just over half of the candidates gained this mark for the idea of killing bacteria or providing a sterile solution. However, many weaker candidates thought that the main reason for using boiled water was 'to make it easier to dissolve the powder'. This was not credited.
- (c)(ii) Nearly 80% of candidates gained a mark for sodium ions or chloride ions. The most common responses seen that did not gain credit were 'water' and 'amino acids'.

### Question 2

- (a)(i) 90% of candidates gained this mark for noting that the volume of air in the lungs increased. Candidates who failed to score usually referred to 'fluctuations' in the graph.
- (a)(ii) Just over 40% of candidates scored full marks. However, most candidates gained one mark for stating that the diaphragm contracts or flattens. Some answers went into unnecessary detail about the role of the intercostal muscles and ribcage in inhalation. This was not asked for. Additionally, a minority of weaker candidates thought that the intercostal muscles move the diaphragm.
- (b) Most candidates gained one mark for noting that the breathing rate increased. However, relatively few mentioned that the tidal volume also increased. The usual attempt at this

was along the lines that 'the volume of air in the lungs increases', a response which did not gain credit. If the term 'tidal volume' was not used, it had to be clear that candidates were referring to the volume of air inhaled *per breath*. A number of candidates gained this mark for noting that the distance between peaks and troughs increased. Better candidates usually gained at least two marks by starting their answers with the equation for pulmonary ventilation. Some weaker candidates confused the terms 'stroke volume' and 'tidal volume'.

### Question 3

- (a) Approximately 70% of candidates gained the mark for 'peptide bond'. The most common incorrect responses seen were 'hydrogen bond' and 'glycosidic bond'.
- (b) Fewer than half of the candidates gave the correct sequence **HJE**.
- (c) Most candidates gained one mark for describing the role of organelle **G** in respiration or in producing ATP. Unfortunately, some disqualified this mark through poor expression such as by stating that respiration 'produces energy' or 'produces ATP for respiration'. However, it was encouraging to see that this seemed to be less frequent than in the January paper. Better candidates usually went on to link this role to active transport or protein synthesis. However, some candidates incorrectly referred to organelle **G** as a ribosome.
- (d)(i) Fewer than half of the candidates were aware that the tissue was homogenised to break open cells or to release their contents. A common misconception was that this process alone separates the organelles. Weaker candidates usually gave vague answers or answers that were out of context such as 'to break up the tissue' or 'to separate the cells'. Similarly, a minority seemed to focus on the *homo-* aspect of homogenised and suggested that this process was used 'to keep the pH the same'.
- (d)(ii) Only 35% of candidates were aware that the suspension was filtered to allow cell debris or complete cells to be removed. The most common misconception ~~seen~~ was that filtration separates the organelles. A number of weaker candidates failed to score though repeating information from the question stem in that 'it allows organelle **G** to be isolated'.
- (d)(iii) Just over 60% of candidates were aware that the suspension was kept ice cold to reduce enzyme activity. Candidates who failed to score often had the idea of 'reduced activity' or 'less kinetic energy' but they did not mention enzymes. A minority of weaker candidates incorrectly related the low temperature to preventing denaturation.
- (d)(iv) Many candidates gained one mark for the idea that an isotonic solution prevents osmosis. However, it was usually only the better candidates who explained the advantage of this in terms of organelles not bursting or shrinking. Unfortunately, many candidates did have the general idea but referred to cells instead of organelles. Consequently, there were many references to 'preventing cells from bursting' and to 'preventing cells from becoming turgid'.

### Question 4

- (a) Only the most able candidates gained full credit on this question. However, most candidates gained one mark for the idea that cervical cancer could be caused by other factors. Unfortunately, some candidates misinterpreted the graph and considered it to

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show the percentage of women with cervical cancer, rather than the percentage of women with a specific type of HPV. It was very clear that these candidates did not realise that *all* women in the investigation had cervical cancer. Consequently, this led to responses that were out of context such as that '66% of women with HPV16 have cervical cancer'. Better candidates were able to criticise the data. They usually referred to the absence of a control group or suggested that cervical cancer may increase susceptibility to HPV. Weaker candidates often gave vague answers that were not qualified e.g. 'it does not prove that HPV causes cervical cancer'. Similarly, they did not usually refer to specific types of HPV.

- (b)(i) Approximately 40% of candidates gained one mark. This was almost always for stating that an antigen stimulates an immune response. Relatively few candidates made reference to the chemical nature of antigens.
- (b)(ii) Just over a third of candidates scored full marks but 60% scored at least two marks. A number of candidates were aware that vaccination causes the production of memory cells or that memory cells remain. However, many candidates had the idea that memory cells ensure a rapid response to the same virus if encountered again. Unfortunately, these points were often poorly expressed by weaker candidates such as in stating that 'memory cells remember the antigen' or that 'they fight the germ quicker'.
- (c) Most candidates suggested that vaccinating young men would reduce the spread of HPV to females. However, it was usually only better candidates who explained this in terms of vaccinated males destroying the virus or not acting as carriers. Weaker candidates usually expressed this idea poorly e.g. 'vaccinated males cannot be *infected*'. A number of creditworthy references to herd immunity were made, although it should be noted that this term is not a requirement of this unit. Some candidates suggested that HPV may cause other cancers in males and this was also credited. The most common misconception involved vaccinated males passing on immunity to their children.

