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Examiners' Report

Principal Examiner Feedback

November 2021

Pearson Edexcel International GCSE

In Human Biology (4HB1) Paper 02

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November 2021

Publications Code 4HB1\_02\_2111\_ER

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1ai The most commonly missed mark in responses was marking point 2; (transport oxygen) *from lungs* which limited a fair number of responses to two marks. Candidates were mostly familiar with red blood cells carrying oxygen for one mark although several failed to state that the oxygen was carried to *body cells, tissues or organs* and more often simply stated *to the body* which was too vague. Some students preferred to state that oxygen was carried to body parts which, again, was not awarded. There were some responses that included unnecessary detail which may have, in some cases, caused students to lose sight of the actual question. For example, information was given by candidates on the reason why oxygen was needed and too much detail about aerobic respiration, energy demand and its waste products were incorporated into answers. There were some responses that included details of red blood cells transporting nutrients or waste products which implied some misunderstanding of the role of these cells in the circulatory system.

1aii Many candidates failed to give an explanation that linked an adaptation of the red blood cell to its function and lists of adaptations or features were too often given without further detail. It was also common for students to name a correct adaptation but link this with an incorrect function. For example, no nucleus to increase surface area or biconcave shape to pass through capillaries. More able candidates were able to gain full marks giving responses that were clear and well-structured and the frequency at which the different marking points were included in answers was fairly equal across responses.

1bii Marking point 1 was covered in the majority of responses although this was often the only marking point seen in answers. Candidates generally failed to state, in their explanations, that valves or a wide lumen, for example were only found in veins. It was obvious that some students had concluded that the vessel shown in the diagram was an artery and it was unfortunate, in these cases, that the details provided to explain their choice of vessel were explanations linked to arteries rather than veins.

1biii There was some confusion in the measurement of the width of the vein between the points stated. Marks were lost due to poor measurements – there were several answers that showed, in the working out, that the distance between points A and B on the diagram was 16 mm or another measurement that was beyond the range given in the mark scheme. Errors occurred where a fair number of candidates used centimetres in their calculations rather than millimetres. Subsequent calculations from these were often confused and inaccuracies were seen in conversions of centimetres to millimetres. It was rare for candidates not to be awarded any marks at all for their response to this question as credit was often given (maximum of one mark) to students that divided their (incorrect) measured value by 10 and provided a correct answer according to their calculation. This mark was most often awarded where candidates showed clear working out. On the rare occasion where no marks were given at all, this was frequently due to an incorrect answer being given without any working out being shown at all.

2a The responses seen were mostly well structured and included a correctly sequenced method that described the Benedict's test including safety measures. Where marks were not awarded, it was often because candidates heated the solution with a Bunsen burner or gave an incorrect safety procedure such as wearing gloves or a lab coat. Although most candidates were aware that a colour change took place in the presence of a reducing sugar some of the information given for this marking point lacked clarity and could not be awarded. Probably the most commonly missed marking point was where students omitted information about dissolving or mixing the powders with water in the initial stage of the procedure although marks were generally made up elsewhere. Some students failed to read the question correct and described only safety measures in their response with no further detail given.

3c There were several responses that lacked clarity where candidates almost hit a marking point but did not quite word their answer clearly or with enough detail to award a mark. There were many responses that gave information on the role of the hypothalamus (including negative feedback) and the pathway of events that occur between the brain and the sweat glands but this information just took up space on answer lines and was irrelevant. It may be worth noting here that candidates can write lengthy responses that include some good science, albeit irrelevant, which takes up much of the space on the paper allocated to the response. This could lead to a lack of space to give the information actually needed to answer the question. What is important here is that students provide responses that are succinct – avoiding information that just pads out an answer – and that the details given reflect the expectations of the question and the number of marks allocated to the question. There were several responses that failed to give the site of evaporation of sweat i.e. the skin's surface and others that confused vasodilation as a mechanism for sweating. It was also fairly common for candidates to omit information on the use of body heat to evaporate sweat.

3d Most candidates were able to extract information from the passage to gain one mark for understanding that hyperhidrosis *runs in families*. Very few responses included details about gene mutation or faulty alleles being the cause of this disorder thus marking point 2 was rarely awarded. Where information was provided for marking point 3 it was generally too vague to gain a mark and few candidates failed to simply state that the faulty gene was *passed to offspring*. Many students correctly identified that males get the disease although some failed to gain a mark for linking the faulty allele to the Y chromosome.

