



General Certificate of Education

Science B 4462 / Physics 4451

PHY1F Unit Physics 1

Report on the Examination

2009 examination - June series

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Science B / Physics
Foundation Tier PHY1F**General**

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

This year there seemed to be more candidates whose standard of handwriting was so poor as to be almost illegible. There also seemed to be an increase in the number of candidates whose writing was so feint or so small that it was almost impossible to read. Candidates should be reminded to use a black pen for writing.

The standard of numeracy was varied. Many candidates could substitute the correct numbers into an equation that they were given, but could then not complete the arithmetic correctly. Candidates should be reminded that they should take a calculator into the examination and use it. The instruction 'show clearly how you work out your answer' is intended to allow candidates that make a numerical error to gain credit for a correct method. Candidates that write 'I did it in my head', show no working out and arrive at a wrong answer need to understand that they will gain no marks.

Question 1 (Low Demand)

- (a) The vast majority of candidates knew that a television is designed to transform electrical energy into light and sound energy.
- (b) Most candidates could identify the false statement from the list.
- (c) Most candidates realised that wasting less energy leads to a higher efficiency.

Question 2 (Low Demand)

- (a) (i/ii) Surprisingly less than half of the candidates realised that the wind is an unreliable energy source and that the tides are a predictable energy source. A significant proportion of candidates thought that both were a constant energy source.
- (b) The great majority of candidates were able to state that a new tree or trees must be planted to replace the one that had been chopped down. Some candidates however misread the question and talked about what must happen to the tree after it had been chopped down, eg being made into paper.
- (c) The majority of candidates were able to interpret the graph correctly, and so deduce that the percentage is most likely to be greater than 4%.

Question 3 (Low Demand)

- (a) (i) Many of the candidates were able to identify correctly all three particles in the helium atom. The most common mistake was to confuse the neutron with the proton.
- (a) (ii) This was a very poorly answered question, with very few candidates gaining credit. The most common response was to talk about the penetrating powers of the alpha particle, or to try to compare their sizes.
- (b) (i) Most candidates were able to obtain the correct answer of 15 hours. Some candidates however, had shown, by drawing on the graph, that they knew *how* to obtain the correct figure, but had then failed to interpret the scale on the x-axis correctly. Some candidates were careless in drawing a horizontal line across from 50 and so gave the wrong value.

- (b) (ii) The majority of candidates failed to appreciate that they had actually just obtained the figure for the half-life in the answer to part (b)(i). Many candidates chose a figure that was either double or half of their answer to the previous part.
- (c) (i) Most candidates realised that americium was chosen because it has a long half-life.
- (c) (ii) Just under half of the candidates were able to score the mark for this question, either by stating one of the dangers of radioactive material or by saying that it would help the user to dispose of the product in a safe manner. Some candidates gave answers that were too vague to earn a mark, such as 'radioactivity is bad for you'.

Question 4 (Low Demand)

- (a) Many candidates failed to spot that what was required was a comparison of the *rate* of cooling; thus answers such as 'the large surface area cooled down more' were common. Several candidates were not able to interpret the graph correctly, and stated that the small surface area would cool down more quickly.
- (b) Many candidates failed to spot the connection between part (b) and part (a) of the question and therefore did not realise that this question was also about surface area. This mistake led to many answers such as 'the large ears act as sunshades' and 'the fox is able to flap his ears to create a breeze'.
- (c) (i/ii) Both were poorly answered, with many candidates being totally confused between conduction, convection and radiation.

Question 5 (Low Demand)

- (a) (i) Most candidates were able to identify France as being the country with the smallest amount of standby energy.
- (a) (ii) Few candidates were able to offer a sensible suggestion as to why an average value of the standby energy is used.
- (b) (i) The majority of candidates were able to spot the correct relationship and gain credit. However a significant minority of candidates clearly misunderstand the term 'standby energy' believing it to be some kind of reserve store of energy that could be used if the mains supply failed.
- (b) (ii) Only the better candidates were able to score both marks for this question. Many answers were very vague and simply talked about there being less pollution, without specifying what type of pollution would be reduced. There were many answers that talked about the general benefits of conservation, and the fact that the coal would one day run out did not answer the question that asked for an explanation of how the environment would benefit.
- (c) Surprisingly only half the candidates identified the joule as being the usual unit of energy.
- (d) (i) It was encouraging to see that a large number of candidates were able to complete the calculation correctly and earn all three marks available. Many of the weaker candidates were able to substitute the correct numbers into the equation that was given, but then failed to complete the arithmetic correctly nevertheless, they could still score marks by showing the correct method.

