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SC02 Energy Transfer Systems

Report on the Examination

2010 examination - June series

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General Comments

The performance of candidates in this exam compared well with that in January 2010. Most questions were well attempted, with the occasional failure to attempt the graph in question 1. There was a tendency amongst the weaker candidates to fail to read the question properly resulting in inappropriate answers. One example is in question 2, where a description of how air is expelled from the lungs was provided, rather than how air is taken into the lungs. Also, where a description of carbon dixoide movement was required in question 2 (c), the resulting answer often talked about gases in general or, in some cases, about oxygen diffusion.

As in previous papers, the concept of what is meant by the *U*-value was often poorly understood, and only the stronger candidates fully mastered the calculations.

Question 1

(a)(i) Despite the fact that phonetically correct spellings were allowed, for sphygmomanometer, many answers failed to fall into this category.

(a)(ii) Mostly correctly answered, although there was occasional confusion with the values for pulse rate.

(a)(iii) Mostly correct.

(b)(i) Mostly correct although there were some incorrect references to spirometers etc.

(b)(ii) Very well answered.

(b)(iii) Most candidates appreciated that ventricular fibrillation, if left untreated, would result in death or collapse.

(c) There was a good general understanding of the roles of the left and right ventricles in terms of the direction of blood flow.

(d)(i) &(ii) Together these constituted a good discriminating question whereby the stronger candidates recognised the differences between structure and function but the weaker candidates tended to confuse the two.

(d)(ii) Many answers confused the roles of the arteries and veins and talked about arteries carrying blood to the heart / veins away from the heart.

(e)(i) Mostly answered correctly, although some thought that a person might be exercising when their blood pressure was at its lowest.

(e)(ii) An increase in activity, or being nervous, were correctly identified in most cases as being a cause of a rise in blood pressure.

(f)(i) Most graphs were plotted correctly, with the exception of the occasional error for one of the points. However, a significant number of candidates failed to attempt to plot the points on the graph, suggesting that possibly they failed to see this section of the question.

(f)(ii) This was a good discriminating question with the stronger answers gaining the full three marks. Marks were lost when the discussion centred round changes to pulse rate during exercise or the rate of recovery, but failed to make a comparison between person one and person two.

Question 2

(a)(i) The diaphragm was mostly correctly identified on the diagram, while intercostal muscle was frequently incorrectly labelled or referred to as 'rib muscles'.

(a)(ii) Three of the four available marks tended to be gained by the stronger candidates, while the weaker ones often described how air is expelled from the lungs, rather than taken in. There was mostly a poor understanding of the pressure changes that occur in thethoracic cavity during inhalation.

(b)(i) Mostly correctly answered.

(b)(ii) An increase in heart rate, in response to a reduced blood oxygen level, was often correctly identified.

(c) This question was generally well answered, with most candidates demonstrating a good understanding of carbon dioxide exchange between the blood and alveoli and the structures involved. However, weaker candidates sometimes talked about the movement of gases to and from the lungs and not between the blood stream and alveoli.

Question 3

(a) Some answers talked about hyperthermia instead of hypothermia, while those who correctly described hypothermia often failed to specify the temperature at which it occurs.

(b) There was often good recognition of a symptom associated with hypothermia.

(c)(i) Mostly excellent descriptions were provided for a method of treating someone with hypothermia.

(c)(ii) Where the use of foil as a method of treatment was given in (c) (i), many answers talked about heat being radiated back to the body, rather than reflected back, hence losing the mark for the explanation of the chosen method.

(d) The concept of homeostasis was not well understood, with descriptions tending to focus on how body temperature is controlled, rather than the mechanism of homeostasis itself. This was a good discriminating question, with only the stronger candidates being awarded the two possible marks.

(e) There was a good understanding of how the body raises its core temperature when necessary. However, some candidates confused the mechanisms involved with those that lower body temperature. Very few answers mentioned that an increase in metabolic rate or respiration rate could contribute toward raising core body temperature.

Question 4

(a) 'Radiation' was mostly correctly stated as the thermal transfer method although the word was sometimes badly spelled (even allowing for phonetically correct spellings) hence losing the mark. However, some answers incorrectly referred to conduction etc.

(b) This question was answered correctly more often than in previous papers where a similar question was asked.

