



Examiners' Report

Principal Examiner Feedback

January 2022

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In Human Biology (4HB1) Paper 01

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Two general points need to be made.

Firstly, candidates performing mathematical calculations need to better set out those calculations. Many candidates are simply putting down a final answer which, if correct, is acceptable. However, in those cases where the final answer is not correct no marks can be awarded for any of the mathematical steps that led to the production of that answer.

The concept of error carried forward is always applied to calculations which means that if a candidate has made a simple mistake for example in reading a figure off a graph, whilst the candidate will be penalised for that particular point they will be given credit for using the incorrect reading if all other stages of the calculation are correct using that initial incorrect reading. Further, where candidates do write down stages in the calculation, the figures are often written in an untidy manner that it is not possible to understand the candidate's thought processes.

Secondly, whilst candidates are often very knowledgeable concerning functions of structures they seem unable in many cases, to apply the reverse argument. The classic case in this paper was question 3(b)(ii). Here candidates were asked what the absence of cartilage in a joint would mean for the operation of the joint. Many candidates described the function of the cartilage rather than answer the question that was asked and whilst many did then proceed to give the correct details they had caused unnecessary reading for the examiner and wasted their own time in writing down irrelevant information. This approach to answering this type of question is common in all examination series.

Question 1

Most candidates could correctly identify the pulmonary artery and aorta in response to (a)(i)/(ii). The correct pathway taken by the blood was given by the majority of candidates in responding to part (a)(iii). Often there was a dearth of arrows, making it difficult to score a mark. A few candidates had the correct direction in one side of the heart but then indicated the opposite direction of flow in the other side of the heart.

Assigning the appropriate chamber to its correct thickness proved more challenging than expected with a significant number of candidates giving an incorrect allocation. The figures were quite straight forward for any candidate knowing the roles of the chambers.

The majority of candidates recognised the role of valves in preventing backflow but there were a number who referred to the high pressure generated by the ventricles as being responsible for the direction of flow. These candidates had clearly forgotten the significance of the atrio-ventricular valves.

The answers to part (b)(ii) often lacked detail. Few candidates made any reference to the thickness of the chambers corresponding to the amount of muscle they contained. Whilst many candidates referred to S pumping blood to the whole body and P to the lungs, few referred to the distances involved. The roles of Q and R in receiving blood or just passing it to the adjacent ventricles was not always very well articulated.

Question 2

Whilst the Benedict's test was generally well known the correct way to undertake the test was less secure. Far too many stated that Benedict's solution should be placed into the Visking tubing. The question clearly states that the student carried out a test for both glucose and starch on the contents of the bag. Had Benedict's solution been added to the tubing it would have been impossible to carry out a different test on the tubing contents. Candidates should have indicated that a sample was taken from the tubing and placed into a test tube/boiling tube. Still far too many candidates are not using a water bath which is the safe way to perform this test. It was encouraging that many candidates actually described the colour change for a positive test and also indicated the result for a negative test.

Some of the above comments with respect to extracting a sample from the Visking tubing for testing purposes apply to part (a)(ii). A number of candidates wanted to heat the reagents during the test which, whilst not penalised, is not correct. It was pleasing to note that the majority of candidates referred to the use of iodine solution rather than just iodine. The standard colour for a positive result is blue-black. Too many candidates stated that it was blue. At best, it is dark blue but candidates should use the term blue-black.

Candidates struggled to find reasons why the outside of the tube was rinsed in their answers to part (a)(iii). Even when they identified the need to remove any starch or glucose from the outside they did not correctly amplify their answer by discussing how the glucose and starch could have arrived on the outside during the filling of the tube. Many thought that it was because it had come from inside the tube.

The answers to part (b) were usually incomplete. The question asks for the candidates to explain the results obtained. Many made correct references to starch being a large molecule and being unable to pass through the tubing and that glucose was a small molecule and could pass through. Unfortunately, most candidates failed to state what the results actually were namely, positive tests for starch and glucose for the solution inside the tubing and positive for glucose but negative for starch in the water outside of the tubing.

