



General Certificate of Education

Applied Science

8771/8773/8776/8779

SC02 Energy Transfer Systems

Report on the Examination

2009 examination – January series

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General Comments

The performance of candidates for January 2009 compares well with that of January 2008. Unfortunately, marks are still being lost for failure to insert units, where appropriate, at the end of calculations, and for ignoring advice highlighted in earlier reports. The latter includes the persistent tendency of some candidates to refer to 'heat' rising, rather than 'hot air' rising. Many candidates are still talking about feathers etc. being poor conductors of heat, while failing to realise the role of air as a poor conductor. The concept of the U-value is still poorly understood, as are the factors responsible for creating convection currents. The manner in which crumple zones serve to protect passengers is another topic that needs more revision.

Poor spelling of some words, which then led to ambiguity, lost marks e.g. does 'hypothermia' mean 'hypothermia or hyperthermia? The structure of the heart would benefit from being learned more thoroughly. This would result in less confusion between the different valves in the heart and the path taken by blood through the heart. Many candidates appear not to read the question thoroughly, for instance failing to give a range of values when asked, but rather a single value instead.

Question 1

- (a)(i) Mostly correct answers given. However, many answers consisted of a single figure despite the fact that the question had asked for a range.
- (ii) There was usually a correct understanding that the brain was involved in sending impulses to the heart, causing it to slow down heart rate. This was a good discriminating question as only the stronger candidates thought to refer to the role of the parasympathetic or sympathetic nerve in controlling heart rate, or indeed the role of the cardiovascular centre. Very few answers mentioned that the S-A node was found in the right atrium of the heart.
- (b) Most answers gained full marks, often with reference to the fact that the time taken for heart rate to return to resting rate, following exercise, is an indication of a person's level of fitness.
- (c) Most answers gained two marks only, usually for a reference to the brain and an increase in pulse rate. There was generally a poor understanding of the role played by chemoreceptors in detecting raised levels of carbon dioxide in the blood, and very sporadic mention of the carotid artery as the area where the receptors are found. Also, many thought that the receptors were in the brain.
- (d)(i) A good discriminating question, whereby the stronger candidates realised that ventricles need to empty completely, and that this can only be achieved if they start to contract from the base, forcing blood up and out of the heart. The weaker candidates talked about the blood going from the ventricles to the atria or pulmonary vein.
- (ii) The valves, when named, were mostly identified correctly, and their role in preventing backflow of blood given.
- (iii) Some confusion existed between the bicuspid and tricuspid valves, and the semi-lunar valves and their relative positions within the heart. This suggests that many candidates have not learned the structure of the heart in any detail.

Question 2

- (a) Mostly correctly given as fat, although the weaker candidates offered wholly inappropriate suggestions such as hair.
- (b)(i) 'Hypothermia' was mostly given as the correct answer, although many variations in the spelling, including hybrid spellings involving 'hyperthermia', tended to cloud the issue.
- (ii) 25 °C was correctly given in the majority of answers. However, 43 °C was sometimes given, suggesting that the question had been misread as 'At what core body temperature is death normally likely to occur?'
- (c)(i) Homeostasis mostly given correctly.
- (ii) Shivering and hair erection were often given as correct examples for mechanisms, although candidates often confused vasoconstriction and vasodilation. Heat, rather than air, was often described as being trapped against the skin. Some answers referred, incorrectly, to blood vessels moving away from the skin rather than to blood being diverted away from the skin surface. In addition, many thought that shivering caused friction which produced the heat, while failing to mention the role of muscles.

