# Examiners' Report
## Principal Examiner Feedback

## Summer 2018

Pearson Edexcel International GCSE

In Human Biology (4HB0) Paper 02

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## Question 1

(1ai) The most common incorrect answer for this response was 'four'. It appeared that a fair number of candidates failed to recognise the producers as a trophic level and therefore did not include this in their 'count'.

(1aiii) 'tiny plants to Arctic cod' or 'tiny animals to Arctic cod' were common incorrect answers as was 'primary to secondary consumer'. Many candidates, rather than use actual terms given on the food web shown preferred to give their own names to the levels such as 'producer' for the tiny plants and 'herbivore' for the tiny animals although these were not penalised and most often gained full marks. There were many random answers to this question with a fair number of candidates seemingly guessing the levels between which most energy was transferred with responses covering all possible alternatives involving the organisms shown in the food web. It seemed that a significant number of students failing to gain a mark for this item confused producers with primary consumers.

(1bi) Many candidates were able to score at least two out of the three marks for their response showing understanding that deforestation and burning fuels contributed to carbon dioxide emissions. A fair number of responses were able to explain how deforestation contributed to a greater quantity of carbon dioxide in the atmosphere and gave information on how less photosynthesis resulted in less carbon dioxide being removed from the atmosphere. Equally popular were responses that included information linking an increase in transport, mainly cars, to increased emissions. Some students failed to gain marks for vague descriptions of deforestation; cutting down trees was commonly seen although not awarded due to lack of detail that implied 'large-scale' destruction.

(1bii) While most candidates clearly understood the idea of global warming and the melting of the polar ice caps, the direct link to habitat destruction was not often demonstrated. Some candidates seemingly failed to understand the expectations of the question and attempted to discuss how carbon dioxide brought about breathing difficulties and other effects on the respiratory system. Other candidates gave information about respiration and it was evident that some candidates misunderstood the phenomenon of climate change. Other incorrect responses included information about photosynthesis and how global warming increased the rate of this process consequently leading to more trees and therefore more habitats for living organisms.

(1ci) This was answered particularly well by candidates although few noted the fluctuations but failed to identify the general increasing trend.

(1cii) This question was mostly well answered with a large number of candidates extending the graph with a line ending between 16 and 25 per 100 000 people. Some students were awarded only one of the two marks for the line drawn and failed to score for the value obtained from this line – many candidates multiplied this value by 100 000 implying that they misunderstood the instruction given in the question. Students that failed to extend the graph line but gave a value unfortunately failed to gain any marks at all. Few candidates extended the graph line correctly but then failed to read off it correctly.

(1ciii) Candidates tended to score either the full two marks for their answer to this calculation or nothing. Of those that failed to score, the working out often showed 63 million translated into numbers incorrectly usually with less zero's than what there should have been. Other working out gave incorrect substitution of values or gave the correct values but in an incorrect calculation e.g. a multiplication by 100 000 instead of division. This meant that no mark could be awarded for working out. Many responses gave 882 as the final answer which, again, failed to score. Very few candidates scored one mark but, overall, this was, overall, a well answered question with a large number of candidates arriving at the correct answer.

(1civ) Candidates often scored the mark for a response that recognised UV light as the main cause of skin cancer. These responses frequently linked an increase in UV light with ozone depletion. Poorly worded responses such as 'greater use of UV light' failed to score. There were a fair number of candidates that were misconceived into thinking that skin cancer had a genetic cause and gave details about skin cancer being inherited from parents. Other candidates described how pathogens such as viruses or bacteria caused skin cancer with some discussing how it was transmitted from one person to another. A significant number linked skin cancer to global warming or to infrared radiation rather than UV and also to cigarette smoking. Several students referred to 'harmful radiation' rather than ionising radiation. Overall, it was clear that many candidates were confused about the effects of global warming and greenhouse gases in the atmosphere, sometimes linking ozone depletion with a rise in Earth's temperature and linking all of these events to a rise in the number of cases of skin cancer.

Question 2

(2a) Most candidates were able to correctly add the complementary base pair. Of the few that did provide an incorrect response, it was generally due to matching incorrect bases although there were few very random answers that included letters for bases, such as P and B, which obviously failed to score.

