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General Certificate of Secondary Education

Science A 4405 / Physics 4403

PH1HP Unit Physics 1

Report on the Examination

2012 examination – June series

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Science A / Physics
Higher Tier PH1HP

General

Most students 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 students generally seem to be able to substitute figures into a given equation, they are often unable to complete the arithmetic correctly.

Question 1 *(Standard Demand)*

(a) Less than half of students were able to state that matt black surfaces were the best surfaces for emitting infrared radiation. Few students referred to the large surface area of the stove.

(b) This was correctly answered by over two-thirds of students; common mistakes were the omission of '%' when the answer given was 90, or the addition of an incorrect unit.

(c) Over two-thirds of students scored this mark.

(d) Few students could give two environmental advantages. The most common correct answers referred to wood being renewable or that using wood conserves fossil fuels. A common incorrect answer was that burning wood produces no carbon dioxide.

(e) The majority of students identified the correct equation and were able to substitute correct values. However, a small number of students had problems performing the calculation correctly. Surprisingly, only about half of the students could give the correct unit for energy.

Question 2 *(Standard Demand)*

(a) (i) This was well answered with most students scoring the mark.

(a) (ii) almost two-thirds of students answered this question correctly. There were some pleasing answers referring to the dissipation of energy into the surroundings.

(b) The majority of students were able to identify the basic pattern of input energy increasing with increasing load. However, only a tenth of students were able to provide further amplification relating to the shape of the graph.

(c) (i) A large number of students were able to identify the correct equation, but mistakes were often made in not converting (or wrongly converting) watts to kilowatts. Most students scored at least one mark.

(c) (ii) The majority of students scored this mark, however a significant number of students failed to realise that an environmental advantage was required, giving a response of 'to save money'.

Question 3 *(Standard Demand)*

(a) (i) Nearly half of the students did not seem to know what geothermal energy is.

(a) (ii) Similarly, a large number of students seemed unfamiliar with the pumped storage hydroelectric system. A common response was simply to describe the normal hydroelectric system.

(b) The quality of response was, on the whole, impressive over half of students scoring at least four marks. The majority of students organised their answer in a methodical way, and were able to express themselves coherently. Some students failed to realise that the wind turbines were offshore, and referred to the noise or visual pollution to the people living nearby. Some answers indicated that Iceland would be giving the energy to Britain free of charge or that Britain would be using the energy that Iceland currently wastes.

Question 4 ***(Standard and High Demand)***

(a) Many students were able to identify that the particles would lose energy. Whilst the idea of the particles moving closer together appeared to be understood, answers referring to the particles 'becoming denser' were quite common.

(b) A significant number of students appear to have misconceptions about double glazing, often relating to it 'not letting the water vapour through'. Just over a tenth of students were given full marks.

(c) (i) The idea of avoiding bias was correctly identified by many students, although some have a dim view of double glazing companies who will 'lie about their results'.

(c) (ii) Many students found it difficult to analyse the given data. A large number of responses merely quoted the data rather than summarising it, although quite a few managed to state somewhere that the better insulating glass was more expensive. Few responses summarising the effect of the air gap width were seen. A number of students recognised that better insulating glass would lead to a reduction in energy bills, but were not always able to express this idea clearly.

Question 5 ***(High Demand)***

(a) Considering the large number of wave properties to choose from, students did not score well on this question. Only a tenth of students could give two correct properties.

(b) Few correct responses referring to microwaves being able to pass through the ionosphere were seen.

(c) A large number of students did not recognise that the radio waves were being diffracted. Of those who did, the majority were able to relate the amount of diffraction to the wavelength of the waves, but very few students explained the relationship between gap width, wavelength and diffraction.

(d) Most students were able to identify the correct equation, and many were able to transpose and substitute correctly. Mathematical errors, often involving powers of ten, were then quite common. The unit of frequency was often omitted or written incorrectly as 'hz'.

Question 6 *(High Demand)*

The mechanism of conduction appeared to be only loosely understood by many students. Unfortunately, unclear or incorrect statements such as 'the particles start to vibrate' were often seen. About half of the answers referred to the metal having free electrons, but descriptions of how these played a part in conduction were often hazy, if not wrong.

Question 7 *(High Demand)*

(a) Very few students were able to locate the correct position of the image. Many students were able to draw one ray from the object to the glass and show it reflecting towards the eye, but in most cases, the angle of incidence was significantly and obviously different to the angle of reflection. If arrows were drawn on the rays, they were mostly shown in the correct direction. A second ray from the object and construction rays behind the glass were rarely seen. Less than a tenth of students achieved three or four marks.

(b) Very few answers explained that the image is formed by virtual / imaginary rays crossing.

Question 8 *(High Demand)*

(a) This was not well answered with just over a tenth of students scoring all three marks. Just over a quarter of students scored two out of the three marks, usually for indicating that red-shift shows that galaxies are moving away from each other or from the Earth and for the statement that the Universe is expanding. Common errors were that the Earth is expanding or that planets are moving away from each other. Also 'galaxies moving towards the red end of the spectrum' was often seen.

(b) (i) About two-thirds of students could give the origin of CMBR to score this mark.

(b) (ii) Only a third of students scored this mark. A lot of responses were claiming that CMBR was proof of the Big Bang theory.

(b) (iii) About two-thirds of students were able to state that the wavelength would be likely to increase, with about half of these students going on to give a correct reason.

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