Version 1.0 30/07/10

## General Certificate of Secondary Education

# Science B 4462 / Physics 4451

## PHY1F Unit Physics 1

# Report on the Examination

*2010 examination – June series*

Further copies of this Report are available to download from the AQA Website: www.aqa.org.uk



Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX

**Science B / 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, with few questions being left unattempted. There were fewer cases this year of candidates writing outside the given answer space. However, there was an increase in the number of candidates who were using a supplementary sheet simply to write one word to complete the sentence. Usually there is enough space under the final dotted line for a candidate to complete the answer: doing so is of benefit to the candidate as they can see their entire answer when reviewing their responses towards the end of the exam.

### Question 1 *(Low Demand)*

(a) Most candidates could score well on this question, with just over half of the candidates scoring full marks. The most common error was to link 'The sea is always too rough' to 'Tides' as the energy source, rather than linking it to 'Waves'.

(b) Most candidates realised that all the energy sources listed were renewable sources. However describing them as 'natural' sources was a common answer that did not gain a mark, and some candidates gave answers that were even more vague, such as 'environmentally friendly'.

(c) Nearly three fifths of candidates correctly realised that one disadvantage of a hydroelectric power station is that large areas of land are flooded.
A significant number of candidates chose 'polluting gases are produced'.

### Question 2 *(Low Demand)*

(a) (i) Most candidates correctly chose radio waves or infra red.

(a) (ii) Only just over half of the candidates correctly stated that radiowaves have a longer wavelength than microwaves.

(b) Just under half of the candidates knew that it is frequency that is measured in hertz.

(c) (i) Only the better candidates realised that the purpose of doing more scientific research is to obtain evidence and establish whether or not Wi-Fi is harmful. Many candidates started from the assumption that Wi-Fi is harmful, and that the research was to find ways of reducing the harm. Some candidates misunderstood the question and talked about the dangers of allowing children to access the Internet.

(c) (ii) Most candidates realised that the politician's statement was an opinion, although a significant number of candidates assumed that it was a fact.

**Question 3** ***(Low Demand)***

(a) (i) Surprisingly, only just over half of the candidates realised that the high setting would be obtained by adding together the low setting and the medium setting. Some candidates were looking for a pattern and, thinking that each power increased by 1.0, arrived at the answer 2.5.

(a) (ii) Pleasingly nearly three quarters of candidates were able to complete this calculation correctly.

(a) (iii) Only the better candidates could arrive at the correct answer to this calculation. Many candidates simply multiplied the cost per kilowatt-hour by the number of hours instead of by the number of kilowatt-hours, thus arriving at an answer of 36.

(b) (i) Generally most candidates opted for the correct answer of 6.00 pm, although the reason given was often too vague to deserve a mark. Candidates often stated that 'that was when the temperature went up', in spite of the fact that the temperature had been increasing throughout the previous hour. A common mistake was to say that the heater was switched on at 7.00 pm because 'that was when the temperature was the hottest'.

(b) (ii) Just over two thirds of candidates realised that if the temperature of the room was not changing then the room is losing energy as fast as the heater supplies energy.

**Question 4** ***(Low Demand)***

(a) (i) Most candidates identified the walls as being the part through which most heat is lost.

(a) (ii) Most candidates opted for double glazing as a method for reducing heat loss through the windows.

(b) (i) Most candidates correctly selected cavity wall insulation as the method that would reduce the yearly energy bill the most.

(b) (ii) Only the better candidates realised that by buying a hot water tank jacket and fitting draught-proofing, the householder would save the most money each year. Some candidates, perhaps believing that the householder could only buy one item, opted for the energy-saving light bulbs: this option however would not save as much money. A few candidates decided to buy 4 hot water tank jackets with the £60.

**Question 5** ***(Low Demand)***

(a) In spite of the fact that this question is frequently asked, the majority of candidates failed to obtain the mark. The most common answer was to say that the stars are so much closer if the telescope is mounted on a satellite. Several candidates stated that the telescopes would have a better view of the Earth if they were mounted on a satellite. These candidates had clearly not read the first line of the question, which told them that 'scientists use telescopes to observe stars and galaxies'.

(b) (i) Most candidates realised that the observation is known as red-shift.

(b) (ii) Most candidates realised that observation of red-shift gives evidence for the idea that the universe is expanding.

(c) (i) Most of the better candidates could state that as the distance increased, the speed increased, although few used terms such as 'proportional'. Many of the weaker candidates stated that the speed and the distance were always equal to each other.

(c) (ii) About half of the candidates correctly identified galaxy **C** as being the galaxy from which the wavelength would have changed the most, with about two fifths of candidates being able to supply a correct reason.

**Question 6** ***(Standard Demand)***

(a) Less than half of the candidates wrote down the name of a process of heat transfer, and of those who did, the great majority opted for convection rather than conduction.

(b) (i) Most candidates appeared to know what was meant by a control variable. Several candidates lost the mark because their answer was imprecise, for example, simply stating 'the temperature' was insufficient, as was 'the temperature of the water', had they written 'the starting temperature of the water' or 'temperature of the hot water', they would have gained a mark.

(b) (ii) It is interesting to note that when this question is asked on an ISA paper, the majority of candidates can state the correct reason for the choice of graph. However, candidates seem unable to transfer this knowledge to a written paper. In this question, the most common answer was 'because bar charts are much easier to understand than line graphs'. Under one fifth of candidates realised that a bar chart was the correct choice because one of the variables is categoric.

(b) (iii) Most candidates correctly chose copper as the best material for the heat exchanger, and most were able to supply a satisfactory explanation in terms of the temperature change. Some candidates however were clearly muddled as to the difference between a conductor and an insulator, and therefore chose plastic because this material gave the smallest temperature change.

(c) There were few correct answers to the question; most candidates simply stated that the pipe was now coiled but failed to explain why this might be an advantage.

**Question 7** ***(Standard Demand)***

(a) The better candidates realised that alpha particles would not be able to pass through the skin in order to be detected. The best candidates were able to say something about the relative ionising power of each type of radiation. Many of the weaker candidates however, had the misconception that alpha would not be powerful enough, and that gamma is more powerful than alpha.

(b) (i) Many candidates thought that they needed to say something at this stage about which kidney was working correctly, rather than simply stating that as both graphs showed an increase in count-rate, the technetium-99 had obviously passed in to each kidney.

(b) (ii) Most candidates were able to deduce from the graphs that the left kidney was failing to eliminate the technetium. However, the reasons given were often too vague or simply incorrect.

(c) (i) Under one twentieth of candidates were able to supply an acceptable definition of the term half-life. Perhaps because the context of the question was medical, many candidates seemed to think that it had something to do with the life expectancy of the patient.

(c) (ii) Many vague and muddled responses were seen to this question. Many candidates believed that an isotope with a longer half-life would be 'stronger' than one with a shorter half-life, and would therefore do more damage to the patient.

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