### **Question 5**

- (a) Just over 60% of candidates scored full marks for this question. Many candidates understood that the active site has a specific or complementary shape, which ensures that only gangliosides can bind. Candidates who did not gain full credit usually referred to the enzyme rather than the active site. A minority of weaker candidates placed the active site on the substrate.
- (b) Some candidates failed to score on parts (i) or (ii) through not reading the question stem carefully. Consequently, curves were drawn without labels or that did not start at the point required. A wide variety of curve shapes was seen for both question parts.
- (c) Approximately one fifth of candidates scored full marks for this question. This was usually for taking the second route in the mark scheme and stating that enzymes are too large to be absorbed. Most candidates who took the first route were aware that enzymes could be digested if taken orally. However, relatively few recalled that enzymes are proteins.

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**Question 6**

- (a) Weaker candidates sometimes failed to gain a mark through a lack of detail e.g. 'exercise', 'weight' and 'diet', but many gained full credit. A minority failed to score because they gave events associated with coronary heart disease e.g. 'aneurysm' and 'thrombosis'.
- (b)(i) Only the most able candidates gained this mark for suggesting that the blood vessels of healthy volunteers would not be affected by other factors or would be of normal size. Very few candidates noted that the blood vessels of healthy volunteers would function normally. Credit was given for valid ethical arguments, providing that they were qualified. However, a number of candidates failed to score through not relating their answers to the investigation. Weaker candidates tended to echo the need for 'reliable results' or 'a fair test'.
- (b)(ii) Nearly 65% of candidates were aware of the need to avoid bias or selection. However, some candidates thought the volunteers were divided randomly to ensure that both groups contained the same number of people, or the same number of males and females. As in part (b)(i), weaker candidates tended to confine their answers to 'reliable results' or 'a fair test'.
- (c)(i) Most candidates noted that the control group should have been treated in the same way as the experimental group. However, it was only better candidates who stated that the control group should have been given chocolate with no flavonoids. The most common incorrect response was 'do not give any dark chocolate'. Weaker candidates sometimes made vague references to using a placebo but this was not usually taken any further.
- (c)(ii) Candidates were asked why it was important to have a control group *in this investigation*. Hence, this question tested the ability of candidates to apply their knowledge to an unfamiliar context. They were required to do more than define the term 'control group'. For this reason, general answers such as that 'results are not due to other factors' and 'results are due to the independent variable' were not credited. Better candidates related their answers to this investigation. They were aware that a control group was used to ensure that the results obtained were due to the flavonoids or that they did not result from other substances in the chocolate. Many candidates were aware of the need to compare both groups. However, relatively few explained why this was necessary.
- (d) Approximately two thirds of candidates gained one mark for noting that a wider lumen would reduce blood pressure. However, it was usually only better candidates who went on to relate this to a reduced risk of atheroma or thrombosis. Very few candidates mentioned both. Similarly, the idea that the coronary artery would also have a wider lumen was rarely seen.

**Question 7**

This question discriminated well across the ability range and there were many excellent answers to parts (a) and (b). Weaker candidates were often let down by poor expression and this was particularly notable for part (b).

- (a) Approximately half of the candidates gained at least three marks. Most correctly described movement down a concentration gradient by diffusion and against a concentration gradient by active transport. The requirement for energy or ATP in active

transport was frequently noted. Similarly, many candidates were aware that membrane proteins are involved in active transport or facilitated diffusion. However, some disqualified this mark for stating that active transport involves channel proteins. Better candidates also referred to the movement of water by osmosis and related the property of a molecule to its route through the plasma membrane. Weaker candidates sometimes confused active transport and facilitated diffusion. Similarly, a minority described the structure of the membrane, without any reference to transport across it.

- (b) Just over half of candidates gained at least four marks. It was pleasing to see better candidates often scoring full marks. References to a flattened epithelium or many capillaries providing a large surface area were rare. However, all other marking points were frequently seen. Many candidates appreciated the role of ventilation or circulation in maintaining a concentration gradient. Unfortunately, weaker candidates often gave answers that lacked detail or were out of context e.g. 'thin membranes', 'better diffusion' and 'faster gas exchange'. Similarly, they did not usually relate 'large surface area' to the many alveoli present. A minority of candidates started their answer with Fick's equation but did not relate this to the question in sufficient detail.