



General Certificate of Secondary Education

Science B 4462 / Physics 4451

PHY1F Unit Physics 1

Report on the Examination

2009 examination - January series

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Physics

Foundation Tier PHY1F

General

Questions 1 to 5 were low demand, targeting grades E, F and G. Questions 6 and 7 were standard demand, targeting grades C and D.

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.

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. Some candidates probably need reminding that they should take a calculator into the examination.

Question 1 (*Low Demand*)

- (a)(i) Most candidates knew that radio waves have the longest wavelength, but many put X-rays and infra red rays the wrong way round.
- (a)(ii) Most candidates realised that a use of gamma rays is to kill cancer cells.
- (a)(iii) Only about 50% of the candidates knew that electromagnetic waves move energy from one place to another.

Question 2 (*Low Demand*)

- (a)(i) The majority of candidates picked up the clue from the diagram, and correctly stated that the wavelength of the microwaves reflected from the ball are shorter than those from the speed gun.
- (a)(ii) The majority of candidates identified that the temperature of the ball will increase slightly.
- (b)(i) Some candidates appeared not to understand what was meant by the word 'pattern'. Thus they were offering answers such as "It goes straight up". Most candidates did score a mark here, even if they stated that the frequency was increasing rather than the difference in frequency increasing.
- (b)(ii) It was pleasing to see that most candidates were able to obtain the correct answer of 20 m/s. The most common mistake was to read the scale on the y axis incorrectly: many candidates thought that they needed to count two little squares up from the 3000 Hz line to reach 3200 Hz. They therefore reached a figure of more

than 20 m/s. Those candidates who heeded the advice in the rubric to "show clearly on the graph how you obtain your answer" were able to score one mark if they showed a suitable method on the graph, even if they subsequently arrived at the wrong answer.

- (b)(iii) The majority of candidates selected the correct answer.

Question 3 (*Low Demand*)

- (a) Most candidates correctly stated that solar cells are designed to transform light energy into electrical energy. The most common mistake was to state that they transform heat energy into electrical energy.

- (b)(i) The majority of candidates could substitute the correct numbers into the correct places in the equation. However, some candidates then found that they could not cope with a fraction where the denominator was larger than the numerator; they therefore inverted the fraction and ended up with the answer 5 instead of 0.2. It is possible that some candidates did not use a calculator in the examination.

Some candidates tried, unnecessarily, to express the answer as a percentage. Those who correctly answered 20 % gained both marks; those who erroneously stated it to be 0.2 % were only awarded one mark.

- (b)(ii) Most candidates correctly stated that the energy that is not usefully transferred is wasted.

- (c)(i) Most candidates correctly stated that either the fuel cells were to act as a backup for the solar cells, or that this enabled the aircraft to fly at night or when there was insufficient light.

- (c)(ii) Most candidates were able to state that burning fuels releases gases such as carbon dioxide into the atmosphere. Candidates whose answers were very vague such as "it reduces pollution" were not awarded a mark.

- (c)(iii) Many candidates believed that such an aircraft would be able to fly into space or be used to visit the moon. Another common mistake was to misread the question and instead of suggesting a possible use for the aircraft, some candidates were giving an advantage of this aircraft over conventional passenger jets.

Question 4 (*Low Demand*)

- (a) Fewer than half of the candidates obtained the correct answer here, possibly because others failed to spot that they were required to say which suggestion would **not** reduce the exposure.

- (b) The majority of candidates realised that the radiation could not be alpha, but most candidates were not very good at explaining the reasons. A common mistake was

simply to write down everything they knew about the three types of radiation, eg "alphas can be stopped by thin paper".

- (c)(i) Almost all candidates realised that both groups agreed that the risks were higher.
- (c)(ii) A common mistake here was simply to describe the shape of the two graphs, without relating this to the views of the two groups of scientists. Curiously, several candidates were able to give a good description of the beliefs of the two groups, but got them completely the wrong way round.

Question 5 (*Low Demand*)

- (a)(i) The majority of candidates were able to offer the name of a suitable renewable energy resource. A few candidates were not sufficiently specific in their answers, and wrote answers such as 'water'. A significant minority of candidates simply repeated the stem of the question and gave the answer as wind.
- (a)(ii) Most candidates realised that using less fossil fuel will decrease the amount of carbon dioxide emitted.
- (b)(i) A large number of candidates do not appear to know the difference between am and pm and were therefore describing what happened to the demand during the evening. An equally large number of candidates also thought that the question asked them to describe **why** the demand varied rather than **how** the demand varied. They were therefore going into great detail about how people were getting up for work after 4 am and switching on their kettles.
- Of those candidates who did attempt to describe **how** the demand varied between 4.00 and 10.00 **am** many only obtained one of the two marks. This was because they had failed to describe what the graph showed in sufficient detail. When asked to describe what a graph shows, it is always a good idea to quote some figures from the graph, particularly for points of inflection.
- (b)(ii) Only the better candidates seemed to realise that a gas-fired power station would have the shortest start-up time.

Question 6 (*Standard Demand*)

- (a) (i) Few candidates obtained any marks for completing the table.
- (a) (ii) It was surprising to find that very few candidates understand what is meant by the term 'vacuum'. The majority of candidates believed that a vacuum contains air, and that this is what prevents the loss of heat.
- (b) (i) This question was very poorly answered. Most candidates failed to read the labels on the diagram correctly, and thought that they were being asked about the *lower* surface of the reflecting hood rather than the *top* surface. Consequently their answers all referred to heat being reflected down onto the people sitting below.

Even those candidates who did understand that they were required to answer about the top surface, failed to realise that it was the emissive properties of the surface that were important, not the absorbing or reflective properties.

- (b) (ii) It was clear that, at some centres, candidates had not come across Sankey diagrams: these candidates often simply copied the diagram of the patio heater and added labels showing the energy flow.
- (b) (iii) Very few candidates could relate this question to conservation of energy.

Question 7 (Standard Demand)

- (a) Most candidates could substitute the correct numbers into the equation, although some erroneously put in a figure of 8 hours instead of 5. The most common mistake was to fail to convert 1800 watts into 1.8 kilowatts, thus arriving at an answer of 9000 instead of 9.
- (b) Many candidates chose the ceramic heater, perhaps because it appeared to have the largest number attached to it.
- (c) Most candidates were able to score at least one mark on this question, although very few scored all three marks. The most common mistake was simply to pick a feature from the illustration and copy it down. These candidates failed to realise that (i) it should be a feature not possessed by *either* of the other two, and (ii) that they should explain *why* this feature is an advantage.

Mark ranges and award of grades

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