Question 3

The answers to part (a)(i) were sometimes transposed and a number of candidates incorrectly identified B as ligaments.

The majority of candidates correctly stated that the role of the synovial fluid was to reduce friction but there were fewer who made any reference to its role in the lubrication of the joint.

Many candidates simply put a wedge of cartilage in between the two bones in answer to part (b)(i) or failed to indicate that cartilage covers the whole of the end of each of the bones in the joint. A minority of other candidates thought that the cartilage lay inside the bone.

Whilst most candidates recognised that the absence of cartilage meant that there would be increased friction, fewer made any reference to the pain generated by that friction.

The answers to part (c) were varied. The common mistake was to omit any reference to the fact that tendons are inelastic. It was encouraging to note that many candidates had grasped the concept that muscles pull on tendons when the former contract and that pull is translated into movement of the arm.

Question 4

Whilst many candidates were able to give a full definition of homeostasis, a common mistake was to omit any reference to changes in the external environment as being a trigger for the process. Additionally, a sizeable minority tried to explain the term by giving a specific example which was not an answer to the question. In answer to parts (b)(i)/(ii) most candidates were able to identify the hormones correctly. The answers to part (b)(iii) were good but the commonest mistake was a failure to identify R as fat/lipid.

Most candidates found part (c) challenging because they failed to appreciate that the concept of maintaining homeostasis, whilst it clearly is about maintaining a constant level of blood glucose in this example, is also about the switching on and off of hormone release at the appropriate point. It is this switching on and off of hormone release that is key.

Question 5

The answers to part (a) often made reference to changes in the base sequence but then went on to discuss amino acid changes rather than discuss the overall picture of changes to the protein produced. A common omission was a failure to mention that this would result in a change in the phenotype. Again, too many candidates resorted to specific examples rather than use the term phenotype which was the appropriate answer to this question.

The probability values to be used for plotting the graph caused problems for many candidates. They were unable to provide an appropriate scale for the Y-axis as a result. In reality they were not as difficult as might have appeared at first sight. A number of candidates failed to include the units for the X-axis and a small number tried to plot a line graph despite the question instructions. The scale on the X-axis sometimes did not show the range of values for each probability.

The calculation in answer to part (b)(ii) was usually correct though in a number of cases candidates ignored the instruction to give the answer to two significant figures and gave 64.5 instead.

The answers to part (c) were often very good. However, whilst the majority of candidates recognised that chromosome pair 21 had an extra chromosome, they failed to translate this into a diploid number of 47 rather than 46. A significant number of candidates failed to justify the fact that the diagram shown was of a female and in some cases where reference

was made to this fact it was justified by an absence of a Y chromosome rather than the presence of 2X chromosomes at pair 23.

Question 6

Part (a)(i) was well answered with candidates recognising that sperm would not be able to pass and that even if fluid could be transferred to the female during intercourse, the absence of sperm meant that fertilisation could not occur.

In answer to part (a)(ii) candidates mentioned the transfer of fluids and went on to say that these fluids may contain the HIV. However, it was only a minority of candidates who made reference to the fluid being produced by the prostate gland.

The vast majority of candidates knew that meiosis occurred in the testis. The answers to part (b)(ii) were often muddled. Many candidates made reference to fertilisation but omitted to say that this was the fusing of the sperm and ova. There were often vague references to haploid cells without any specific reference to sperm and ova being haploid cells which when fused resulted in the diploid number being restored.

Question 7

Parts (a)(i) and (ii) were well answered. The simple calculation for part (a)(iii) caused few problems.

Part (a)(iv) caused more problems with candidates not being sufficiently careful in reading figures from the graph.

The test for fat was confused in the minds of many candidates. The correct sequence is to add alcohol to the substance being tested and shake the mixture to dissolve the fat. It is at this point that water is added which will give a cloudy appearance in the presence of lipid. Water should not be added at the same time or before the alcohol.

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