GCSE

SCIENCE A / PHYSICS

PH1HP

Report on the Examination

4405/4403
June 2013

Version: 1.0

Further copies of this Report are available from aqa.org.uk

General

Questions 1 to 4 were standard demand, targeting grades C and D. Questions 5 to 8 were high demand, targeting grades A and B.

Question 1 (Standard Demand)

(a) Although seemingly a straightforward question, nearly three quarters of the students failed to realise that the waste energy would warm the surroundings. Many of the incorrect answers referred to pollutant gases or global warming.

(b) Half of the students correctly calculated the efficiency using data from the Sankey diagram. Common mistakes were mis-counting the number of squares on the diagram, or calculating a correct value of 0.8 but including a unit.

(c) The majority of students understood that the CHP station produced less waste energy, with many realising that the energy which would have been wasted was now being put to a useful purpose. A majority of students scored at least one of the two marks.

(d) (i) A minority of the students answered correctly. The most common, incorrect answer was 'a system of cables and pylons'.

(d) (ii) This was well answered, with over half of the answers referring to less energy being wasted. A significant number of students stated, incorrectly, that less 'electricity' would be wasted.

Question 2 (Standard Demand)

(a) Nearly half of the answers scored all three marks, with good answers giving detailed descriptions of both evaporation and condensation. A large number of students referred to the water vapour 'condensating' on the mirror.

(b) This was well answered with many students scoring both marks.

Question 3 (Standard Demand)

(a) (i) This question produced a wide variety of answers, with around one-third of students answering correctly. A common incorrect response was 'parallel'. Surprisingly, a significant minority of students failed to give an answer, leaving a blank space.

(a) (ii) Most students understood what was required of them, but the remaining students failed to see the significance of the motor and fan blades. However, a significant number failed to score both marks because they only referred to what would happen when the lamp was switched on. Despite the question emphasising that energy transfers did not need to be described, the majority of students wrote lengthy answers describing these energy transfers.

(b) This question was not answered well, with nearly half of the students failing to score any marks, and very few achieving full marks for this ray diagram. Common mistakes were drawing rays which did not come from the wrist watch and drawing what appeared to be refracted rays through the mirror. Many students did not appreciate where the image was positioned.

(c) There was a variety of definitions of a virtual image, most answers were incorrect or imprecise.

Question 4 (Standard Demand)

(a) Some good answers were seen, showing a sound knowledge of energy transfer processes and a good standard of written communication. Nevertheless, only a small minority of students scored the maximum six marks and nearly half of students scored two marks or less. Common mistakes were referring to 'heat particles', thinking that the vacuum stopped all forms of heat transfer, thinking that the vacuum contained air and referring to the transfer of 'cold'.

(b) This was very well answered with over half of the students scoring both marks, and a majority of students scoring at least one mark. Some students referred to the 'large surface area' of the ears or discussed the large ears of a desert fox or elephant.

Question 5 (High Demand)

(a) Less than half of the students scored at least two marks, usually for referring to the hot water becoming less dense and therefore rising. Students who referred to water particles often mistakenly referred to them 'vibrating more' as a result of the energy given, or to the particles themselves becoming less dense.

(b) Nearly three quarters of the students correctly identified the process of conduction.

(c) (i) Fewer than one fifth of the students realised that this question related to the greatest difference in temperature between the water and the surroundings.

(c) (ii) A small minority of the students scored full marks. The majority of students failed to convert kJ to J. Many students were unable to transpose the equation correctly.

(c) (iii) This was very well answered, with over half of the students scoring at least two of the three marks. This was usually for realising that the insulating jacket would keep the water hotter for longer, thus requiring the heater to be switched on for a shorter period of time. Many did not score the third mark because they merely repeated the question by saying that this 'saves money' rather than referring to the cost of electricity / energy used.

Question 6 (High Demand)

(a) (i) This was generally well answered with over half of the students scoring both marks. The most common answers were related to carbon dioxide and global warming.

(a) (ii) There were some good answers describing carbon capture methods. However, a significant number of students failed to take notice of the statement that 'the amount of fossil fuels burnt stays the same' and gave answers relating to reducing the amount of fossil fuels burnt.

(b) (i) This was well answered by over half of the students. A common error was to state what a 'short start-up time' was, rather than explaining its importance.

(b) (ii) Over half of the students scored the mark here, the most common answer being 'renewable', with a minority realising the significance of it being a way to store energy for use at a later time.

(c) (i) This was well answered by nearly two-thirds of students. It appeared that a significant number of students did not understand the word 'fluctuations'.

(c) (ii) Again this was well answered, the most common response referring to the increased use of energy saving light bulbs.

Question 7 (High Demand)

(a) Just over one-third of students answered correctly.

(b) (i) Just over one-third of students gave a correct example of infrared waves being used for communication, TV remote controls being the most common answer. A common answer which did not score a mark was 'mobile phones', although some candidates gained credit for expanding on this answer by referring to the transfer of data files in older mobiles.

(b) (ii) Around 13% of students scored all three marks for this calculation. A similar number were able to perform the calculation correctly but either overlooked the instruction to give the answer to two significant figures, or did not understand what 'two significant figures' meant. A significant number of students substituted correctly into the equation and transposed it correctly, but were unable to carry out the calculation correctly, mainly because of the powers of ten. Answers of 1.66×10^{17} were common.

(c) Around half of the students were able to identify that there may be other factors affecting sperm count. Of the remaining responses, a variety of interesting answers were seen.

Question 8 (High Demand)

(a) (i) Nearly two-thirds of students answered correctly. A common wrong answer was that the Big Bang theory describes the creation of Earth, or the Solar System.

(a) (ii) A majority of the students gave the correct answer.

(b) (i) 'Red shift' was correctly identified by most of students. A significant minority of students did not give an answer.

(b) (ii) One-sixth of students failed to attempt this question, whether through lack of time or because of its difficulty. A very small number scored all three marks, and a majority did not gain any marks. A common mistake was to say that red-shift and blue-shift indicated the distance of the star. A few candidates gave a good description of the red-shift and blue-shift of a binary star system, but failed to relate it to Star A and Star B in the given diagram.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator