



**General Certificate of Education (A-level)  
January 2012**

**Biology**

**BIOL1**

**(Specification 2410)**

**Unit 1: Biology and Disease**

***Report on the Examination***

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## General Comments

As might be expected of a unit test that attracted a large entry, there was a considerable range of marks. It is encouraging to note that the very best students were able to gain maximum or near maximum marks. Their work was of the highest quality and they demonstrated not only a comprehensive understanding of the principles and concepts tested but also excelled with the skills of application and analysis. The more modest students, however, demonstrated a number of common failings.

- There was evidence of heavy reliance on past mark schemes. On occasion, this led to entirely inappropriate responses being offered. This was particularly true of question 7 where there were numerous descriptions of competitive or non-competitive inhibition that failed totally to take note of the information provided in the passage.
- Many students presented their responses as bullet points. Frequently these points were no more than key words. Consequently, answers often lacked either the necessary detail or the coherence necessary to gain credit.
- Many students clearly knew much more than was required about the topic of immunology. The examiners were often left with the impression of an obsessive desire to write down all that was known about the topic at the expense of any attempt to target the detail required by the question.
- In some cases, the quality of written communication left much to be desired. It was not unusual to find the correct terms in an answer that made little overall sense.

### Question 1

- (a) Students who were familiar with the emulsion test were often able to gain full credit. There was the inevitable confusion between this and other biochemical tests, and some of the less able students were of the opinion that a substance called “emulsion” should be added. Where students appreciated the need to add ethanol and water, they were not always certain about whether or not it was necessary to heat the mixture, or of the order in which ethanol and water should be added.
- (b) In their answers to part (i), the majority of students correctly suggested 4. Among the incorrect responses, there were frequent references to 3 and 6. Although many students gained both marks in part (ii), there was much irrelevant comment about hydrophobic and hydrophilic groups. It was also apparent that many of the less able students confused phospholipids and plasma membranes. It was expected that students would refer to the presence of phosphate in a phospholipid. Phosphorus was not considered to be an acceptable alternative. Part (iii) was generally answered well although saturated and unsaturated were occasionally confused. It was particularly pleasing to see that many students followed the instruction to use the diagram and described fatty acid **C** as being unsaturated.

### Question 2

- (a) All that was required in answer to this part of the question was a description of the role of the diaphragm in exhalation. Consequently, those who read and understood the question usually gained maximum credit. There were many, however, who failed to notice that the question related to a person breathing out and wrote either about inhalation or about both inhalation and exhalation. Among these students, frequent crossing out and replacement of terms suggested much uncertainty over the detail of

the mechanism involved. This was occasionally compounded by a failure to separate the roles of diaphragm and ribs with references to the diaphragm moving up and out. Other students misunderstood the question completely and wrote about the effect of the inhaler.

- (b) Many students again ignored the instruction given in the question and made no attempt to use the graph. These students often inappropriately applied the formula linking pulmonary ventilation to tidal volume and breathing rate. Others assumed that the breath had been completed in 6 seconds and simply read off the corresponding value from the y-axis. It was only the very best students who appreciated that the curve required extrapolation to the point where it levelled.
- (c) Although this part of the question was frequently well answered, there was a widespread failure to refer specifically either to curve **A** or **B**. Failure to clarify this meant that, on occasion, it was not possible to award credit. Weaker students were clearly uncertain of the roles of bronchioles and wrote of increased surface area and oxygen diffusing through the bronchiole walls. There were also comments that suggested confusion between asthma, emphysema and even tuberculosis.

### Question 3

- (a) Although most students were able to link the features given with the specific cells, there were numerous errors. These usually related to the incorrect attribution of flagellum and nucleus.
- (b) In part (i), most students correctly linked the presence of mitochondria with active transport. Credit was usually awarded for the role of these organelles in releasing energy through the process of respiration. Weak expression occasionally limited the marks awarded. Credit was not awarded, for example, where the student wrote of “making energy” or using energy “for respiration”. The frequency with which Golgi appeared both in this part and in part (ii) suggested considerable uncertainty as to its role. Students who recognised that enzymes were proteins and that proteins were synthesised on ribosomes gained both marks for part (ii). However, many failed to distinguish synthesis and subsequent modification and wrote inappropriately about Golgi. Additionally such comments as “the proteins are now made into enzymes” suggested uncertainty over the relationship between proteins and enzymes. There were many correct answers to part (iii) although the role of microvilli was not always appropriately associated with an increase in surface area.

### Question 4

- (a) An encouraging number of students correctly suggested that a risk factor would increase the likelihood or chance of an event occurring. Where errors occurred, they usually involved incorrectly referring to risk factors causing, or being a side effect of, specific diseases. Defining a risk factor as a factor which affects risk was considered to be insufficient to gain credit.
- (b) Most students correctly distinguished between positive and negative correlation although there were those who explained either in their answers to part (b) (ii) or part (c) that negative correlation meant no correlation.
- (c) The better students had clearly examined the data presented in the question and referred to correlation not necessarily meaning causation and to the negative correlation from 1980 onwards. These students sometimes suggested that other factors such as population increase could explain the rise in both the number of cases of asthma and of the concentration of substances from vehicle exhausts. It was clear that many students took refuge in set responses that might have been

relevant to previous questions but did not apply to the data here. Such responses included poor diagnosis and factors that might have explained the increase in asthma cases but had little bearing on the increase in the concentration of substances from vehicle exhausts. There were also a number of answers along the “we do not know” theme. Answers to questions of this nature should be based on the material that has been provided. “We do not know” is generally an inappropriate response.

