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General Certificate of Secondary Education

Science B 4462 / Physics 4451

PHY1F Unit Physics 1

Report on the Examination

2011 Examination – June series

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Science B / Physics
Foundation Tier PHY1F

General

Questions 1 to 6 were low demand, targeting grades E, F and G. Questions 7 and 8 were standard demand, targeting grades C and D.

The majority of candidates attempted all parts of all questions, with few questions being left unattempted.

Examiners commented on the poor quality of handwriting from many candidates this year. In addition to some words being almost indecipherable, there seemed to be an increase in the number of candidates using pencil or an ink that was so faint that it was difficult to see. Candidates should be reminded of the instruction on the front of the paper that states 'Use black ink or ball-point pen'.

Question 1 *(Low Demand)*

(a) (i) The majority of candidates correctly identified **L** as being the electron.

(a) (ii) Only a quarter of the candidates knew that an alpha particle is made up of two protons and two neutrons, and therefore was represented by **M** on the diagram.

(b) Most of the better candidates realised that one application of alpha radiation is to make a smoke detector work. About half of all candidates gained the mark for this question.

(c) The great majority of candidates correctly read the graph and arrived at the answer of 40.

Question 2 *(Low Demand)*

(a) (i) Most candidates wrongly chose radio rather than microwave, perhaps because they are used to listening to the radio from a satellite transmission.

(a) (ii) About half of the candidates correctly recognised **C** as being a digital signal.

(a) (iii) The better candidates knew that digital signals are less affected by interference.

(b) (i) Just over half of candidates correctly chose infra red as being able to pass along an optical fibre.

(b) (ii) There was a disappointing response to this question, with the majority of candidates scoring zero. Just under a fifth of candidates were created with full marks. Many candidates simply drew a curved line, parallel in all places to the walls of the fibre. Other candidates had the ray of light emerging from the side of the fibre, whilst some candidates mistakenly changed the direction of the ray of light in the middle of the fibre.

Question 3 *(Low Demand)*

(a) The great majority of candidates correctly interpreted the graph and stated that a high level of UV radiation gives the highest health risk.

(b) (i) About two thirds of candidates realised that staying inside would reduce the risk of skin cancer.

(b) (ii) This question discriminated well, with the best candidates scoring both marks. Many of the candidates who only scored one mark did so because they gave a good explanation of the mechanism, ie relating the lack of sunlight to a deficiency in vitamin D. However, they often failed to state whether or not the risk of developing bone disease would increase or decrease.
The two main errors amongst those scoring zero were to be talking about skin cancer rather than bone disease and to imply that vitamin D is ejected by the Sun in a stream.

Question 4 *(Low Demand)*

(a) Most candidates could suggest at least one reason why it was difficult to see distant stars with the telescope illustrated. Some answers however were too vague, such as 'because of the weather'.

(b) The better candidates could suggest a disadvantage of having a telescope in orbit above the Earth. Weaker candidates often appeared confused as to the difference between an advantage and a disadvantage.

(c) (i) Most candidates correctly selected the answer that the atmosphere absorbs gamma rays.

(c) (ii) The great majority of candidates deduced the correct answer.

Question 5 *(Low Demand)*

(a) The great majority of the candidates knew that the radio was designed to give a different form of output energy from the other three devices. However, not so many could give a correct reason.

(b) About half of the candidates correctly identified the kettle as being the appliance that transforms the most energy. The other half tended to choose toaster, presumably because it had the largest number associated with it and not noticing that the kettle's power was given in kilowatts rather than in watts.

(c) The majority of candidates arrived at the correct answer of 60 pence. Some candidates thought that the answer was £60.

Of the candidates who arrived at the wrong number because of faulty arithmetic, many of those who showed their working were able to score one mark. This of course was not true for those who failed to show any working.

(d) This question proved to be a good discriminator, with only the best candidates scoring all three marks. About half of the candidates scored two out of the three marks available.

One of the most common reasons for failing to obtain maximum marks was to talk about 'electricity being wasted', rather than referring to the amount of energy required to boil the water for a longer period of time. Some of the candidates were also referring to the cost of the extra volume of water rather than the cost of the extra energy required.

Question 6 *(Low Demand)*

(a) Just under a half of the candidates wrote a correct response of either heat (thermal) or sound energy as the form of wasted energy. However, many candidates opted for kinetic or electrical energy.
A few candidates read the word 'as' to mean 'because' and wrote a sentence in the gap to try to explain why energy is wasted.

(b) There was a pleasing response to this question, with about half of the candidates obtaining the correct answer to the calculation. The most common mistake was to invert the fraction and hence arrive at an answer of 2.5 rather than 0.4.

Question 7 *(Standard Demand)*

(a) (i) Just under a third of candidates knew that radiation was the process by which energy reaches the Earth from the Sun.

(a) (ii) Only the best candidates obtained both marks for this question. Many candidates stated that black colours absorb radiation, but failed to make the distinction that such surfaces are *better* than white surfaces at absorbing. There were many examples of unscientific answers such as 'black attracts the Sun' and even 'the Sun attracts black surfaces'.

(b) (i) The majority of candidates wrote down the correct answer as 1.2 hours. Of those who tried to convert this into hours and minutes, many arrived at the incorrect answer of 1 hour 20 minutes.

(b) (ii) Most candidates were able to state that the temperature of the water increased during the three hours shown on the graph.

(c) (i) A good proportion of candidates were able to suggest two appropriate control variables. Some, however, were vague in their answers; for example simply writing 'temperature' without making it clear which temperature they were referring to.

(c) (ii) Many candidates realised that the line they should add to the graph should be above the line that had already been drawn. Of these, however, a significant proportion lost the mark because they thought that the relationship between time and temperature would be linear, and hence drew a straight line. As a result, about a third of candidates scored this mark. Also, about a fifth of candidates did not attempt this question.

Question 8 *(Standard Demand)*

(a) (i) The majority of candidates opted for the wrong answer 'decontaminating' rather than the correct answer of 'decommissioning'.

(a) (ii) This proved to be a difficult question for most candidates, with less than a tenth achieving both marks. The most common mistake was to argue that, as the half-life was 5.3 years, this would mean that in 10.6 years all radiation would have ceased.

Many of the weaker candidates treated the term 'half-life' rather too literally, and would talk about the isotope being 'dead' after 11 years. Another common misunderstanding was to talk about the half-life reducing as time went on. Some candidates even thought that the term 'half-life' referred to the life span of the workers.

(b) (i) Most candidates realised that the percentage of people in favour of nuclear power stations had increased.
Some candidates simply wrote 'it went up', without specifying what 'it' was.
Some candidates failed to say how the percentages had changed, but instead suggested a reason why the figures might have changed.

(b) (ii) The better candidates were able to suggest a sensible reason as to why some people might consider the results to be unreliable. Many candidates, however, thought that the results were unreliable simply because there was no data for the intervening years. Others suggested that the results could be biased, but offered no suggestion as to why they might be biased.

(b) (iii) Few candidates were able to offer an acceptable reason as to why more nuclear power stations should be built. Most of the reasons offered were not specific to the building of a nuclear power station, eg 'to bring more jobs to the area'.

(c) Most candidates correctly identified this as being an economic reason.

Mark Ranges and Award of Grades
Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.

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