

Examiners' Report/  
Principal Examiner Feedback

January 2014

Pearson Edexcel International GCSE  
in Human Biology (4HB0) Paper 02

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## **4HBO (02) Principal Examiners' Report – January 2014**

The paper enabled candidates to demonstrate their knowledge and understanding of the subject matter. All questions proved to be accessible to at least some of the candidates and those questions which were intended to discriminate do so effectively. One area for candidate development is in the use of scientific language. For far too many candidates colloquialisms particularly in parts of question 6 i.e. 'fighting' disease and in question 3 the use of the term 'germs', often detracted from potentially good answers.

### **Question 1**

Most candidates demonstrated at least some understanding of the overall process of sewage treatment and usually identified at least two and in many cases, all three places where bacteria were needed for the process. Whilst many candidates correctly identified 'methane' as the gas evolved there were many who described it as 'biogas' which was not acceptable. Most candidates recognised the use for the digested sludge as a fertiliser however, a minority regarded it as 'compost' or 'manure' which were not acceptable descriptions. Part (d) proved to be more challenging with fewer candidates selecting the correct stage. This may be due to a lack of understanding of the term 'anaerobic'.

### **Question 2**

Although many candidates were able to correctly name the structures labelled A there were many who described them as 'chromatids' or 'DNA'. Only the better candidates gave clear and unambiguous answers to part (b). Many drew the correct number of chromosomes but failed to distinguish them using their appropriate shapes, leaving the examiner to decide whether the candidate really did know what was happening during the two processes. Unless the shapes were clear and distinguishable marks were not awarded.

The major issue with the answers to part (c) was often the appalling spelling of the names of the bases. Although the phonetic spelling was accepted it must be a focus for future candidates to ensure that they learn the correct spelling of the five bases to avoid confusion and to allow them to score marks more freely.

Many candidates were unable to give a clear and concise account of the term 'sex linked'. Many confused it with the term sexually transmitted. A simple statement that the condition is carried on the X chromosome was all that was required. The genetic cross should have proved relatively straight forward but many candidates failed to score marks because they did not set out their answers in the expected and traditional manner. The genotypes of the parents were required followed by the genotypes of the gametes they produce. An indication of the crosses carried out by the gametes (and a Punnett square was perfectly acceptable) should follow with lastly each resulting offspring genotype being assigned its appropriate phenotype. This last stage in the cross was the one most commonly omitted.

The question asks for a probability which was not given by a number of candidates. Others became confused between the ratio 1:3 and the probability of 1 in 4. A surprising number of candidates did not know that the male genotype is XY and instead tried to cross XX with XX and many thought that the relevant allele is carried on the Y chromosome as well.

### **Question 3**

Many candidates confused the question asked with one asking about food preservation, so many answers given were largely irrelevant. However, this question outside of this issue did prove to be a good discriminator with good candidates scoring maximum marks but even the weaker ones able to score one or two. There were two particular failings in candidates' answers. Firstly, many candidates correctly described a method that was appropriate to the prevention of the spread of food-borne diseases, for example, wash hands after going to the toilet. However, they failed to then give a reason why i.e. to remove any bacteria that could be passed onto the food. This meant that many candidates denied themselves access to a significant number of marks. The second issue was that use of the word 'germs' instead of appropriate terminology such as bacteria or pathogens. The term 'germs' does not receive credit and should never be used.

### **Question 4**

Many candidates correctly identified 'carbon' as the element though a sizable number suggested that it could be 'iodine' because of the black appearance. All three available tests for water were quoted by candidates and it was particularly pleasing to note that many quoted the complete colour change ie from to. It would have been preferable if all candidates had quoted the use of 'anhydrous' copper sulphate or cobalt chloride rather than just name the chemicals. Many candidates who used the boiling/freezing point means of identification simply stated the temperature at which water boils or freezes. However, the question asks the candidates how it would be possible to test the theory which means the water either had to be heated, or cooled and the temperature at which it boiled or froze noted.

The answers to part (c) were often very poor. The use of gloves is not an acceptable precaution and their use is not something that would be part of normal laboratory procedure. The use of a water bath in many cases would be an acceptable precaution but not in this case because the heating temperature needed to be well above the boiling point of water. Candidates must apply their knowledge and understanding the actual experimental procedure and not trot out generic safety precautions.

Many candidates were unable to draw an appropriate piece of workable apparatus. A common mistake was for a delivery tube, when drawn, not to pass under the surface of the limewater/indicator so the apparatus would not work. Often candidates failed to include a bung in the tube to be heated or put one into the tube containing limewater/indicator. The former scenario

would not yield an appropriate result the latter would yield a result but would not be very safe unless an outlet tube had been included. Answers to part (e) indicated a good knowledge of the Benedict's test though a minority failed to employ any form of heating.

### **Question 5**

Many candidates were able to identify all four bones correctly though where problems arose it was usually with the ulna and radius. However, a number of candidates named bone C as the shoulder blade rather than as the scapula.

Most candidates scored well in answering part b and understood the antagonistic relationship between the biceps and triceps muscles. There were a number of candidates who named the muscles bicuspid and tricuspid and a very common error was to describe movement of the 'arm' rather than the 'forearm'. Few candidates made reference to the pulling effect on bones as a result of muscular contraction.

The difference in movement between the two joints was well described by many candidates. However, a significant number still describe movement in terms of one direction versus all round movement. The simplest and most concise and accurate way to describe movement in the joints is either 180 degree movement versus 360 degree movement or movement in one plane versus movement in three planes. These descriptions leave no element of confusion.

### **Question 6**

Overall, this question proved to be the most challenging. Descriptions of how the transfer of malaria occurs were often confused and indeed confusing. The situation was not helped by many references to the causative organism being either a bacterium or a virus. Few seemed aware that it is a protozoan organism. There were many irrelevant descriptions of development processes of the organism in the blood and liver of a human. Few candidates made it clear that the mosquito will suck the blood of an infected person and then pass it onto an uninfected person through the saliva of the mosquito.

Most candidates failed to understand that tropical climates are wet and warm and are ideal breeding grounds for mosquitoes. In the answers to part (c) many candidates made reference to the condition conferring resistance to malaria (often comparing it with sickle cell anaemia which was not relevant) but then could not go the next step to say that such people would be likely to live longer and reach breeding age and pass on the condition.

In their answers to part (d) many candidates were able to describe the production of antibodies or memory cells but often failed to mention that they remained in the blood. Where they did make this connection they were unable to effectively describe how this helped prevent subsequent attacks of malaria. Far too many candidates made reference to them 'fighting' the

disease. The use of this word does not convey the fact that the immune response occurs more quickly thereby destroying the pathogenic organism before it can manifest symptoms of the disease.

Many candidates understood that the difficulty in producing an effective vaccine lay in the fact that there are many strains and mutations are common.

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