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Examiners' Report/
Principal Examiner Feedback

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Pearson Edexcel International GCSE
in Human Biology (4HB0) Paper 01

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## Examiner's Report June 2014 International GCSE Human Biology – 4HB0 01

### Overview

In many cases, candidates gave very concise, clear responses that showed good structure and organisation. Knowledge of particular concepts for some items was exceptional although pockets of misconception remain apparent and these will be addressed throughout the report. Most candidates showed skill in interpretation and analysis of tabular and graphical data presented to them although in some instances the lack of use of correct scientific terminology and an inability to construct succinct conclusions from data meant that candidates working below a C grade were less able to score full marks.

### Question 1

The multiple choice questions that introduced the paper were, on the whole, well done and most candidates scored highly for these ten items. Item 1b was the least successfully answered where it appeared that 'guess-work' was frequently at play making it quite clear that many candidates are unsure of the hierarchical structure of cells. There was no pattern in the incorrect responses made for this question with candidates responses spread randomly across the incorrect options. Item 1g also posed a problem for some candidates with the most common incorrect answer being the pulmonary artery.

### Question 2

Apart from item 2aii, students' performance on the first of the structured questions on the paper was good. Most were able to correctly identify Biuret as the chemical used to test for protein and name the apparatus shown in the diagram. For 2aii 'wear gloves' was frequently seen. Consequently, too many candidates failed to score on this item as did those that gave other common incorrect answers that were not related to *safety* such as 'avoid parallex error', and 'take readings at eye/meniscus level'.

For item 2c a few candidates failed to gain marks by confusing the test for protein with the test for a reducing sugar and focused their response on the use of iodine and the formation of a brick red colour. Others were under the impression that the blue colour of P, being a less 'intense' colour indicated that it contained less protein than Q. Although this was incorrect, these candidates gained one mark for implying the presence of protein in Q.

## Question 3

There were many clear, accurate responses that indicated a good understanding of the roles of the different structures of the white blood cell for question 3a. Candidates that failed to score marks tried to link the functions of the various structures to the actual role of the white blood cell e.g. (cell membrane) engulfs bacteria and (cytoplasm) contains enzymes that breakdown the bacteria rather than recognising them as a basic feature of all animal cells. Some candidates just listed the names of the structures rather than their functions and this was likely a case of misinterpreting what the question was asking.

For item 3b, most candidates understood the role of the phagocyte in destroying pathogens and answers were generally well structured. The mark that was most commonly omitted was 'enzymes' where some candidates were aware that the white cell digested or broke down the bacteria but failed to state that this occurred through enzyme action. Very few candidates failed to score at least one mark on this question.

Many candidates scored at least one mark for question 3c for providing a response that most commonly included binding to antigens. Some excellent answers also detailed how the consequence of this binding acted as a signal for phagocytes for a further mark. Only a few candidates gave less successful responses such as 'antibodies destroy pathogens/antigens' or 'antibodies produce chemicals to neutralise toxins', and these failed to gain any marks.

## Question 4

Question 4 posed few problems although a fair number of candidates did confuse the labels for the parts of the tooth. However, candidates demonstrated a good understanding of how brushing teeth helps to prevent tooth decay with the idea of removing bacteria/plaque/food from teeth seen more often than other marking points. Acid production was also seen frequently for a further mark although the inclusion of 'enamel' in responses was not always in the correct context or required further clarification.

## Question 5

The food chains/webs drawn by candidates for question 5a were generally correct with the majority gaining two marks for their response. Those that were not awarded full marks most often lost a mark for drawing arrows the wrong way round. Question 5bi was generally well answered with most candidates gaining two marks. Movement and respiration were the most common correct answers seen whereas as the most common incorrect answers stated that energy was lost in the formation of bones, skin and hair or just simply state that energy was lost without further clarification.

Item 5bii was probably one of the least successful for candidates on this paper. The poor use of technical terms in answers and lack of understanding of how eating barley instead of meat from cows could reduce food shortage meant that many candidates failed to score at all for this question. There were too many references to there being more cows 'if we don't eat them' and that 'the cows will produce cheese and milk' leading to a reduction in food shortage. Most candidates failed to recognise that shortening the food chain would reduce the amount of energy lost or that the barley contains more energy than organisms found in higher trophic levels. Candidates scoring one mark more often gained this for recognising that barley can be produced more quickly than cows.

Similarly for question 5ci some candidates gave poorly structured responses such as 'plants *breathe in….*' or 'oxygen is needed to help us breathe' rather than state that it is needed for respiration. The majority of candidates understood that photosynthesis released oxygen and gained at least one mark for including this information in their response although many failed to answer the question fully by neglecting to add the reason *why* humans are dependent on oxygen. A small number of students failed to gain marks by stating simply that plants produce oxygen or just repeated the question - 'humans depend on plants for oxygen' – and although some of these candidates were able to add further detail such as 'plants take in carbon dioxide and release oxygen', this information was again too vague to award credit. Better candidates gave excellent responses, providing details on photosynthesis and its importance to humans in respiration and then continued to describe the importance of respiration for humans. The majority of these responses covered all marking points on the markscheme.