(c) Black was the most common answer, although an alarming number of candidates gave 'white' as their answer.

(d) This calculation generally resulted in two of the available three marks being achieved, with one of the marks tending to be for the stand-alone mark 'joules'. The equation often contained the correct figures, with a failure to complete the calculation resulting in an incorrect final answer. Also, many candidates failed to change the time into seconds before calculating the energy.

The weaker candidates often gained one mark for correct substitution and the use of the correct units.

(e) Any error carried forward from part 4 (d) was allowed in this calculation, meaning that it was still possible to gain the two possible marks for the question. Weaker answers included failure to insert figures correctly in the equation. Also, weaker students often could not work out U by re-arranging and then inserted it in the wrong place in the equation

(f) Few candidates mentioned cost in the context of energy. Also, few stated that carbon dioxide is generated at power stations, tending instead to talk about the car or the heater producing carbon dioxide. However, most knew that more fossil fuels would be used or that global warming might occur.

(g) A good discriminating question where those who understood the necessary calculation gained both marks, and others gained one mark for providing the correct equation or substitution.

Question 5

(a) The stronger answers gained the full three marks, while the majority of answers gained a maximum of two marks for a calculation resulting in an answer of 1500. Many candidates tried to use grams as the unit of mass.

(b) Many answers gained the full two marks, although often where an error was carried forward from part (a). In these cases there was no penalty applied.

(c) Often only two of the three possible marks were gained, as the incorrect figures were used in the equation. Credit was awarded for writing the correct equation and for correct substitution. Again, many candidates used grams as the units of mass, instead of kilograms.

(d)(i) It was noted that the units at the end of the answer section were incorrectly given as ms^{-2}, rather than m. During their initial deliberations, on a sample of scripts, the senior examiners found no indication that the units (ms^{-2}) on the end of the answer lines had distracted candidates. All candidates in the sample had read the text and calculated the "maximum height the ball would reach" and largely ignored the units (which were for acceleration and not distance). The marking scheme was left as originally intended.

At no point during the marking period did any examiner see a response that was outside of the scope of the mark scheme (i.e. candidates have calculated acceleration, tried to convert m to ms^{-2}, used the wrong units for distance etc). Consequently, no candidates were penalised as a result of the error.

The question was reasonably well answered with most candidates gaining at least one mark for the correct equation, fewer gaining the second mark for the correct substitution. Many candidates calculated the speed of a ball dropped from a height of 1 metre, rather than the height gained by a ball with a kinetic energy of 20 J. Quite a few, though, tended to not know quite how to deal with the "1m above the ground" as a starting point and then were inclined to use this as the actual height when working everything else out.

(d)(ii) Air resistance or a loss of energy were often correctly given as a reason why the answer to (d)(i) was probably an overestimate, even when the answer to (d)(i) was incorrect.

Question 6

(a) There was good recognition that efficiency meant useful output power, but less understanding that this was a function of the total input power.

(b) The lack of greenhouse gases or carbon dioxide production was often correctly given as an advantage of generating electricity from solar voltaic cells, although any references to cost tended not to be qualified in terms of energy. Mention of the intermittent presence of the sun was awarded a mark, while bald reference to expense was not, unless linked to photo-voltaic cells.

(c) Most answers gained two of the three possible marks.

(d) There was a good general recognition of the fact that fossil fuels will run out and also create carbon dioxide, while neither applies to renewable sources that generally don't produce carbon dioxide.

(e The fact that renewable sources tend not to be used as often for producing electricity, compared with fossil fuels, as they are less reliable or more expensive to install, was well documented.

(f) There was a general lack of awareness that the major danger to people comes from nuclear waste. Some answers mentioned the danger of an explosion taking place or the possibility of a leakage at a power station, thus getting the mark.

(g) Usually only 1 mark was awarded here for noting that not all days are sunny or for stating that the sun does not shine for 24 hours a day. Only rarely, was a reference made to the fact that the average (voltage, current, power) will be less than maximum.

(h) The need to take measurements over several days or in different seasons was often mentioned, as was the need to measure the energy output, both of which were valid points that were credited. Only very few candidates made it clear that they knew what they were measuring.

Mark Ranges and Award of Grades

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