

Examiners' Report/
Principal Examiner Feedback

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

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The paper proved accessible to the majority of candidates and even the weakest could answer a significant number of questions. At the other end of the scale there were some high scoring papers where candidates demonstrated a clear understanding of the principles underpinning the specification.

Question 1

The parts that caused most problems were (e), (f), (g) and (j).

Question 2

(a) Many candidates drew the lens in the space representing the pupil. In some cases the shape of the lens was too circular to award credit. Other candidates drew the lens in-between the cornea and the iris/pupil. In this case, some gained one mark for drawing the correct shape whereas other diagrams were ambiguous and therefore failed to gain any marks.

(b) This question was well answered overall with most candidates recognising that the lens refracts or focuses light/images on the retina. Where marks were lost, this was mostly for omitting that rays were focused on the retina.

(c) Many candidates confused the combined action of the ciliary muscles, suspensory ligaments and lens shape in their description of how the lens carries out its function. In some cases candidates described the action of the ciliary muscles and suspensory ligaments correctly, for example for distant objects, but related their response to focusing on nearby objects. Few candidates described the action of 'circular' rather than 'ciliary' muscles and others linked details specifically to dim or bright light rather than focusing on distant or nearby objects. Some responses were very vague in their approach and did not link the actions described to focusing on distant or nearby objects. For example, 'the ciliary muscles contract or relax and the suspensory ligaments are pulled taut or slacken depending on whether the object is near or far away'. Other similar responses stated that 'Ciliary muscles contract or relax to help change the shape of the lens'.

Question 3

(a)(i) Some excellent, accurately drawn and labelled graphs. The main error was that a fair number of candidates plotted the graph with the axes labels the wrong way round i.e. temperature on the Y axis and glucose on the X axis. Other candidates lost marks for not fully labelling the axes, in particular units were missing in a large number of cases. Some candidates failed to plot the points from 70°C onwards and several candidates did not draw a line through the plotted points.

(a)(ii) Most candidates scored one mark for correctly identifying the temperature at which most glucose was produced. Those that failed to gain the second mark generally repeated the question i.e. '.....because this is when most glucose is produced'. A minority of candidates recognised that there were no plotted points between 35°C and 40°C and that the amount of glucose produced between these temperatures was likely to be the greatest. Those that did gain full marks for their response correctly identified the temperature and linked this to the optimum for enzyme activity.

(a)(iii) The most common error was stating 'temperature' as control variable despite this being the dependent variable. Some candidates failed to gain marks by just stating 'concentration' or 'volume' without going into any further detail.

(a)(iv) Many candidates repeated the question in their response which restricted their overall score for this item. For example 'amylase converts starch to glucose' or similar was frequently seen. In a large number of cases, candidates misinterpreted the question and described why it was important that starch was broken down. In these cases, responses included information about glucose being needed for respiration or energy or for use by muscles or that starch was a large molecule that had to be broken down before it could be absorbed.

(a)(v) The most common incorrect answer given by candidates was that there was no more glucose to be produced as it had all been produced between 35°C and 40°C. Other candidates gave vague answers such as 'the enzyme does not function at 70°C' with providing further detail. Good answers including accurate details about how the shape of the active site changed which prevented the substrate from binding.

(b) This question was answered well with many candidates scoring 3 out of the 4 marks. The candidates that failed to obtain the fourth mark tended to omit that iodine solution was used. Less frequently, candidates described the Benedicts test for reducing sugars and others proceeded to analyse the data from the table in more detail.

Question 4

'Capillaries' was a common incorrect alternative to arteries that was given by several candidates and rather than stating 'capillaries' as the vessels with the thinnest walls, many gave 'veins'. Plasma was often given as an incorrect alternative to tissue fluid. Water was named frequently as a useful substance carried by the tissue fluid and again as a waste product that was picked up from cells, in addition to pus.

Some candidates failed to recognise, for the last answer in the passage, that the liquid remaining after returning to the blood drained into lymph vessels. Students that were unsuccessful here nearly always gave urine as their answer.

Question 5

(a) This question caused few issues with most candidates scoring full marks for their responses. The least popular of the labels was the cell body and the synapse although again incorrect answers were fairly infrequent.

(b) Candidates lost marks here for not linking their response in the first column (nervous system) to their response in the second (endocrine). The question implied that a comparison be given and this was not the case in some answers given. Some answers were vague e.g. 'fast process/slow process' which required further clarity in order to be awarded. Another common error included 'involuntary response/voluntary response'. Better answers included clearly written comparisons such as 'responses short-lived' vs 'responses long-lived' and 'impulses carried by neurones/nerve cells' vs '....carried by hormones'.