## Question 6

Candidates generally performed well on question 6. Most candidates were able to correctly name the structures of the heart for 6ai with the most common error being Part B which was frequently named 'bicuspid valve' or just 'valve'. Some marks for their response to item 6b purely for the way it was worded. Although details in many cases were on the right track, key elements were omitted or vague details such as 'arteries become blocked' were used which were insufficient and non-creditworthy in this case. Weaker students seemed to concentrate on describing how cholesterol contributed to the formation of an atheroma with others showing limited understanding of *why* eating too much fatty food could lead to a heart attack. Conversely, there were some very good accounts detailing how the fatty deposits resulted in the narrowing of the coronary arteries leading to a reduction in blood flow and hence oxygen delivery.

## Question 7

Items 7ai, 7aii and 7ci posed little challenge to the significant majority of candidates, but candidates were very unsure of the type and number of cells divisions that produced the embryo shown in the diagram for 7bi. The ticks given in the table as a response seemed to be randomly placed with very few correctly identifying mitosis and 2 cell divisions. Similarly for item 7bii, many candidates were not able to correctly state the term given for a random change in genetic material. 'Genetic modification' was seen very frequently which may imply a misconception with this process where the DNA structure is changed at an identified, specific point rather than a random change that occurs with a mutation.

Candidate responses were mostly successful for 7ciii with most gaining two out of three marks allocated for the question. Some students included non-creditworthy details in their response which did not focus on the role of the placenta in the *nutrition* of the embryo, providing information for example on the removal of waste products. A significant minority were under the impression that blood was transferred from mother to foetus, others simply repeated the question stating that 'nutrition was passed from the mother to the baby'. Oxygen was too often missed from the list of substances transferred.

## Question 8

For item 8ai most candidates were able correctly state maltose as the sugar produced from the breakdown of starch although glucose was seen most commonly as an incorrect answer. A vast number of candidates failed to interpret the question properly for 8aii and appeared to translate it into 'where amylase was found' rather than *made*. Consequently many students gained only one mark for their answer, mostly for small intestine or pancreas, but failed to gain the second mark for stating 'mouth' or 'saliva'.

Item 8bi was answered correctly by the majority of candidates but many failed to gain full marks for 8bii. Although many were able to gain at least one mark for their by recognising the reaction at $40^{o}C$ being greater than that at $60^{o}C$ a large number of candidates failed to provide further detail to *explain* the difference in the rate of reaction between the two temperatures. More able candidates mostly gained 2 out of the 3 available marks for their response by including details about the enzyme denaturing at $60^{o}C$. Marking point 3 was not seen at all and few students managed to obtain the fifth marking point, omitting details linked to the binding of the enzyme to its substrate. Many candidates lost out on a second mark for providing vague details such as 'at higher temperatures the enzyme denatures'. The information provided in the table does not entirely support this and, therefore, marks were not awarded to those candidates whose responses were ambiguous in this respect. Many responses for 8biii stated that $37^{o}C$ had to be the optimum temperature as this was body temperature despite the data in the table not fully supporting this. Most candidates recognised that the $10^{o}C$ increments in the temperatures were insufficient, although in some cases answers lacked clarity and were not awarded. Others suggested all sorts of possible experimental errors and a very low percentage of candidates failed to recognise that repeat tests were needed. A good number of candidates were able to clearly state that more readings were needed between $30\,^{o}C$ and $50\,^{o}C$ and others included detail about the optimum temperature being above or below $40\,^{o}C$. Overall, not a very well answered question mainly due to a lack of consideration given to the data provided.

## Question 9

Around half of candidates gained a mark for their answer to 9ai with the most common correct answer focused mainly on car exhausts or engines. Those that were unsuccessful in their response commonly gave sources such as 'global warming', 'cigarettes' or 'smoking'. 'Unfinished' answers such as 'incomplete combustion' or 'burning fossil fuels' were not deemed acceptable as an example was needed to gain the mark, whereas candidates that gave a little more detail such as 'incomplete combustion of fossil fuels' were awarded the mark for their response.

For 9aii a large number of candidates were aware that factories were a major source of sulphur dioxide pollution for one mark and although many were on the right lines with their answer inadequate detail meant that they were unable to score on this question. For example 'fossil fuels' alone did not meet the marking criteria and 'car exhausts' was unacceptable as a major source of sulphur dioxide pollution. Candidates who failed to score full marks for their response to 9bi most often lost marks on the percentage calculation although most candidates scored the mark for determining the number of bricks covered by lichen.