Question 3

- (a)(i) A good understanding of the role of the trachea was often demonstrated.
- (ii) Despite the fact that this has been highlighted in previous reports, people are still talking about the cilia trapping dust or dirt, rather than moving it. There was, however, a general understanding that cilia serve to prevent damage to the lungs.
- (b)(i) Surfactant was seldom mentioned, although most candidates gained at least one mark, and many gained two.
- (ii) The features of the blood vessels that aid gaseous exchange were mostly well documented, often with reference to the presence of many blood vessels surrounding the alveoli creating a short diffusion path.
- (c) Marks were mostly awarded for appreciating that the patient's wishes needed to be considered, in addition to religious beliefs. Some answers, that were not credit worthy, talked about hospitals needing the bed for another patient, or the cost to the NHS of keeping the person alive and the suggestion that the money could be better used elsewhere.
- (d) The possibility of side effects occurring due to taking part in clinical trials, and the level of risk involved, were often correctly identified as necessary information to be given, in advance, to trial participants.

Question 4

- (a)(i) 'Radiation' was usually correctly identified, although 'conduction' was sometimes incorrectly given.
- (ii) It was generally understood that 'black' absorbs (radiation) effectively. However, the weaker candidates failed to make the distinction between 'black' and 'black coal dust'. Very rarely was any comparison made between black and the white or shiny snow, in terms of absorption ability. Many incorrect references were made to 'black attracting radiation' or 'black attracting the sun'.
- (b)(i) There were very few correct diagrams showing how convection currents serve to help keep clouds in the air.
- (ii) Virtually no-one mentioned that heat is transferred from earth to air, although most people gained a mark for realising that hot air rises or that cold air falls. 'Heat rises' was still appearing despite the fact that it has been highlighted as unacceptable in previous reports. Only a few mentioned that hot air was less dense than cold.
- (iii) Mostly answered correctly but with much variation on the theme.
- (c)(i) Good answers talked about air being trapped and that air was a good insulator, while the weaker ones referred to the thickness of the nest helping to keep heat in, with no understanding of the role of air as a poor conductor.
- (ii) This was a good discriminator as only the stronger candidates acknowledged that air was trapped in 'small' pockets, which did not provide enough room for convection currents. Many answers mentioned that air was trapped but failed to say that it was trapped in small pockets.
- (iii) A thicker layer of feathers or wool resulting in a smaller U-value usually gained one mark and, to a lesser extent, the fact that more air is trapped or more heat is kept in. There appeared to be little understanding of the U-value as many answers referred to it increasing.

Question 5

- (a)(i) 85% or 0.85 was often correctly given for the full two marks, while some answers lost a mark for failing to put '%' after '85'. Most answers gained at least one mark for correct substitution.
- (ii) A good discriminator where only the stronger candidates stated that no system has 100% efficiency. Most answers gained a mark for stating that heat is lost.
- (iii) Less pollution was often given as an advantage, although with no mention of where this was found, namely, at the engine. Power cuts or danger from electric shock were often given as a correct disadvantage of using electrical power compared to diesel.
- (iv) This question was generally well answered, with a mark being lost on occasion due to an error being made at the end of the calculation, or failure to insert the unit.
- (b)(i) Very well answered.

- (ii) Candidates mostly failed to understand how a crumple zone could reduce force on passengers in the event of a collision. Also, there was much confusion regarding how it might affect the acceleration or deceleration of a train.
- (iii) One mark was usually gained for giving the correct equation, with a second mark awarded for correct substitution or rearrangement. The stronger candidates gained the full three marks for a correct answer with the correct units. There was a stand-alone mark awarded for units.

Question 6

- (a)(i) Many candidates seemed to think that a 'fair test' means keeping everything the same, rather than changing one variable at a time.
- (ii) The mark was usually awarded here for stating that the technician repeated her readings in order to get an average. However, many answers talked about this making the results more reliable, rather than checking or testing whether the results were reliable, thus losing the mark. Very few correct references to checking for anomalies.
- (iii) Light gates were correctly given by about one third of the candidates, while using a stop clock was a very common incorrect answer.
- (b)(i) The weaker candidates tended to gain one mark only here for giving the correct equation, while often the stronger candidates gained the full three marks.
- (ii) Incorrect reference was often made to the skier gaining heat due to her skis moving on the snow.
- (iii) Cold air striking the body or wind chill often gained the mark here, as did 'exhaling', but not 'breathing' on its own.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results statistics](#) page of the AQA Website.