Question 6

(a)(i) Most candidates gained full marks for their answer to this question, correctly stating that bacteria and fungi are two microorganisms that could grow on the nutrient agar. Some candidates lost a mark by naming two types of bacteria although this was infrequently. One mark was often lost where responses included 'virus' or less commonly 'protozoa'.

(a)(ii) Another well answered question although it appeared that some candidates referred back question 3 and gave 70°C as their answer.

(a)(iii) Whilst many candidates made reference to this temperature being too high for enzymes to function few gave more explicit detail to link points such as 'past optimum temperature' and 'denatured' or based their answer around body temperature being the best for enzymes to function. These responses made it clear that candidates recognised temperature as an influence on enzyme activity but many failed to link their answer to an increase in microbial growth. Very few candidates correctly stated how the extreme temperatures of 0°C and 70°C affected the microorganisms with many linking these more often to enzyme activity rather than the effect of each temperature on the actual bacteria.

(a)(iv) This question proved demanding for a number of candidates although most made a good attempt at suggesting a source of error in the investigation. Many responses included details about the temperature being incorrect or that the plates were incubated for too long. Others suggested that the plates or agar were contaminated 'at the beginning' despite the question stating that conditions were sterile and other mentioned that the 'lids were not sellotaped down'. Few candidates realised that contamination could occur from the hands to the hair as it was being transferred to the dish with most correct answers stating that bacteria entered from the air when the lid of the petri dish was lifted.

(b) Some diagrams showed more growth on day 2 than day 7; others needed to make growth on day 7 more distinguishable from that on day 2. A fair number of diagrams appeared to show clear zones around the hair

with growth occurring only around the edges of the plate implying that the hair or agar around the hair some sort of antibacterial effect. Some candidates drew 'mirror-image' hairs on each of the plates and a fair number of candidates failed to attempt the question at all.

(c) The majority of responses to this question were very disappointing with many candidates failing to score at all. Responses that did score for stating that an agar plate should be set up without the hair, generally failed to gain more than one mark. Most candidates did not realise that the control would allow a comparison to be made and that it would help to prove that the microorganisms did come from the hair. Some candidates mentioned sterilising or washing a hair beforehand and using this as a control alongside a plate containing an unwashed hair.

(d) Many candidates were under the impression that the agar was being depleted by the microorganisms and the extent of depletion could be used as a measure of bacterial growth. For example, several mentioned that the 'agar would not change' or that it would 'stay the same' or that the 'dish would contain a lot more agar at the end of the experiment'. Some candidates referred to clear zones (or not) around the hair whereas others seemed to misinterpret the question and focused on the health of the hair instead. For example 'hair will be more healthy/shiny/straight or clean after washing'. Several candidates gaining one mark tended to state that the 'antiseptic kills bacteria (on the hair)' but then neglected to relate this to how it would affect growth on the agar. Other candidates recognised that there would be less microbial growth on the agar but then failed to link this to the action of the antiseptic shampoo.

Question 7

(a) There were few issues with naming the parts of the digestive system shown in the diagram although several candidates gave 'large intestine' rather than small intestine for A. 'Duodenum' was rarely seen. Some candidates incorrectly identified the gall bladder as the kidney.

(b) The most common responses included the names of the digestive enzymes and the hormones insulin and glucagon. Some candidates confused glucagon with glycogen and common errors included urea, sweat and in particular bile. Trypsinogen and other valid named enzymes were given and these were awarded credit where correct.

(c) Generally well answered with students showing a good understanding of the action of the muscular wall of the oesophagus in moving food through the digestive tract. 'Bolus' was omitted often and some candidates described the action of the 'circular' and 'radial' muscles indicating confusion with the action of muscles in the eye.

(d) On the whole, answers scored well with many scoring full marks for giving clear, accurate descriptions of the function of bile. Where marks were lost, this was generally for omitting more specific details including lipase. Most candidates recognised the fluid released from structure B as

bile and understood its action in digestion although most commonly mentioning its role in emulsification rather than neutralisation. Some students gaining one mark for their answer gained this for stating emulsification but then went on to define this process.

Question 8

(a) A large number of candidates failed to read the question carefully and follow the instruction of 'Using information from the diagram....' This limited the number of marks allocated to many responses that included random organisms in a food chain that were not remotely linked to the diagram. Some candidates lost marks for not giving four organisms in a food chain but instead started their chains with energy followed by three organisms from the diagram.

(b) This question was not well answered with many of the candidates that failed to score using information from the diagram in their answer. 'Microscopic algae' was commonly seen and a variety of other responses such as oxygen, carbon dioxide and glucose failed to score. It is important that candidates realise that it is the light energy from the Sun that provides the source of energy for food chains and not just 'the Sun' which is rather ambiguous would require further clarification for merit.

