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SC02 Energy Transfer Systems

Report on the Examination

2010 examination - January series

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General Comments

The performance of candidates in this exam compared well with that in June 2009. However, there is still a tendency for some candidates to repeat errors seen in previous exams. These include an incorrect reference to 'heat' rising rather than 'hot air' rising. In addition, there were a significant number of cases where a word equation was provided for respiration, rather than the requested chemical equation. As in previous years, some answers gave 'sweating' as a route by which the body loses heat, despite the question asking for 'routes other than through the skin'. These imply that some candidates failed to read the question properly.

The knowledge base for the structure of the heart was poor in some instances, with the correct labelling being applied the wrong way round. This was also evident with the labelling of the lung volumes in the spirometer trace. The concept of what is meant by the *U*-value was often poorly understood, as was the relationship between small pockets of air and convection currents, the meaning of energy efficiency and the kind of energy changes that occur in a battery or motor.

Question 1

(a) Most candidates correctly identified the aorta but many labelled the pulmonary artery incorrectly as the pulmonary vein. Some answers had the correct labels but in the reverse order.

(b) Most answers gained one of the two available marks for realising that the left ventricle has a thicker wall as it has to force blood to travel round the body, compared with the right ventricle which pumps blood for a shorter distance to the lungs. The more able candidates gained the second mark by adding that blood in the left ventricle was under a higher pressure than that in the right ventricle. Some often thought that the oxygenated blood was more dense or viscous and needed more muscle to push it.

(c)(i) Often well answered but many thought that an ECG records heart beats or heart murmurs, or is linked to abnormal heart beat. One mark was usually gained for referring to the electrical activity of the heart, while the second point, concerning rhythm, was only evident in the stronger answers.

(c)(ii) Often correctly answered although there were many candidates who identified, incorrectly, trace C, depicting ventricular fibrillation, as tachycardia.

(d) There was mostly a good understanding that valves were involved in producing the heart sounds, giving a maximum of one mark, if this alone was mentioned. However, the valves concerned were often incorrectly named. The less able candidates tended to gain one or two marks for mentioning that contraction and/or relaxation of the heart was connected to producing the heart sounds. When wrongly answered, "beats" of the heart was a common response.

(e) A comparison between the peak expiratory flow rate of the girl and the normal peak flow rate was generally known, although many answers talked about the girl's rate being 'low' without indicating that it was actually 'very low' or 'lower than normal'.

(f) The more able candidates tended to correctly identify both lung volumes from the trace, with the less able ones only identifying one.

Question 2

(a)(i) Generally speaking, the knowledge of specific body temperature, under certain conditions, remains weak. Although many answers correctly gave 38°C as the temperature that indicates heat stroke, many answers were incorrect, or depicted a range of temperatures, neither of which was acceptable.

(a)(ii) The processes involved in thermoregulation were largely well understood, with many answers gaining three of the possible four marks. Marks tended to be lost by poor descriptions of blood being diverted to the skin, with reference being made to blood vessels rising up towards the skin, rather than actual diversion of blood. Sweating was often given but usually without mentioning that it comes from sweat glands. Drinking, crying or urination was incorrectly given several times.

(a)(iii) Shivering was often given but infrequent reference made to respiration being a process whereby the body generates heat, and even less mention of the involvement of chemical or metabolic reactions in the body. Other answers varied from sunlight to hot drinks.

(b) Despite the fact that the question clearly asked for a route other than the skin by which the body loses heat, many answers mentioned sweating. This is a clear example of a failure to read the question carefully. Excretion and urine were often given as separate mechanisms for heat loss, gaining only one mark, while any reference to 'breathing' on its own, rather than 'exhaling' or 'breathing out' was not credited.

(c) The temperature of the surroundings and the activity level of the body often earned two marks, with several answers mentioning the difference between core and surrounding temperatures. However, reference to 'clothing' alone, with no further clarification, failed to gain a mark. Humidity was often recognised by the more able candidates as being a factor involved in heat loss from the body.

