Version 1.1: 0409

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology 1411

BIOL1 Biology and Disease

Report on the Examination

2009 examination - January series

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Set and published by the Assessment and Qualifications Alliance.

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General Comments

The first unit test for a new specification is always likely to reflect unfamiliarity with both the specification content and the style of questions in the test paper. In view of this it was encouraging to note a spread across the entire mark range. There were some outstanding scripts. These provided evidence of sound preparation resulting in a secure grasp of factual knowledge, as well as the ability to analyse data and to apply the basic principles of *How Science Works* to material presented in a novel context.

At the other end of the mark range, however it was clear that many candidates were ill-prepared. Their factual knowledge was often extremely limited and they were inclined to confuse basic ideas. Thus in question 1, myocardial infarction and aneurysm were often interchanged and, in question 4, asthma was confused with a range of other pulmonary and circulatory conditions. There was also much evidence of poor question technique with candidates responding to key words and answering the question that they thought had been asked. Perhaps the worst example of this was in question 6 (b) where many candidates either explained the causes of diarrhoea or simply listed the contents of an oral rehydration solution.

Examiners also noted the poor performance on question 3. The specification requires candidates to undertake a limited number of specific practical investigations. There was abundant evidence from the scripts that, as with the more theoretical aspects of the unit, many candidates underpinned limited knowledge with little in the way of understanding. Terms such as reliability and accuracy frequently appeared but it was rare to find a candidate who understood, for example, how graphs enabled intermediate values to be determined.

Candidates should be encouraged to follow the rubric and to write only in the spaces provided. This is because answers written in margins or on blank pages may not be scanned and, hence, might not be marked. From June 2009 the extra page will no longer be printed as part of the question paper answer booklet; candidates will be advised to ask for extra paper which should then be secured to the booklet. This change has been made to bring GCE Biology in line with other subjects.

Question 1

(a) Most candidates appeared to appreciate that atheroma involved the build up of fatty material. There was less certainty over where it occurred, however, and there were numerous incorrect references to it being found in the lumen or in the endothelium. Those candidates who confined their answers to part (ii) to appropriate discussion of how a blood clot could lead to myocardial infarction usually demonstrated some understanding of the importance of restricting arterial blood flow. They were frequently let down, however, by a lack of precision. Many candidates wrote vaguely of blood vessels being blocked or of the heart dying, without providing the detail required by the mark scheme. Those answers that gained full credit usually referred to the blocking of the coronary arteries limiting the supply of oxygen to heart muscle.

(b) There was widespread failure to read the stem of the question and many candidates apparently failed to appreciate that the data in the graph represented deaths from coronary heart disease in different countries. Answers to part (i) were not infrequently based on a sample of this size being more reliable, or on the difficulty of plotting large numbers on a graph. Better candidates did, however, refer to the influence of differences in population size. Answers to part (ii) fell into two discrete camps. Candidates who did not appreciate the fundamental principle that correlation does not prove causation were inclined describe the trend shown by the data and cite this as

evidence that dairy fat caused coronary heart disease. On the other hand, those who understood this basic principle usually progressed to point out that other factors were also involved.

Question 2

(a) Most candidates were able to identify glucose as one of the monomers from which a molecule of sucrose was formed, but there was less certainty about the other. Part (ii) was designed to be accessible to grade E candidates and, in view of this, it was disappointing to see so few gaining full credit. There were a number of predictable errors such as in describing the active site as being on the substrate, and in maintaining that active site and substrate were the same shape. Credit was generally lost however because of a lack of precision in the answers. There were many general references to specificity that were simply worded in terms of sucrose and lactose not being 'specific to each other' or enzymes being specific to a particular substrate. Good answers amplified the concepts of shape and fit with appropriate reference to complementarity and the active site of the enzyme.

(b) It is encouraging to note that most candidates were able to describe the data in the graph with appropriate precision and gained full credit for their answers to part (i). There were, however, candidates who failed to distinguish between the terms 'describe' and 'explain' and offered inappropriate responses both here and in part (ii). In part (ii), better candidates generally identified the role of absorption in raising the glucose concentration and respiration or storage resulting in the fall after 45 minutes. Difficulties arose where candidates referred imprecisely to sugar, and there were many answers where the examiners were left unclear as to whether glucose or sucrose was being discussed. It was also apparent that many candidates considered the graph to be showing some aspect of enzyme activity and responded in terms of the effect of a particular parameter on substrate or product concentration. Candidates would be well advised to take the necessary time to read the introduction to questions based on data and to look carefully at the axes before embarking on their response.

Question 3

This unit requires practical work to be undertaken that includes the effect of solute concentration of water uptake by plant tissue. In this question, therefore, candidates were required to demonstrate their understanding of such prescribed practical techniques. It was evident from the responses to this question that although many candidates had some experience of related practical investigations, they had little understanding of the procedures involved. Many otherwise sound candidates gained very little credit on this question.

(a) The diagram clearly showed two different tissues, but only the best candidates based their answers on this information and described cutting the cylinders in such a way as to ensure that they consisted of the same tissue. Many of the answers did little more than reiterate what have become standard responses in past practical assessments without attempting to apply general principles to a novel situation. In this particular case, references to the same cork borer or the same length were irrelevant. There were also a number of vague references to ensuring that this would be a fair test. Candidates would be well advised not to use this term without appropriate amplification.

(b) It was immediately apparent from marking this question that many of the less able candidates had undertaken practical investigations without any understanding of what they were trying to do. Thus there were numerous responses that indicated confusion

with investigations of enzyme activity or respiration. Where candidates did appreciate that the essential purpose of the bungs was to minimise evaporation, it was uncommon for them to refer to the evaporation of water evaporating resulting in a change in the concentration of the sucrose solution.