There was a distinct lack of clarity in responses to question 9ci. Most candidates were aware that carboxyhaemoglobin reduced the amount of oxygen carried by red blood cells but then failed to provide further details to explain the detrimental consequences of this on health. Consequently, these candidates were only able to obtain credit for covering the first marking point on the markscheme. Other candidates described how less oxygen in the blood would lead to cells carrying out anaerobic respiration and producing lactic acid and although this was not a marking point, these candidates again did not mention how this would affect the health of an individual. Very few students understood the initial effect on the body of carbon monoxide poisoning as that affecting brain cells leading to their death and many of these students preferred to talk about cells in general with some focussing only on muscle cells. Some candidates lost marks for making vague comments such as 'less oxygen in the body' and again for not structuring their response clearly e.g. 'cells need oxygen for respiration'.

## Question 10

Candidates that did not score full marks for 10ai generally included information only on how the food could become contaminated by the server and failed to include other methods by which the food could become contaminated e.g. through flies or through airborne pathogens. Some candidates had the right idea but failed to use acceptable terminology. For example, 'germs' was often used as an alternative to pathogens or bacteria. Other candidates stated that 'a disease' or 'an infection' was spread from the server or from flies to the food or that droplets could land on the food. Again these responses failed to gain marks either for their use of incorrect science or vagueness. For 10aii, many candidates were aware of the lag time during which the bacteria multiplied and included the 'incubation period' in their response. Some then went on to describe what happened during the incubation period although this unfortunately failed to gain them an extra mark as it was part of the same marking point. However, the details given by many candidates clearly indicated a good understanding of why symptoms of food poisoning did not appear immediately after eating infected food. Few candidates were able to structure their response adequately to describe the delay in symptoms appearing being due to the time taken for bacteria to travel through the gut.

The graphs drawn for 10bi were, on the whole, excellent. Points were plotted accurately with clear lines showing the trends in the number of cases of food poisoning by all bacteria and Salmonella alone. It was very unfortunate however that most candidates, despite the high quality of the graphs drawn, lost one mark for omitting the units (thousands) on the Y axis. A small number of candidates failed to gain marks for labelling the axis the wrong way round (year on the X axis, number of cases in thousands on the Y axis) but the graphs were, on the whole, very clearly drawn with each line labelled appropriately. The most common omission in response for 10bii included the use of data, extracted from the graph, to support details that the candidates gave in relation to the number of cases of food poisoning.  In some cases, the data chosen was insufficient or poorly presented. Consequently a common score for this section of the question was 2 out of the total 4 marks allocated to the question. Many candidates gave responses that did not distinguish clearly between the two sets of data given although one mark was often gained for recognising the decrease in cases of Salmonella food poisoning. Some candidates attempted to explain why there was an overall decrease in the number of cases of food poisoning which was not what the question asked. For example, 'better hygiene' or 'better education' were seen fairly often. These candidates misunderstood the demands of the question.

## Question 11

Most candidates scored at least four marks for 11aii but many scored nearer to full marks. Common errors included respiration or metabolic reactions for shivering, heat for insulation, dilate for constrict and escape for evaporate. Question 11bi was generally answered well by most candidates who scored 2 marks for recognising that the volume of ice increased in the winter months and decreased in the summer months. These answers were very clear in their detail and to the point.  Some candidates were vaguer in their response making statements such as 'when the temperature is higher the ice melts and it freezes again when it is colder' or 'the volume of ice changes with the seasons or weather'. These responses neglected to link temperatures with specific seasons and did not, therefore, attract any score. Other candidates referred to the changes in the volume of ice as a consequence of global warming or just simply stated that the 'the graph shows that the volume of ice changes'. Responses for 11bii too often repeated the question. For example, many candidates gained one mark for identifying a decreasing trend in the ice volume but many stated that this was 'due to global warming' rather than linking the drop in ice volume to a general rise in temperature.

## Question 12

There were some very good answers given for 12ai where candidates demonstrated a comprehensive understanding of the process of blood clotting. Most made a correct reference to fibrinogen and fibrin, with better candidates also recognising the role of thrombokinase (less often seen), prothrombin and thrombin. Less able candidates were mostly able to score one mark for including details on the formation of a 'mesh' to seal wounds. Question 12aii seemed to include many responses where the terminology used was less desirable. Candidates should be encouraged to refrain from the use of terms such as germs and use more appropriate terminology in order to gain marks. However, the vast majority of candidates obtained full marks for this item, showing a good understanding of the importance of blood clotting in reducing blood loss and preventing the entry of pathogens into the blood system.

For 12bii many candidates substituted the expected explanation for a genetic diagram which was not acceptable response in this case. There were only a few candidates who were able to explain why no female haemophiliac offspring were produced and many were content to show the cross between the father and the mother (often with the use of a genetic diagram) with very little further detail. Of the candidates that did attempt to give an explanation some identified the genotype of the father correctly, explained that only he could pass on the dominant allele and that the female offspring could only receive the recessive allele from the mother if she was heterozygous. It was in only a few good answers where the statement was made that the female would have to be homozygous recessive.  Overall, a poorly answered question with many responses lacking clarity and succinct detail.

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