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SC14 The Human Body

Report on the Examination

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General Comments

Throughout the paper marks were gained by candidates demonstrating confident understanding of the underlying concepts of the specification and expressing this understanding using appropriate scientific terminology. Many candidates were able to do this well, but a significant number failed to gain marks through re-iterating the stem of a question rather than responding with factual information. Many candidates had good knowledge of the symptoms of conditions such as emphysema and cystic fibrosis, but fewer had a confident grasp of the theory underlying these conditions, which is where most of the marks lay.

The difference in approach to questions that require factual recall (such as Question 1 part (a)(i) and Question 7 part (b)(iii)) and those that require explanation (such as Question 2 part (b) and Question 3 part (c)) is important and not always recognised by candidates. In the latter the response is almost always going to involve the word “because”.

A significant number of candidates appear not to use the stem of the question when trying to work out answers. Others think that the stem provides information that will gain mark. Both approaches are misguided: the stem is written carefully in order to give the candidate a chance to see the biology in a realistic context and to supply information that may be helpful. However, the mark scheme will not give credit for simple copying from the stem without any processing or application of information.

Question 1

Only the most able candidates appreciated that ATP breaks down to release energy during muscle contraction. Many seemed to think ATP was produced by muscle contraction rather than being produced by respiration and then used. Some failed to gain this mark by writing down the reaction as reversible without indicating in which direction the reaction was going. In this question (as in several in the paper) some candidates tried to write down a considerable amount of memorised detail (in this case about glycolysis and Kreb’s cycle) even though this was not required by any part of the question.

Misreading of the stem meant that many candidates did not mark the crosses in the boxes (marks were awarded for ticks in the correct boxes; boxes left blank were assumed to be crosses). Some had clearly completed a similar table during teaching or revision in a format that included numbers of molecules of ATP etc and wrote these numbers in. In this case a number was counted as representing a tick and a zero, a cross. Most candidates responding in this way gained full marks.

Few candidates appreciated that lipids and proteins entered Kreb’s cycle; many did not gain the mark by writing a list of the pathways that were at the top of the table. Candidates should be reminded that correct answers cannot be extracted by the examiner from a list of multiple responses.

Success in part (b) and part (c)(i) seemed to go by centre, where some had been well prepared and understood the processes and others were clearly guessing. Only the highest scoring candidates realised that the respiratory breakdown of muscle in the last stages of anorexia was responsible for heart failure: most were assuming a lack of nutrient simply failed to supply the energy necessary.

Question 2

Part (a)(i) was answered well, although some candidates did not read the stem carefully and gave far more information than required: that the healthy child's villi were larger and more numerous.

Part (a)(ii) was frequently misinterpreted with many references to pH, mucus and enzymes correctly argued but which were not relevant to absorption as specified in the stem.

In part (a)(iii) the word *explain* was ignored by less able candidates who tended to rewrite their answer to part (a)(i) and miss the idea of surface area.

The specificity of enzymes was generally well known with the majority of candidates having knowledge of the lock and key hypothesis. Many candidates did not appreciate that different proteins were different shaped molecules and that the reason why a protease that digested meat protein could not digest gluten was because gluten was the wrong shape for the active site of the meat-digesting protease. A significant number of candidates did not read the statement found in the stem of the question, that gluten is a protein, and continued the question assuming that, because it is found in wheat, gluten is a carbohydrate.

Question 3

This question seemed to be a clear differentiator between the very able and less able candidates, with the candidates scoring high marks in this question tending to do well on the unit overall. However, some centres did much better than others across the ability range of their candidates, with some clearly comfortable with AO3 ideas of controls, accurate and valid data but others much less so.

The relationship between lipase and bile salts was insecure in many cases, with a significant number of candidates believing that the bile salts had digested, or been digested by the lipase. The role of the milk as the source of lipid was missed by all but the most able and the concept of the rate-limiting effect of a reducing quantity of substrate (part (c)) was even more rarely explained. This in turn led to the second mark of part (d)(ii), to increase the availability of substrate to avoid any rate-limiting effects also being very rarely achieved.

An understanding of the difference between accurate and valid data was very patchy. Candidates need to be made aware that accuracy is a product of the measuring equipment and techniques whereas validity is a measure of the confidence that can be put in the data, by repeating observations until a large enough body of data is available to be able to deduce the true result.