3e The majority of responses to this question were surprising as candidates tended to give the symptoms of diabetes rather than provide information on risk factors. For example, common incorrect responses included heart disease, high blood sugar and in some cases amputation of limbs. The definition of risk factor is clearly an area of confusion for some students.

3f Some responses were very wordy and just revisited the details that candidates likely provided for question 3c. This information tended to describe the role of sweating in controlling body temperature and negative feedback which was not awarded. A fair number of answers did, in a roundabout way, convey an understanding that varying external temperature was a determinant in the volume of sweat produced and these most often gained a mark. Many candidates were aware that the level of activity of an individual also influenced the amount of sweat produced but very few linked this to an increased rate of respiration and the consequential increase in the amount of heat released from this process. Incorrect details often linked sweat production with health and various illnesses were named. More able students were able to gain the full five marks for their answers although candidates working at lower levels often provided answers that were restricted to a maximum of 3 marks, gaining these by covering marking points 1, 4 and 5.

4ai There were many variations in the bar charts produced by candidates for this question. The most common error was labelling the axes incorrectly by placing the number of students on the X axis (which often led to the scale also being wrong) and the number of teeth on the Y axis. In most cases the bars were plotted correctly despite incorrectly labelled axes and, therefore, students were often able to gain two marks for the chart drawn. Some attempted to draw line graphs – a case of ensuring that all information provided by the question is read and digested thoroughly. Some bar charts were very badly drawn – different width bars or bars not spaced correctly were seen in several responses. Most candidates drew a histogram rather than a bar chart and although this was not penalised in this instance it did reflect some misunderstanding between the two.

4aii Few candidates calculated the total number of pupils incorrectly which restricted their marks to a maximum of two in most cases. For example, calculations were seen where students divided 13 by 28 (rather than 30) but those that did arrive at the correct answer were given some credit. It was rare for candidates not to gain marks for their response and the vast majority were able to obtain full marks for providing a correct answer of either 43% or 43.3%.

4b It was disappointing that too many responses reflected a lack of knowledge on the reasons why the number of teeth in young children is less than in adults. Information such as young children having tooth decay and consequently having teeth removed was often seen. Very few answers indicated that a young person's jaw was too small to accommodate more teeth and it was this marking point that frequently restricted the number of marks allocated to a maximum of one. There were many descriptions that discussed just milk teeth without any further detail of wisdom teeth or molars.

4ci This was generally well answered with many candidates gaining three marks. Most commonly, one mark was lost in responses where students failed to state that sugar remained in teeth. Candidates most often referred to bacteria *feeding* off sugar and *producing acid* rather than using the sugar to respire and naming the type of acid produced. There were some incorrect responses that referred to bacteria *eating* the tooth or that it was the sugar itself that produced or was converted to acid without a mention of bacteria. Good understanding was evident in the majority of responses that included the production of (lactic) acid by bacteria and the erosion of enamel.

4cii There were a large number of candidates that repeatedly hit the same marking point. For example, responses scoring one mark tended to describe how regular brushing using fluoride toothpaste and flossing reduced tooth decay. More vague responses that were not awarded included information such as reducing the amount sugar eaten or reducing the intake of fizzy drinks or brushing teeth correctly rather than regularly. Two-mark answers also included some detail on regular dental visits.

5b There were some answers that were poorly worded or confused which failed to gain credit. For example, several responses stated that an increase in reflex reaction would be seen without referring to speed or that reaction time increased. Some candidates gave a correct response but then went on to describe their statement using wording that negated their original answer. Most students, however, recognised that caffeine decreased reaction time or increased the speed of reaction.

5c Many candidates were not able to gain full marks for their response to this question. Although a fair number recognised that it took time for caffeine to be absorbed into the blood responses often failed to mention that caffeine also needed to be transported *to the brain*. Rather than refer to caffeine, some students only mentioned coffee in their answer. These responses were not credited.

5d Candidates were mixed up on the wording of their responses to this question and a large number failed to provide evidence to meet the first marking point. Many were unable to describe clearly that food or drink could contain (unknown) substances that might affect the results of the investigation. Some vague answers simply stated to make the test valid. However, many students were aware that refraining from eating and drinking before carrying out the investigation would help to ensure that it was the caffeine that affected reaction time and no other factor.

5e The vast majority of candidates failed to gain a mark for dividing the mean distance travelled by the ruler (169) by 2, arriving at an answer of 84.5. This question certainly presented a challenge to students working below level 6 – it was only the more able students that were able to correctly use the difference between the mean values with and without coffee in their calculations to obtain the right answer.

6a One mark was lost to candidates who stated that a joint was where two bones *joined* together, rather than meet. Similarly, some students stated that a joint was where two bones *connected*. Again, this wording was not credited. On the whole, candidates were not overly challenged by this question, and many were easily able to gain full marks for very simply stating ‘where two bones meet’.

6bii Overall this was well answered, and marks were only lost by candidates that failed to indicate that cartilage was found both at the end of the humerus AND the depression in the ulna. Some drawings were unclear in that the cartilage was added inside the humerus rather than outlining its end at the joint. Candidates that failed to score any marks made no attempt to complete the diagram at all.

6c It was quite evident that many candidates were familiar with the role of cartilage. Responses mostly provided clear details that implied increased friction between bones or less shock absorption would be a result of damaged cartilage. A good number of students were also able to state that a lack of cartilage would cause pain.

6d Some students gave details that included named muscles although this was not an expectation. There were several responses that confused the action of the triceps with biceps with many providing incorrect information on which bones these muscles were attached to. Consequently, this information and, more often than not, further information about direction of bone movement could not be awarded. Other students did not provide details linked specifically to bone M (even though this bone was clearly stated in the question) and proceeded to discuss how the biceps affected movement of the lower arm. Few candidates were able to state the importance of tendons other than their role in attaching muscle to bone – many seemed unaware that tendons *pull* on the bone as muscles contract. Other responses stated that tendons were ‘flexible’ or ‘elastic’ or provided details suggesting that tendons acted like a muscle e.g., contract and relax and these were incorrect.

7aii This was very well answered. Most students were aware that Ebola is caused by a virus and that this type of pathogen could not be treated with antibiotics. Most commonly, one mark was lost by candidates that gave unclear responses on the action of antibiotics and there was a little confusion on which pathogen they targeted (marking point 2). There were a number of answers that described how antibiotics act on cell walls, but the detail given failed to specifically state that viruses do not have cell walls meaning that any antibiotic would be ineffective.

7bi There were many clearly structured calculations from the vast majority of candidates although too many of these failed to give a final answer to two significant figures as the question asked. Although it was rare that responses failed to gain any credit at all, students that did show working out tended to gain a maximum of 2 marks (as a result of an error carried forward being applied). This question was challenging to many candidates.

7bii Candidates analysed information from the graph well and drew conclusions from the data shown to often gain full marks for their response. There were only a few students that named

antibiotic A as bactericidal which unfortunately led to any other details given on the reasons why being incorrect.

7biii There were a very large number of students that incorrectly stated that antibiotic A prevented the bacteria from reproducing indicating some unfamiliarity with interpreting and making conclusions from bacterial growth curves. It is worth reinforcing the fact that a plateau on a bacterial growth curve means that the number of bacteria reproducing equals the number of bacteria dying i.e. that reproduction is not stopped, only population growth. Responses that stated antibiotic A prevents population growth were very rarely seen. Candidates that identified antibiotic B as the best to treat the disease tended to gain at least two marks by further mentioning that this antibiotic killed bacteria or caused a decrease in their number. There were an exceptionally low number of responses that scored full three marks for this question.

8aii This was well answered by many students who correctly used the terms homozygous and heterozygous or a clear description and/or example in responses that gained the mark. Students working at the lower levels were more likely to not include these terms and less able to define them.

8bi There were a vast number of correct, full mark responses to this question with most students presenting, alongside a diagram, a clear key that reflected the gender and genotype of each individual in the family. On the rare occasion where a mark was lost, this was most commonly for the second generation where some students were confused on the connection between the mother and father of the affected child. The linkage to these was, at times, unclear and such responses often gained a maximum of two marks. In unsuccessful responses a key was often omitted from a genetic diagram drawn by the candidate which, although the diagram given was more likely correct, rendered the response too ambiguous.

8bii Several students were under the impression that because the disease was more common in males than females that the faulty allele was carried on the Y chromosome, from father to son. Many recognised that it was a sex-linked disorder with some candidates stating that the mutation was carried on the X chromosome. Marks were lost frequently where candidates failed to recognise that the faulty allele was *recessive* – this was rarely mentioned in responses which restricted many to a maximum of two marks.