(2bi) Some students wrongly identified the chromosomes according to their shape rather than designated number and therefore labelled those that visually resembled an 'X' as the X chromosome and its pair the 'Y chromosome'. Other candidates were less astute and made a guess at which were the sex chromosomes, sometimes labelling all of them in the karyotype as either 'X' and 'Y'. Few students pinpointed the 23$^{rd}$ pair and of those that did, the majority were correctly labelled although it was unfortunately, but inevitably the case where there were several responses in this category that identified the correct chromosomes but got the labels the wrong way round.

(2bii) Many students lost marks for providing minimal amount of information, usually in the form of unlabelled diagrams or Punnet squares with the offspring phenotype being the most commonly missed mark. A good number candidates were able to gain full marks by drawing suitable diagrams which included clear labels and match offspring phenotypes to their genotypes. Occasionally candidates did not fully represent the female gametes leading to an incorrect number of offspring Where students were writing an 'x' between two individuals to indicate a genetic cross between the individuals it sometimes led to confusion e.g. XX X XY, depending on where they put the letters.

(2c) Several candidates simply described what mutation was and how it was caused. Many responses were vague and off the point. A number of candidates thought the only form of mutation was a trisomy and went on to discuss Down's Syndrome and others included information on sex-linkage possibly because the mutation was carried by the sperm. Strong candidates had a clear understanding of the key ideas and were able to clearly express their understanding in responses that gained access to all marking points.

Question 3

(3a) The most common incorrect response was the role of progesterone with many candidates stating that it 'regulates the menstrual cycle'. Less often, responses stated that it maintained the thickness of the uterus 'wall' rather than 'lining' implying that some students were not able to distinguish between the two structures. There were many correct answers, however, with the majority of candidates able to identify the roles of the three different hormones in the menstrual cycle including correct details that referred to the inhibition of LH and FSH.

(3bi) The most common error seen in responses was candidates getting the components of the artery and vein the wrong way round. The diagram clearly showed the direction of blood flow from fetus to mother (and vice versa) to provide some help with answers although this seemed to be overlooked by a fair number of candidates. Correct answers, however, were well written and very clear with scores most often gaining the full four marks for stating that the artery carried deoxygenated blood and urea (although candidates inevitably mentioned carbon dioxide as well) and the vein carrying oxygenated blood and nutrients to the fetus. Few responses mentioned that urea (and carbon dioxide) were excreted by the mother. Responses that scored less than four marks but were awarded some marks for their content were sometimes vague in their detail giving information such as 'waste carried' (by the artery) rather than specifying the type of waste. Few responses described the structure of arteries and veins or the pressure differences between each implying that the question had been misunderstood and a significant minority of candidates failed to cover marking point 3 – excretion by mother. There were a number of students that discussed the structure of arteries and veins rather than focus their details on the topic of the question and pupils also lost marks for referring only to one of the vessels rather than both.

(3bii) Many candidates gave details about how the pressure of the mother's blood may differ from that of the fetus and thus cause damage to fetal cells. These responses were not credited. Other unsuccessful responses included information about transfer of pathogens or substances, such as waste products (carbon dioxide, urea, etc.) in blood that might harm the growing fetus and some candidates lost one mark by stating that the fetal blood would 'clot' rather than agglutinate or clump. There was some confusion in some responses between antigens and antibodies. One mark responses generally mentioned a difference between the blood type of mother and fetus with some candidates scoring two marks for extending their answers to include details about antibodies or, more commonly, agglutination.

Question 4

(4) Most candidates scored well on this item, 7 marks or more with the most common error being a confusion between retina and optic nerve.

Question 5

(5ai) Not many students understood the experimental set up and the vast majority of candidates saw the pH sensor, assumed that the experiment was about how pH affects enzyme activity and consequently mistook pH for the independent variable. It seemed, on the whole, that a large proportion of candidates were unable to apply their knowledge to this scenario - the skill of linking ideas to unknown scenarios is clearly an area which needs to be developed in candidates. Many who did identify the digestion to fatty acids were too generalised about what would happen to the pH, giving vague details about pH change without expressing 'how' it would change.

(5aii) For nearly every student that gained one mark for stating that time needed to be measured, there was another that failed to gain a mark for stating temperature or volume of milk or lipase solution. It seemed that many of these candidates were thinking along the lines of what needed to be measured *out* initially rather than the measurements taken to determine the rate of fat digestion. Rather than time, few candidates mentioned 'stopwatch' or another piece of equipment as a way to measure time but failed to score for this detail.

(5aiii) A large number of candidates stated that the pH needed to be controlled, despite this factor being the measured value to determine the rate of digestion, a misconception carried over from interpretation of the diagram perhaps or a simple case of not reading all the information given. Candidates that opted to give 'volume of milk/lipase' generally scored only one of two available marks as they failed to adequately explain why this variable needed to be controlled. A frequent attempt at an explanation invariably included 'to make it a fair test' or 'to get accurate results' which were not accepted. Candidates that gave 'temperature' as the control variable and who gained just one mark gave vague explanations such as 'temperature affects enzyme activity' or 'enzymes work at different rates at different temperatures' or 'temperature affects the rate of reaction' without going into further detail. Other candidates made an attempt to describe how to control the temperature although this is not what the question asked. However, there were a good many responses from candidates that understood how temperature would affect the investigation and were able to translate their understanding clearly into answers that covered details related to the collision theory and enzyme denaturation.

(5aiv) There were a variety of suggestions on how the pH could be measured, with many failing to score for providing details such as litmus paper (most common incorrect answer), pH paper, a thermometer or a named indicator other than universal such as phenylthalein or methyl orange. A fair number of these answers, however, did go on to include some form of colour change and were awarded one mark. Other responses scoring one mark generally stated universal indicator but omitted details of a colour change. A good number of candidates were able to describe clearly how universal indicator could be used to measure pH and were able to gain full marks.

(5b) Some candidates were confused on the action of bile and stated that bile digested or broke down fats – this was a common misconception which failed to gain a mark. Similarly a mark was lost by students who stated that bile made it 'easier' for lipase to digest the fat rather than give details that linked its effect to an increase in the rate of reaction or who just simply said that 'bile affects the rate of reaction' or 'affects the pH' or 'bile changes the pH'. Several candidates are under the impression that bile itself is an enzyme. Other incorrect details included 'raising the pH' rather than lowering which confused answers and in some cases negated marks. However, use of the term 'emulsification' was seen often although frequently not linked directly to the practical as very few candidates were able to identify the pH dropping faster.

Question 6

(6ai) Many candidates gave as much time discussing the effects of insulin as they did to the effects of glucagon and although the majority of the details given were correct for insulin, this was not the detail expected. It was made quite clear in responses, however, that the majority of students are familiar with this type of graph and the role of glucagon in maintaining blood sugar levels although a fair number failed to gain full marks for omitting key detail. This mainly included the omission of the pancreas and/or the liver or for stating that the glucose levels were returned to normal rather than raised in answers that otherwise would have obtained the full four marks. Other candidates stated that glycogen was released from the pituitary gland rather than pancreas. There were very few answers that mixed glycogen with glucagon but even where these were seen they often gained at least one mark for covering, most often, either marking point one, two or three.

(6aii) Most candidates were able to gain the first mark for the corresponding decrease in glucagon but fewer added negative feedback and fewer still any inhibitory effect. There were a significant number of students that just described the roles of insulin and glucagon without actually answering the question. Candidates need to be able to articulate ideas about inhibition and negative feedback more clearly for future examination series.

(6b) Details linked to 'diluting' the blood were seen often where several candidates thought that drinking more fluids would help to reduce the level of blood glucose. Other candidates seemingly failed to understand the expectations of the question and described the homeostatic mechanism of blood glucose regulation or gave a definition of diabetes itself. There were a significant number of responses that referred to reducing the amount of fat in diet and many failed to gain marks for stating simply that diabetics needed to ensure that they had a 'balanced diet' or that their intake of glucose needed to be 'controlled'. Similarly, vague descriptions such as diabetics should eat a more 'healthy diet' or a diet containing more fruit and vegetables failed to score. There were many candidates that just missed out on gaining full marks for not stating that 'more' or 'regular' exercise could help to control blood glucose levels although there was implied understanding that exercise could help to reduce the amount of sugar in the blood. Several of these answers gave good information about how exercise decreases blood sugar although this detail failed to gain marks due as they generally omitted information that suggested only regular exercise could do this. However, these responses generally gained one mark for giving details about limiting the amount of sugar or carbohydrates taken in the diet. Interestingly, a fair number of candidates described how blood sugar levels could be controlled by injecting insulin, despite the question quite clearly stating 'without medication'. Perhaps these students are unaware that administering insulin artificially is a form of medication.

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