Question 4

In part (a)(i) candidates did not make full use of the data and therefore failed to gain marks. Almost all recognised the lower levels of oxygen in the blood of the cf sufferer but many then went on to repeat the same idea in other words, or confirming it by quoting data from the table. Few looked closely enough at the data to realise that the rate of uptake was much slower in the cf sufferer. Less able candidates ignored the data altogether and gave lists of symptoms that the cf sufferer might experience, giving answers such as "tired and breathless" which did not score any marks.

The calculation in part (a)(i) was attempted by most candidates, using a variety of mathematical processes. Credit was given for recognition that the sufferer would have 64% of the normal level of saturation. Many candidates went on to complete the calculation and gain full marks.

In part (b) the need to break down the insoluble food molecules before they could be absorbed was missed by a number of candidates, with many suggesting that the enzymes were ingested to digest the mucus rather than replace those that had been blocked from secretion.

In part (c) many candidates scored well, although they should be warned against writing long lists of vague symptoms as it is difficult for the examiner to extract correct responses from a list that contains a mixture of right and wrong.

Question 5

Both parts of (a) were generally well answered and many candidates gained full marks on the calculation, although some worked out effects on lung volume or weight instead of surface area. This suggested they had not read the question carefully enough.

In part (b)(ii), the less able candidates listed the symptoms of emphysema, often quoting directly from the stem of the question. Many others scored well, the best using the data in the table to support their statements and gaining an extra mark for doing so. Communication difficulties prevented some candidates gaining marks, for example talking about oxygen entering the lungs rather than entering the bloodstream. The context of their answer suggested that they were thinking along the right lines, but when the actual words they used to answer the question were read carefully there were significant errors that negated the original mark. A few candidates got so involved with the booklet idea that they forgot to include valid biology, although their responses were often full of enthusiasm and an impressive desire to communicate.

Question 6

This was one of the best-scoring questions on the paper. Almost all candidates gained the first two marks. Many arrived at the correct numerical answer for the calculation but very few worked out the correct units even though they were cued by the stem of the question. Less than half recognised that the skin was assumed to be sweating at a constant rate over the whole surface. Many saw the phrase “assuming the client has a skin surface area of $3m^2$“ and simply wrote that down as the answer to part (a)(iii).

Knowledge of ADH and its role in water retention was good, and many candidates scored full marks. Credit was given to information on aldosterone, but only in the context of water following the salt by osmosis. Some candidates named aldosterone as the hormone and then went on to describe the action of ADH. In this case they did not gain the first mark (for naming the hormone specifically) but were allowed access to the other three marks if the biology was correct.

Question 7

This was also a high-scoring question although many candidates would have benefitted from more careful reading of the stem. In part (a)(i) a response such as “more energy” wasn’t felt to be enough information beyond that which was given in the stem. Credit was awarded for suggesting named foods that would give additional energy or specifying increased intake of, for instance, carbohydrates.

In part (a)(iii) many candidates appreciated that there was a link between sunlight and vitamin D. In order to gain the mark they needed to show that the skin/body synthesised the vitamin in the presence of sunlight, rather than giving the impression that the vitamin rained down from on high during the summer. This was evident in responses such as “the sun gives us vitamin D”. Only a few candidates knew that the haematocrit test assessed haemoglobin levels by measuring the packed cell volume after centrifugation.

Some failed to gain marks by talking about a “blood sample injection” when they meant using a hypodermic syringe to withdraw a sample of blood. A significant number of candidates took urine samples and measured the blood sugar levels, suggesting that they hadn’t read the stem of the question at all. Surprisingly few gave the correct response of anaemia for part (b)(iii).

Question 8

All candidates were able to gain the marks available for describing how to maintain dental hygiene. Very few made the link between bacteria in the mouth, the presence of sugar and the formation of acids from the sugar being the cause of dental decay.

In part (b) most candidates appreciated the need for increased surface area from chewing and the effect that this had on the efficiency of enzymes further down the digestive system. Less able candidates repeated information from the stem of the question.

Only a few candidates gained full marks in part (c). Most candidates realised that part of the problem was that a modern diet contained too much sugar and acid for the natural antiseptic properties of saliva to cope with but few explained this in enough detail to gain the second mark.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.