Question 3

(a)(i) The full three marks were gained by the more able candidates while the less able ones made many errors including failing to balance the equation correctly: inserting CO_2 as part of the input rather than O_2, providing the wrong formula for glucose or writing a word equation when the question specifically asked for a chemical equation.

(a)(ii) At least two of the available four marks tended to be awarded here, with most answers mentioning that maltose produced the most carbon dioxide and that more carbon dioxide was produced with time. Some answers made no reference to respiration, despite the question asking about the respiration of yeast. In these instances a maximum of three marks was available. Many candidates picked up three marks but failed to achieve the fourth by grouping maltose and glucose.

(a)(iii) 'Control' was a very popular answer while some just said 'to keep it fair'. Others correctly noted that sugar is needed for yeast to respire.

(b)(i) Usually one mark was awarded here, for the first mark point, with only the more able candidates realising, in addition, that glucose had been produced by the action of lactase on lactose and hence was available for respiration by the yeast. Very few statements appeared to the effect that glucose is respired much more readily by yeast compared with lactose. Quite a few wrongly discussed how the reaction might be slower because the enzyme might take a while to react.

(b)(ii) A well answered question with most marks being gained for mentioning that the alteration of temperature and the concentration of certain substances would affect the respiration rate of yeast. Virtually no reference was made to the role of pH in these circumstances.

Question 4

(a) The majority of candidates gained a mark for 480 000 rather than the possible two marks for 4800. It would be very helpful if candidates could remember to use SI units in their calculations.

(b)(i) Only the more able candidates gained two marks for using the correct calculation, with or without using an error carried forward from part (a). Many used the wrong equation to carry out their calculation.

(b)(ii) Many correct answers, with often one compensation mark being awarded for correct substitution in the poorer answers.

(b)(iii) Potential energy was often quoted, with 'gravitational' being left out. Kinetic energy was usually correctly given.

(c)(i) Many thought that carbon dioxide was reduced in the atmosphere generally, with no mention of the effect on travellers standing near the bus. Also, many didn't take into account power stations and their emissions. 'Trams producing less noise pollution' was often correctly given.

(c)(ii) Usually well answered.

Question 5

(a) Most mentioned heat loss but area and temperature difference were often missing from answers.

(b) This was either well explained or misunderstood, with mention of foam being a poor conductor or heat being trapped in foam/air pockets.

(c)(i) Radiation was usually given correctly.

(c)(ii) 'Silver' was a popular incorrect answer although most chose black.

(c)(iii) Mostly one mark gained by stating that the sun is not always present, while fewer candidates appreciated the need for a back-up system in these circumstances.

(d)(i) This was often well answered. Wrong answers usually included making sure that exactly the same amount of heat was delivered to each barn rather than setting the thermostats at the same temperature.

(d)(ii) Often 'repeating' was mentioned, so applying generic experimental techniques.

(e) 'Heat' was often seen to rise although cold air then usually fell as well. Often 'hot air' did rise but then the candidate failed to see that this would make the space under the roof hotter. No one thought of 'bigger surface area' or 'darker roof'.

Question 6

(a)(i) Many correct answers. Wrong answers included electrical energy becoming potential energy. Many did not appreciate what was meant by a conversion and just put one name down for each.

(a)(ii) This was usually well answered.

(b) Some candidates thought that lower friction would lead to the tyres lasting longer, although many scored well.

(c) This question was not well answered. Many thought that you would feel the stones through “hard” tyres, and failed to understand that under-inflation would mean a longer impact time, so missing the momentum idea completely. ‘Less force’ was often seen without clarification, while ‘impact’ was often wrongly used in place of ‘force’.

(d) Answers relating to high pressure often included detailed kinetic particle theory being discussed, leading to efficiency. There were several attempts to include P=F/A so higher pressure on the same area leads to increased force which would help do more work-leading to greater efficiency. There were many correct references to there being less friction with high pressure tyres, as well as them having less contact with the road.

(e) This was often well answered. However, many incorrectly talked about PE = mgh and many interchanged units especially speed in mph.

Mark Ranges and Award of Grades

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