(c) One mark was frequently lost for the omission of 'aerobic' for the first part of this question which led to most candidates gaining 4 out of the 5 marks for their responses. Students scoring less than this often confused photosynthesis for aerobic respiration, sometimes writing this in the space allocated for aerobic respiration but also completing the boxes showing carbon dioxide and water as the reactants and oxygen as one of the products. Some candidates wrote incorrect formulae into the boxes rather than taking the simpler route and writing out the names of the reactants and products which failed to score them some marks.

Question 9

(a)(i) Incorrect answers varied but the most common error was identifying F as showing the vital capacity. These were infrequent with the majority of candidates performing well on this question.

(a)(ii) Another high scoring question although one mark was lost at times for either not stating the value of the tidal volume or failing to include the units where the value was given. Several candidates did not give a full definition of tidal volume and neglected to state that it was the volume of air taken into the lungs at rest. Instead, these candidates stated that it was 'normal breathing' or 'breathing at rest' which was deemed too vague to award credit.

(a)(iii) Very few problems here with most candidates correctly identifying the maximum volume of air that could be taken into the lungs.

(a)(iv) Some candidates failed to give the value of the residual volume or failed to include the units for the values that they gave despite giving a correct definition. Some responses lost marks for neglecting to mention that the residual volume was the amount of air left in the lungs after (forcefully) exhaling.

(b)(i) This question again provided evidence that some candidates are not reading the instruction given carefully. Despite the question focusing on changes in breathing a variety of incorrect answers were seen including and increase in heart rate, blood flow or pressure, an increase in body temperature, oxygen and energy demand.

(b)(ii) Most candidates were able to correctly analyse the graph to arrive at the answer of 6 minutes for oxygen demand to return to normal after exercise.

(c) Few candidates recognised that the oxygen demand outweighed supply which meant that the first marking point was very rarely awarded. Candidates who scored few (if any) marks provided details such as 'muscles need to cool down slowly after exercise' or 'respiration rate decreases slowly', or other vague answers that failed to score. A number of candidates stated that muscles still needed energy after exercising as they were still working, implying that the oxygen was necessary to meet the energy demand rather than to oxidise the lactic acid that had accumulated from anaerobic respiration.

Question 10

(a) In general, most candidates were able to correctly name the organelles shown in the diagram although many failed to obtain the second mark for each part of the question by providing an incorrect description of the function or omitting the function altogether. Some candidates were able to name the organelles and wrote very good descriptions of their functions and this would have gained them full marks if they had not written their answers the wrong way round i.e. part A written in the space provided for part B and vice versa.

For part A, where mitochondrion/mitochondria was correctly stated, candidates failed to gain the second mark for giving descriptions of the function of mitochondria such as 'the powerhouse of the cell' without further clarification. 'Respiration' was also common and it was important in this case that 'aerobic' was defined to distinguish it from anaerobic respiration taking place in the cytoplasm.

Fewer candidates were able to correctly name the endoplasmic reticulum or ribosomes and if they did, were less familiar with the function of these organelles. 'Chromosomes' and 'golgi body' were seen frequently alongside functions ranging from 'making amino acids' to 'controlling cell activities'.

(b) Most candidates scored one mark for demonstrating an understanding that the organelles seen by the electron microscope were too small to be

seen under a light microscope. Where the second mark was obtained, this was most frequently for stating that the electron microscope had a higher magnification. Very few responses included details about the resolution or clarity obtained using an electron microscope.

(c) This question proved fairly challenging for some candidates who were unable to express their reasons for the differences between the red blood cell and a cheek cell clearly. Although many were aware that the red blood cell lacked a nucleus and cell organelles, which were more often than not named, the reasons given usually mentioned haemoglobin but in the wrong context. For example, rather than stating that the omission of cell organelles or a nucleus provided more space for haemoglobin a majority simply stated that the red blood cell contained haemoglobin. Some candidates neglected to follow the instruction given by the question and just described the role of the red blood cell.

Question 11

(a)(i) Overall a well-scoring question with common mistakes being: Part A – urethra and sperm duct, Part B – seminal vesicle and Part C – epididymis.

(a)(ii) The structure of responses in some cases meant that the details provided to explain the function of the prostate and seminal vesicle were too vague to award credit. Some candidates stated that the fluid released transported the sperm... rather than providing a medium in which sperm could swim and others incorrectly described how the fluid provided the sperm with energy. In several cases it was clear that candidates misread the question and described the passage of sperm through the male reproductive system with random answers that described the function of the prostate or seminal vesicle as 'producing urine' or 'producing sperm'.

(b) Some excellent, detailed diagrams were frequently seen and these were fully and accurately labelled. Where candidates lost marks, this was usually for very poorly drawn diagrams rather than the labelling. Some candidates failed to score for correct labels as it was unclear what they were pointing to on the diagram and others had correct labels that pointed to incorrect parts of the sperm.

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