



General Certificate of Secondary Education

Science B 4462 / Physics 4451

PHY1H Unit Physics 1

Report on the Examination

2009 examination - January series

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Set and published by the Assessment and Qualifications Alliance.

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Physics

Higher Tier PHY1H

General

The majority of candidates attempted all parts of all questions, suggesting that time was not a problem in completing the paper.

The standard of handwriting was generally good. However, some candidates would clearly benefit from having a scribe assigned to them if they are eligible for such. Candidates should be encouraged to use a black pen, and to contain their answers within the confines of the allocated space. If they wish to use continuation sheets, they should clearly indicate that they have done so.

Question 1 (*Standard Demand*)

- (a)(i) Few candidates gained 2 marks, although many candidates correctly linked the silvered surfaces to reducing radiation for one mark only.
- (a)(ii) Even at Higher Tier it was surprising how many candidates did not know what a vacuum is. Many candidates gave answers in terms of the vacuum containing air, a poor conductor. Few candidates showed a good understanding of the role of particles in conduction and convection.
- (b)(i) The majority of candidates scored no marks. Most answers referred to the underside of the hood reflecting heat down to the patio. Those candidates who picked up that the question was asking about the top surface sometimes scored one mark for saying that shiny surfaces were poor emitters of radiation, but most candidates were still concerned about reflection and often not even of heat but of light.
- (b)(ii) Many candidates attempted to draw a Sankey diagram and gained some credit. However the standard of the diagrams drawn tended to be poor – not using a ruler to draw straight lines and both output's being similar in magnitude.
- (b)(iii) Many candidates quoted the law of conservation of energy. However candidates should appreciate that an answer which merely re-states the question (energy input always equals energy output) will not gain credit.

Question 2 (*Standard Demand*)

- (a) A large number of candidates scored at least 1 of the 2 marks, common mistakes were a failure to convert from W to kW, or wrongly converting by dividing by 100. A surprising number of answers used the time as 8 hours, presumably because of the 8-hour timer. It would appear that many candidates do not read the questions thoroughly.
- (b) This was well answered on the whole, although it appeared that some candidates just looked for the highest number, regardless of units.
- (c) Many marks were lost by candidates not comparing each heater with the other two, again an example of not reading the question thoroughly. Good answers explained

why the feature would be an advantage rather than just picking out a statement from the lists given.

Question 3 (Standard Demand)

- (a) Some candidates had problems reading all 4 values from the graph correctly, but did gain one mark for showing correct working. A significant number of candidates, having read the values correctly, were unable to calculate a proportion.
- (b)(i) This was generally well answered. The most common one-mark answers chose student B but failed to explain the link between fossil fuels and carbon dioxide emissions.
- (b)(ii) This was very well answered with candidates showing a practical understanding of the problem. The most common response being 'don't leave appliances on standby'.
- (c)(i) Whilst many candidates were able to score one or two marks for picking out a couple of significant features of the graph, detailed answers were not common. A number of candidates failed to gain any credit for answers which tried to describe the action of a wind turbine. Some candidates seemed to think that because the line went down after 25 m/s, this was showing that the wind speed was falling. A cause for concern was the idea that it is the wind turbines that create the wind!
- (c)(ii) This was well answered by many candidates, the most common error being a general description of wind turbines such as noisy and an eye-sore.

Question 4 (High Demand)

- (a)(i) Whilst many candidates knew that the answer involved neutrons and protons, few gave a correct answer. Common incorrect answers included 'it has more neutrons than protons'.
- (a)(ii) Good answers, often referring to the emission of alpha, beta or gamma radiation were not uncommon. However the majority of candidates were unable to say what the term 'radioactive' meant.
- (b) This question produced many correct two mark answers. Some candidates used the correct method but were unable to read the scale on the x-axis correctly and so gained one mark.
- (c)(i) This should have been an easy mark to score, but many answers showed a complete lack of knowledge.
- (c)(ii) Very few candidates scored both marks. Although many candidates identified that there were fewer plutonium nuclei left to decay, most failed to link this to the key point of less heat being produced.
- (d)(i) Most candidates were able to score one mark for the idea that alpha radiation would not be able to penetrate the skin. However few candidates scored the second mark for the harm that could be caused if inside the body. Marks were often lost by answers which were too vague eg general references to killing the individual or destruction of organs.

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- (d)(ii)** Generally well answered with candidates realising that there was a risk the same thing could happen again. Incorrect answers were often given in general terms about the harm that radiation may have on the environment.

Question 5 (High Demand)

- (a)(i)** This was generally known. A common incorrect answer was ‘radio active waves’.
- (a)(ii)** Less than half the candidates knew that energy is transferred by a wave.
- (b)(i)** There were a disappointing number of candidates who could not rearrange the equation. Many candidates tried multiplying the two numbers ending up with a value that they obviously did not consider unrealistic. Of those candidates who did rearrange the equation correctly, many were unable to deal with the large number of zeros. A few candidates pointed out on their scripts that their calculators were unable to handle such large numbers. Candidates seem to have lost the ability to cancel out before using a calculator.
- (b)(ii)** A significant number of candidates linked the idea of a substance that absorbs microwaves having a rise (albeit very small) in temperature.
- (b)(iii)** Many candidates demonstrated a good understanding of this topic, realising that it was about the Doppler Effect, and gained both marks.
- (c)(i)** Many candidates seemed unable to transfer the ideas used in ISAs to this question. Few correctly stated that the variables were continuous. A common error was stating only one named variable as continuous or attempting to describe the line of best fit/ directly proportional etc.
- (c)(ii)** Whist most answers correctly identified that a digital signal would be better, very few explained this in terms of data transfer.
- (c)(iii)** Generally well answered by most candidates with correct labelled diagrams or correct descriptions. However, as with question 1(b)(ii), the standard of drawing was on the whole poor, attempted straight lines drawn without rulers being the norm.

Mark ranges and award of grades

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