



**General Certificate of Secondary Education**

**Science B 4462 / Physics 4451**

**PHY1H      Unit Physics 1**

**Report on the Examination**

*2011 examination – January series*

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**Science B / Physics**  
**Higher Tier PHY1H****General**

Questions 1 to 3 were standard demand, targeting grades C and D. Questions 4 to 7 were high demand, targeting grades A\* to B.

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

Some of the numerical questions were poorly answered. Whilst candidates generally seem to be able to substitute figures into a given equation, they are often unable to complete the arithmetic correctly.

There were indications that candidates did not always read the question carefully, and also did not read through their answers to check that they made sense.

**Question 1 (Standard Demand)**

- (a) Surprisingly only just over half of the candidates were able to answer this correctly. A common mistake was to simply say that the wavelength or frequency was different without stating direction, ie the wavelength of microwaves is shorter. Another common error was to state a property of microwaves, eg their use in cooking food.
- (b) Less than half of the candidates were able to give the correct answer.
- (c) Whilst a large number of candidates identified that the microwaves would be reflected, few seem to have referred to either the given diagram or the information and so failed to gain the mark for the waves being transmitted by the plastic casing.
- (d) (i) This part question was poorly answered. A common wrong answer was that the wall covering would prevent the waves from escaping and thereby harming people.
- (d) (ii) When considering how many times this type of question has been asked it is very disappointing that only just over a tenth of candidates gave a correct answer. Whilst many candidates recognised the 'fair test' idea, few were able to explain why this was important.
- (d) (iii) It was pleasing to see that many candidates recognised the potential for bias; however the wording used by many candidates often put across the idea that all company scientists are liars and would happily doctor their results.
- (e) (i) Responses seemed to fall into one of two categories – either very well answered, with the differences and trends clearly stated, or total confusion as to what the table was showing. In this last category, answers referred to the 'degrees' as being temperature, or the RCS values as being angles.
- (e) (ii) This was very well answered, although a minority of answers indicated that candidates had failed to read the given criteria and had made their own up.

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**Question 2 (Standard Demand)**

- (a) Many correct answers were seen, although responses, such as, ‘the note decreased’, rather than referring to the frequency or pitch were common.
- (b) (i) The majority of candidates answered correctly. Although candidates were asked to choose one of the statements, answers where two or even all three boxes had been ticked were seen.
- (b) (ii) Whilst many candidates had an understanding of red-shift, very few attempted to explain how the demonstration modelled it. Over half of the candidates scored no marks.
- (c) This part question was well answered, with nearly all candidates gaining the mark.

**Question 3 (Standard Demand)**

- (a) The majority of candidates opted for the ‘no’ answer and were able to identify that gas, as a fossil fuel, would release carbon dioxide when burned. Of those who identified ‘nuclear’ waste as not being environmentally friendly, many failed to say that this was because it was radioactive. Over half of the candidates gave incomplete answers or such vague responses that they scored no marks.
- (b) Surprisingly, only just over half of the candidates were able to identify that nuclear power stations did not use a renewable source. There were many vague answers stating ‘they are not all renewable’.

**Question 4 (High Demand)**

- (a) (i) This was well answered.
- (a) (ii) The majority of candidates were able to substitute correctly into the given equation.  
Mistakes made subsequently were to do the arithmetic incorrectly, or to give a wrong unit with a correct numerical answer, eg 75 J or 0.75 %.
- (b) Few candidates scored this mark. A common insufficient answer was to say that it would take up a lot of land, without going on to explain the consequences. Few candidates seemed to realise that scaling up by a factor of 100 000 would require the area to be flooded.
- (c) (i) As a simple recall of knowledge question it was surprising that very few candidates were able to give the correct answer. Common misconceptions included the idea that pylons carry the electricity; that the power station or consumer is part of the National Grid.
- (c) (ii) Despite the given information stating that the electricity from the micro-system was transferred to local homes via a transformer, a large number of answers stated that no transformers would be needed, indicating that many candidates had failed to read the question carefully.

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**Question 5 (High Demand)**

- (a) (i) Responses were fairly evenly divided between conduction (correct) and convection, with the occasional 'radiation' as well.
- (a) (ii) Despite the question specifying 'the particles in the metal', a significant number of answers described convection in the water. Of the responses attempting to describe conduction, very few referred to the role of free electrons in the metal.
- (a) (iii) Responses were divided between convection (correct) and radiation.
- (b) (i) Many candidates seemed to think that C and D should be used, as they were the same shape. Those candidates choosing a correct combination were usually able to give a clear and correct reason for doing so.
- (b) (ii) A significant number of incorrect responses compared the temperature drop in A and B to that of C and D. Totally incorrect statements were not uncommon, eg 'A and B are the same colour' 'C is bigger than D', etc.
- (b) (iii) Candidates often seemed confused about the difference between radiation and absorption, so a common answer was that black radiators would absorb more heat.

**Question 6 (High Demand)**

- (a) Many candidates answered this well. A common error was failing to realise that the question had referred to a period of 5 years; also, simple arithmetical mistakes were not uncommon, particularly when subtracting the installation cost from the energy saving. A significant number of candidates made up their own question and worked out payback times.
- (b) Just under half of the candidates were able to state that energy cannot be destroyed or that energy is conserved.
- (c) Candidates generally found this calculation difficult, as they had to work back from the cost. Very few seemed to be able to do this in a logical way. A common incorrect response was 10 hours, indicating that perhaps candidates realised they could get 10 kWh for their £2; however, calculations were often just a jumble of numbers, so it was difficult to credit any steps in the working.

**Question 7 (High Demand)**

- (a) In this part question candidates often gave an incomplete answer, saying that the gamma radiation would go through the aluminium, rather than qualifying this with 'whatever thickness the aluminium is'. Common insufficient responses were to state the general properties of each type of radiation without relating it to the specific situation shown. Only a tenth of candidates gained all three marks.

- (b) The principle behind this question, ie that a drop in count rate signified an increase in thickness and vice versa, seemed to be quite well understood. Unfortunately, this was not always backed up by sufficiently detailed answers and many candidates only referred to the initial increase in thickness without mentioning the subsequent decrease. Similarly, the response of the system was not always referred to or described in terms of the changing roller pressure or gap width. Nearly three fifths of candidates failed to score any marks.
- (c) Of the candidates who appeared to understand how to tackle this question, a variety of responses was seen, including incorrect calculation of the remaining 25 % of 6 micrograms, inaccurate drawing of lines on the graph and misreading of the scales on the graph.

**Mark Ranges and Award of Grades**

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