



Examiners' Report Principal Examiner Feedback

Summer 2019

Pearson Edexcel International GCSE
in Human Biology (4HB1) Paper 02

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1aiii There were many responses that referred to 'cusps' which were very often linked to a greater risk of tooth decay. This implied that a vast number of students misunderstood the function of this structure which unfortunately cost them a mark. Other candidates referred to enamel on these teeth being 'thin' so easily decayed – again no marks were awarded for these candidates that failed to understand the expectations of the question. On the contrary, a significant number of students were able to score at least two marks for including details that correctly described the external structure of the tooth as having crevices (although this term was not frequently used) and therefore food was more like to get trapped.

1bi This was answered well by candidates who were able to use the graph to make two valid conclusions about tooth decay in children. The majority of responses gained full marks. There were, however, a number of students that lost marks by merely quoting figures without giving a conclusion and others that gave reasons for the trend in tooth decay rather than describing the trends as the question asked.

1bii Candidates gained marks by including details about the use of fluoride toothpaste or more regular brushing and/or visits to the dentist. Others were less successful in their responses and there were a vast number of students that gave vague answers suggesting 'better technology' or 'better healthcare/hygiene' or 'more awareness of tooth decay' or just simply 'using toothpaste' were the reasons for the reduction in tooth decay over the 30 year period. These failed to gain marks. Some candidates talked about 'caring for teeth' without stating how and others mentioned 'more children visiting the dentist' but omitted to state more regularly. Some students gave a brand name of a toothpaste without mentioning that it contained fluoride. Again, these answers were not credited.

2ai Most responses gained full marks for this question showing a good understanding of the function of cell structures. Candidates were mostly able to recall that mitochondria were the organelles that released energy and that the nucleus store genetic information. The most common incorrect response was 'cytoplasm' in place of mitochondria although these students often gained one mark for their understanding of the role of the nucleus. There were, however, some responses that referred to the nucleus as the 'brain' of the cell – a term that has been highlighted several times in previous examiner reports as unacceptable.

2aiii A vast majority of candidates were able to correctly determine a correct measurement from the diagram given and were awarded two marks for using this value in a calculation. However, the number of responses awarded three marks was limited

as many students seemed unaware of how to use the measurement they obtained in a correct calculation.

2b The majority of students used the word 'diffusion' and clearly understood and stated the correct concentration gradient. Students scoring one mark tended to omit the concentration gradient mark but gained credit for correctly mentioning the process by which carbon dioxide moved from a body cell into the blood. Less successful responses mostly included a discussion of where the carbon dioxide goes but not how.

3cii Adding excess biuret reagent was the most common incorrect answer given by candidates. However, many students were able to come to the conclusion that the result for the distilled water was incorrect due to contamination by protein. Some students stated that the distilled water 'may have been contaminated' or that the 'distilled water was impure' and other answers that failed to gain credit included information such as 'human error in seeing colour' or 'using tap water of distilled'.

3d Nearly all students included 'wear gloves' in their response to reducing the risk of hazards when dealing with broken glass or using biuret reagent. This detail was ignored and gained no credit. Many failed to mention that broken glass should be cleared using the equipment mentioned in the markscheme and a variety of incorrect detail was given such as 'back away from broken glass carefully' or 'wear safety clothing' or 'use tongs'. In dealing with biuret reagent more answers gained a mark for stating that goggles should be worn, but again many answers implied a lack of knowledge of how to minimise the risk of potential hazards.

4a This was a well answered question with the vast majority of candidates showing clear working out and arriving at the correct answer. Students scoring one mark most often arrived at an answer of 75000 as they had divided by 40 and multiplied by 100 rather than the other way round and these were only credited where the answer to their calculation was correct.

4b There were many responses that stated pathogens were 'organisms' rather than 'microorganisms' that cause disease and these failed to gain a mark. Some candidates incorrectly stated that pathogens were the disease themselves. Others quoted pathogens as 'animals' or 'substances' – again these responses did not gain a mark.

4c Although generally answered well there were common errors seen in responses. Several students simply stated that 'pellagra was a deficiency disease' or 'caused by a lack of vitamin B in the diet' or simply that 'it is not caused by pathogens' and others used terminology given in the question such as 'pellagra is caused by a poor diet and so is not infectious'. However, a good number of candidates understood infectious as transmissible from one person to another and used terms such as 'non-communicable' or 'contagious' in answers that gained one mark.