(c) Candidates who read this question with sufficient care should have noted that it referred to the results provided in the table. Accounts, therefore based on repeating the investigation with other sucrose solutions were inappropriate and did not gain credit. The investigations carried out for assessment of practical skills at AS all require candidates to plot their data as appropriate graphs, and it was hoped that candidates would have applied a similar approach here. Relatively few did, and of these, even fewer appreciated that they should identify the concentration of sucrose in which the ratio of final length to initial length was 1. Few candidates displayed an understanding of the concept of a ratio in part (ii).

Question 4

(a) The first problem for many of the less able candidates lies in determining precisely what they were required to calculate and there numerous attempts at determining magnification and heart rate. Those who appreciated that rate of flow could be determined by dividing distance by time, not infrequently experienced difficulties in changing the subject of the equation or had little understanding of the relationship between centimetres, millimetres and micrometres. The ability to handle routine calculation is a fundamental part of a science subject such as biology and candidates must continue to expect such questions.

(b) Many candidates correctly identified the principle involved in part (i) and were able to describe the role of circulation in replacing blood with a high oxygen concentration. Others, however, were uncertain of the relationship between the lungs and the alveoli, or lacked basic understanding of the process of diffusion. It was not uncommon, for example, to read of an increase in carbon dioxide concentration providing the essential gradient for the diffusion of oxygen. Those who correctly distinguished between asthma and other diseases of the gas exchange system made some progress with this question and frequently gained at least one of the available marks. However, there was considerable confusion in evidence and many accounts that started encouragingly foundered over precise detail. Common misunderstandings involved narrowing of the trachea, alveoli or blood vessels, and there was much imprecise reference to ‘tightening’ of the chest.

(c) Although a significant number of candidates appeared aware of the importance of a control, only the better ones could describe its significance in allowing a comparison to be made or in confirming that it was the drug that led to recovery. An encouraging number of candidates recognised that the control group should be treated either with an inhaler containing either a placebo or their old treatment. There were many, however, who were clearly controlling for the use of an inhaler and suggested giving the drug orally or intravenously.

Question 5

(a) There were many excellent answers to this part of the question that described phagocytes engulfing microorganisms and the subsequent role of lysosomes. Where difficulties arose, they not infrequently stemmed from too much, rather than too little, knowledge and there were some extremely involved and often confused answers that

wrote in great depth about antigen presentation, opsonisation, b cells and t cells, none of which were relevant in the context of this question. The treatment of immunology should be confined to the principles set out in section 3.1.6 of the specification. Candidates will only be required to recall information explicitly described in this section.

(b) From the evidence in the answers to part (i), most candidates appeared to appreciate that a person might be infected with different strains of the influenza virus. Only the better candidates, however, were able to explain this in terms of memory cells. Less convincing answers were seldom expressed in appropriate scientific terminology. Antigen, antibody and antibiotic were often used interchangeably in these responses, and there were many references to 'attacking while the immune system was still weak'. In part (ii), candidates frequently ignored the instruction to 'Use your knowledge of antigens' and merely indentified Strain 1 as the most frequent. There were however some excellent answers.

Question 6

(a) Most candidates were able to extract the relevant information from the passage and explain that many of those with the illness failed to see a doctor. As was the case in question 3, the concept of a ratio in part (ii) proved difficult for some to understand. Although there were many correct answers there were many that should have been considered, at best, to have been improbable.

(b) Where full credit was given, it was generally for linking water potential and the osmotic movement of water out of the intestine. Relatively few wrote of the stimulation of solute uptake through co-transport proteins. Many candidates appeared to have relied on prepared answers and these frequently had little relevance to the question that had been asked. Thus there were numerous accounts that explained, often in meticulous detail, the causes of diarrhoea before ending with a brief comment to the effect that this is all 'stopped by ORS'. Others offered little more than a comprehensive list of the ingredients of a standard oral rehydration solution, describing such features as the effect of potassium ions on appetite and glucose as a respiratory substrate.

(c) Many candidates were able to comment on the identical nature of the sugars in the bacterial antigens and on the surface of nerve cells. For some, this led to a comprehensive account of antibody binding and the formation of an antibody-antigen complex. Others rather lost their way at this stage and did no more than suggest that this led to antibodies 'attacking' the nerve cells.

(d) There were many lengthy accounts presented in answer to this part of the Question. Able candidates frequently described the entire process of ventilation and extended their answers onto additional sheets before eventually arriving at a point where they describe the effects of paralysis. It was clear, however, that many candidates had little idea of the precise role of the diaphragm. It was not infrequently described, for example, as 'pushing the ribs up and out'. Such statements as 'breathing in causes the diaphragm to flatten' were common and revealed confusion between cause and effect.

Question 7

(a) There was occasional confusion between prokaryotic and eukaryotic cells but many candidates were able to draw from a list of suitable points and gained full credit. Some answers, however, were based on function rather than structure and these gained few marks. The spelling of technical terms left much to be desired. Although the examiners

will always give credit where the answer is unambiguous, there were occasions where the spelling of flagellum in particular proved too far removed to gain the relevant mark.

(b) The examiners were at something of a loss to explain why so many candidates chose to write about the advantages and limitations of using a transmission electron microscope rather than a scanning electron microscope. Those who selected the right instruments usually commented about the greater resolution of an electron microscope but occasionally attributed this to the **lower** wavelength of the instrument itself. Limitations, however, were somewhat less convincingly discussed and there were many vague references to size, cost and portability and an obsession among the least able with the fact that electron microscopes were unsuitable for school use.