### Question 5

- (a) Most students correctly identified the left ventricle in their answers to part (i) and many progressed to describe the importance of the thick muscular wall of this chamber in producing high pressure. There were many, however, who confused cause and effect and attempted to explain why high pressure was necessary.
- (b) Most students were aware that cardiac output could be calculated by multiplying heart rate by stroke volume, although there was occasional use of terms more appropriate to calculating pulmonary ventilation. Heart rate was frequently calculated correctly but the figures were sometimes transposed in transfer to the answer space. More difficulties were experienced, however, with determining stroke volume as 148 – 55 or 93. Errors here fell into a number of categories but it was particularly disturbing to see so many responses in which the correct figures were selected but subtraction errors resulted in credit being withheld.
- (c) There were many correct answers to this question but some students failed to heed the instructions and attempted to answer with ticks and crosses. Credit could not be awarded in these cases.

### Question 6

- (a) Most students correctly identified the evidence as relating to four polypeptide chains. Incorrect answers usually centred on the presence of variable regions or of hydrogen bonds. There was some evidence of the difficulties that students find in interpreting diagrams with numerous references to two polypeptide chains.
- (b) Most students clearly appreciated that an antigen is able to bind to an antibody to form an antigen-antibody complex. Not all, however, were able to identify the binding site of the antibody as having a complementary shape to the antigen. Many of the less able students confused antibodies with enzymes. Use of the term active site rather than binding site was perhaps understandable, but many went considerably beyond this in writing of substrates and enzyme-substrate complexes. There were also many students who failed to maintain the necessary focus and wrote at length of plasma cells, memory cells and vaccines.

### Question 7

There was much evidence from the answers to different parts of this question of the difficulties that many students experience with comprehension questions. It appeared that many of those of more limited ability took very little note of the information in the passage or of instructions embedded within the questions. They identified this question as relating to enzyme inhibition and sought refuge in set responses, many of which were largely irrelevant. Further evidence of the difficulties that the question presented was provided by the number of answers that were crossed through and rewritten on extra sheets.

- (a) Most students correctly identified the monomers concerned as amino acids.
- (b) Students, who read the question carefully and noted the information to which the lines referred, should have been able to point out in their answers to part (i) that aspirin would bind to one of the amino acids making up the active site and that different

enzymes would have different amino acid sequences. Responses along these lines were made by disappointingly few students. Better students produced economical answers to part (ii) in which they correctly identified enzyme **X** and explained that it was involved in the production of both prostaglandins and thromboxane. Others wrote at great length with tortuous logic and often included detailed quotes from the passage of marginal relevance.

- (c) Many students appeared to be of the opinion that aspirin was a non-competitive inhibitor and described it binding at some site on the enzyme other than the active site. Most of these students, however, were able to gain some credit for correctly pointing out that the substrate itself could not bind and produce an enzyme-substrate complex.
- (d) Students showed an excellent understanding of this area of the specification and frequently gained full credit. Most were able to indicate that thromboxane would not be formed and, therefore, that there was a lower probability of clots forming. There were a few, however, who selected an inappropriate property of aspirin and attempted to explain the reduced risk of myocardial infarction in terms of reducing fever or inflammation. Weaker students usually established the principle but could not explain the consequences in sufficient detail to secure additional credit. They failed to refer to the coronary arteries or to the heart muscle receiving insufficient oxygen.

### Question 8

- (a) The starting point for questions requiring longer responses must be careful determination of precisely what is required. This question required students to explain how vaccines protect people against disease but few could resist the temptation to describe in great detail everything they knew about immunology. This often resulted in the allocated space being filled with material that, at the very best, could only be regarded as of marginal relevance. Most students should have been able to access the first three points on the scheme and indicate that antigens on weakened or dead pathogens stimulated the production of memory cells. The fact that credit was not always awarded stemmed from interchangeability of the terms pathogen and disease, and uncertainty over the origin and nature of memory cells. The second part of the mark scheme referred to the generation of a secondary immune response. Those students who finally arrived at this concept, often did no more than offer a few passing thoughts at the very end of the page or on an extra sheet. As always with questions on this topic, the use of language was often far from convincing and there were many references to antibodies “fighting” and memory cells “remembering”.
- (b) This question was generally well answered by those who appreciated that they were required to explain what an ORS consisted of and how it worked. Such students had relatively little difficulty in obtaining maximum credit. There were many others, however, who adopted an approach based either on explaining why the symptoms of cholera included diarrhoea or how substances are absorbed in a healthy person. Where the correct focus was adopted, most students correctly identified the importance of sodium and glucose. Co-transport was a less familiar term and, where it was used, students were not always certain over precisely what was transported. Many students attributed the osmotic effect of ORS to changing the water potential in the intestinal lumen rather lowering it in the cells as a result of absorption of sodium and glucose. There is still a lingering suspicion that some students regard the lumen as a structural feature of the intestinal wall.

## **Mark Ranges and Award of Grades**

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