Some candidates converted their answer into pounds, but then failed to put a pound sign in front of the number. This lost them a mark as the units 'pence' had already been put into the answer line for them.

- (d) (ii) Most candidates correctly identified an advantage of using nuclear fuels.

Question 6 (Standard Demand)

- (a) (i) The better candidates were able to identify the HESS telescope as being the one that detected the shortest wavelength.

- (a) (ii) About half of the candidates correctly concluded that the Spitzer telescope was designed to detect infrared waves.

- (b) The better candidates were able to score both marks here for realising that the Hubble telescope would produce a clearer or more detailed image because the waves were not subject to any deleterious effects of passing through the Earth's atmosphere.

Many candidates did not appreciate the significance of this; instead they believed that both telescopes were designed to view the Earth. They therefore stated that the Hubble would be better because it could see the whole of the Earth, whereas the William Herschel would only be able to see part of the Earth.

- (c) Only the very best candidates realised from the table that the SPT telescope detects microwaves, and therefore the water in the atmosphere would absorb these and therefore reduce the quality of the image. Weaker candidates simply copied out part of the stem of the question, stating that electromagnetic waves are absorbed by water. Simply copying out information given in the question does not earn marks. Some candidates stated that electromagnetic waves absorb water. It was also common to see answers such as 'the lens of the telescope will become misted over if it is in a humid environment'.

- (d) This was a very poor-scoring question, with hardly any candidates scoring a mark. Most candidates talk about the size of the source or the strength of the radio signal, with only a handful of candidates stating that the radio telescope image showed another source that was not detected by visible light.

Question 7 (Standard Demand)

- (a) (i) A common misunderstanding was to state that digital signals travel faster than analogue signals. The better candidates however, correctly talked about the quality of the signal received.

- (a) (ii) About half of the candidates chose the correct answer of 'cooking food'; some looked back to the table and realised that some telescopes also use microwaves. A few candidates adopted a minimalist approach to their answer and just wrote down 'microwaves'. One suspects that they meant a microwave oven for cooking food, but their single word answer did not earn a mark.

- (b) (i) Many candidates suggested carrying out a practical experiment such as putting a group of people in a room and forcing them to use a mobile phone constantly to see if they became ill. Answers along these lines were not creditworthy.

It was expected that candidates would suggest a survey, in which health comparisons were made between a group of phone users and a group that did not use a phone. This was what most of the better candidates suggested. Some candidates however, chose the wrong groups to compare and they suggested comparing phone users who were ill with phone users who were not ill.

It was disturbing to see how many candidates believed that the main problem with mobile phones is that they are radioactive.

- (b) (ii) The best way to improve the reliability of a survey is to increase the sample size, and most of the better candidates stated this. Simply 'repeating' is not good enough.
- (b) (iii) Half of the candidates chose the correct answer of 'ethical'.
- (c) (i) Many candidates were using the terms 'reliable', 'accurate', 'precise' and 'valid' (and sometimes all of these) without showing any understanding of their meaning, thus scoring no marks. As with ISAs, the term 'fair test' on its own, without any further explanation, does not qualify for a mark.

Only the better candidates realised that, unless the tests were the same, it is not possible to make any comparison between the phones.
- (c) (ii) The majority of candidates answered this question correctly, either by stating 'Yes, because all the values are below 2.0' or 'No, because even low levels of radiation may be harmful'.
- (d) The majority of candidates realised that scientists employed by the company that made the devices could be accused of being biased.

Mark Ranges and Award of Grades

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