4d Many students answered this question well and gained three marks for their answers. Those failing to score full marks tended to miss out the

comparison/monitoring mark and gained two marks. Responses that obtained one mark included details only of using a group of people but did not mention about varying their diet. For some reason, and in a fair few cases, candidates chose to include a very small sample size e.g. 'take two people....' which was bordering on inadequate for the mark although some leniency was shown in such answers. Several candidates mentioned blood testing and occasionally the use of rats which did not score.

4e Some candidates just gave a description of the role of cartilage and others failed to link the effect of a lack of normal collagen production on cartilage production. One mark responses often mentioned how 'bones would rub together' or, less frequently, there would be 'less shock absorption'. There was a fair amount of evidence to suggest that candidates failed to read the question properly and there were a number of responses that did not refer to cartilage at all. Instead, these answers gave details about weak bones due, for example, to the lack of protein or made reference to vitamin D and its effect on bone strength. However, the majority of students gave clear responses that covered the necessary details for two marks.

5aiii Students had difficulty in explaining, for a second mark, how each half of the divided embryo each formed one offspring and this meant that a large number of responses were restricted to one mark. However, the diagram was used well to gain the first mark where correct details were given about the zygote (rather than the embryo) dividing. Some candidates mentioned that the zygote (or embryo) 'divides by mitosis to form two identical twins' which failed to gain a mark and others confused meiosis with mitosis assuming that the ball of cells shown in the diagram was a product of this process.

5bii Good understanding of the IVF process was shown by the vast majority of candidates in their responses with an excellent number gaining full marks. Students that were less successful often failed to mention that the sperm was taken or extracted from the male and others preferred to discuss artificial insemination or gave details about when sexual intercourse should take place during the menstrual cycle to increase the chances of pregnancy. Some responses included details of meiosis which were irrelevant and in few cases marks were negated. Most students failed to mention how an embryo was formed although candidates were mostly aware that the embryo was inserted back into the uterus. Most often, these answers included zygote as an alternative to embryo and although the use of the term was allowed for the appropriate mark students should be made aware that it is the embryo that develops and is implanted. Some candidates seemed misled into thinking that the IVF process involved artificial insemination.

6aiii The most common error in responses for this item was a failure to draw the valves which restricted many answers to two marks. Diagrams were not always drawn clearly, particularly thickness of the walls which showed little difference in thickness to the artery. Benefit of the doubt was given in a few cases and some students were able to gain full marks although caution should be taken, when drawing diagrams in exams,

to ensure that drawings reflect, without doubt, the structure they are supposed to and not to include details that have not been requested in the question.

6aiv A vast number of candidates still fail to understand the command word 'explain' and gave a list of structures in their response without explaining the differences in the structure between the artery and the vein. Many marks were lost due to this where students just gave a list of differences. The most common correct answers referred to veins having valves to prevent backflow of blood but too many responses were, on the whole, restricted to this where the remainder of the answers just listed structures without giving an explanation. Students should be advised to link structure to function as this appears to be a challenge for all but the best candidates.

6b Candidates often, and incorrectly, referred to capillaries being one cell thick rather than their walls and this error cost many students marks. Other responses described the function of capillaries and did not include details of structural adaptations – again this cost marks. Some students misunderstood the question and described adaptations of the capillary network as a whole rather than discrete vessels and stated that they had a large surface area. This is a collective adaptation but, unfortunately, did not answer the question. There were a good number of candidates that were able to link the structure of capillaries to a shorter diffusion distance for one mark.

7a Many candidates were able to arrive at the correct number of units using the information given to them to in the question. Where full marks were not awarded, this was generally for failing to show coherent working and in many cases it was difficult to elucidate how the students arrived at the answer they had given. There were a fair number of students that were unsure of the steps needed to complete this calculation and many failed to subtract three hours meaning that marks were limited.

7bi A vast number of candidates did not use the value that they obtained in the previous question to carry out this calculation and candidates scoring one mark gained this primarily for an error carried forward.

7bii This question was generally answered well with candidates scoring a mark for showing an understanding that alcohol slowed reactions. Few mentioned that alcohol was a depressant and the general effect i.e. that it affects the nervous system was often missed. Incorrect responses often included 'blurred vision' or 'unconsciousness' and there was an apparent (but traditional) confusion of reaction time where candidates were misconceived into thinking that alcohol *decreased* rather than increased reaction time.

7c There were three marking points that students most often missed and this tended to limit the number of marks awarded to many responses to three or four. A large number of candidates failed to link high acidity in the small intestine with enzyme action in general. Few candidates included details that referred to reduced action or denaturing of enzymes and even less answers described the effect of high acidity on protein and/or carbohydrate digestion. Egestion of more fat was not seen at all. A fair

number of candidates were able to provide a perfect description of the function of bile but failed to link this to the effects of a damaged liver. There were many descriptions of deamination and glycogenesis and it appeared that these candidates confused these processes with actual digestion. Many students discussed the build up of toxins and failed to talk about digestion at all.

8ai Responses gaining one mark showed understanding that small molecules were filtered although many answers were too vague to award further. Candidates, in general, omitted to mention that high *blood* pressure *forced* small molecules into the nephron and there were several answers that gave clear evidence of a misunderstanding between ultrafiltration and reabsorption.

8aia Students again had a problem with explaining the differences in the composition of the blood in the renal artery and vein. Most candidates just listed differences and although comparisons were made between the two vessels in a large number of responses these did not give the explanation that was expected by the question. This affected the vast majority of candidates which meant that four mark answers were exceptionally rare. Where an explanation was attempted it was mostly by including details on the excretion of urea. Use in respiration was very infrequently seen to explain the levels of glucose and carbon dioxide. Some students compared differences in the blood pressure in the two vessels and some responses discussed the actual structures of the artery and how they differed to the vein. Others gave vague responses such as 'the renal vein carries less waste' without specifying the type of waste. A large number of answers included the direction of blood flow i.e. to or from the heart. These were not awarded. The most common correct answers gave differences in oxygen and carbon dioxide levels in each of the vessels with some responses including urea for a further mark.

8bi The vast majority of candidates gave the correct answer to this question. A small number stated the independent variable as 'time', 'temperature', 'volume of urine' and 'type of food' amongst other incorrect answers that were less frequently seen.

8bia Most candidates understood that providing the people with different foods would make the investigation unreliable but few were able to gain a second mark. If a second mark was obtained it was usually for including details about gender, age or a named medical condition such as diabetes although some students recognised that water intake prior to or during the investigation was not controlled.

8biia This was well answered with many students gaining one mark for stating that the type of food given to the people should be the same or that the amount of water/food consumed should be the same. This marks was sometimes negated in responses that included that the same type of food should be given with the 'same' salt content.

9ai There was strong evidence to suggest that many candidates failed to read the question properly. A surprising number of students failed to gain marks by linking blood clotting to atherosclerosis or cholesterol and the formation of fatty plaques. Others

included information linked to poor diet such as high fat intake which were irrelevant. Most candidates were aware that platelets were involved in blood clotting and a significant number of responses included details of fibrinogen and fibrin, although a few candidates got these the wrong way round. However, some good answers were seen covering all marking points and the information given was generally well structured and presented clearly.

9a_{ii} Many candidates gained two marks for their answer to this question although a fair few found it more challenging to gain the third. The main reason for this is that students failed to state that blood flow was reduced to heart *muscle* or an adequate alternative and preferred to simply state that blood flow was reduced to the 'heart'. Other candidates failed to recognise that a lack of oxygen to the heart muscle resulted in less aerobic respiration and omission of details covering this final marking point generally restricted the total marks awarded to two.

9b_i There were several responses that simply stated 'aspirin solution' without specifying exactly what about the aspirin solution needed to be controlled. Similarly, other responses stated 'blood clot', again without giving any further detail. These answers were too vague to give any credit. Some students attempted to describe a control test rather than give a control variable and others described an independent variable. Other incorrect answers included 'time' which was frequently seen.

9b_{ii} Although this question was generally answered well there was some confusion among candidates over control tests and control variables. Less successful answers gave details such as 'use a solution without aspirin' or 'repeat without the aspirin' or described how to make the results more valid by stating a control variable. There were a large number of blank spaces for this question. This could be blamed on either lack of time to answer at this stage of the paper or students that were just not able to understand how to answer. There were a good number of candidates who understood that using just distilled water as opposed to aspirin solution would be an effective control test.

9b_{iii} Many candidates failed to make a conclusion based on how the number of tablets affected the volume of solution collected with several making reference to how the volume of solution collected varied over time. Although there was credit given to time for marking point 2, most students did not provide responses in this context. There were many responses that gave descriptions or quoted figures without giving an explanation which limited marks awarded.

9c Most students were able to use the diagram to explain that inhibition of enzyme X would cause a reduction in the release of the chemicals leading to less platelets sticking together although there were less responses that went into further detail. There were numerous answers that included details that would have been better placed in an answer for question 9a_i – candidates often got caught up with the chemical names and processes. These were not awarded. Few responses mentioned aspirin binding to

the active site or at another site, causing a change in the active site and preventing the formation of enzyme-substrate complexes. Consequently, very few students were able to obtain the full four marks for their answer.

