Version 1.0 02/08/2012

General Certificate of Secondary Education

Science A 4405 / Physics 4403

PH1FP Unit Physics 1

Report on the Examination

2012 examination – June series

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Set and published by the Assessment and Qualifications Alliance.

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Science A / Physics
Foundation Tier PH1FP

General

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

Some students attempted to answer some of the questions by simply rephrasing the words in the stem. There was also evidence of increased use of the words 'it' and 'they' in students' answers. Such use often leaves examiners unsure as to what 'it' and 'they' refer to. Students should be advised to avoid these words in order to make the answer clear.

In questions where the students were asked to 'explain', the answer was often a simple statement or description. Students should be reminded that if the question contains the word 'explain' their answer should usually include the word 'because'.

The legibility of the responses seemed to be poorer this year compared to previous years. Students should be reminded that the examiner needs to be able to read what they have written.

Question 1 *(Low Demand)*

(a) Surprisingly, less than two-thirds of students could identify the fan, the drill and the washing machine as being the devices that were designed to transfer electrical energy to kinetic energy.

(b) Just over half of students scored both marks, and just under half scored one mark.

Question 2 *(Low Demand)*

(a) Surprisingly, less than a third of students scored all three marks. Many linked 'television' to 'visible light rays'. Perhaps they had misread the question as being 'which type of wave the device produces' rather than 'which type of wave the device uses'.

(b) This was not well answered, and many of those students who did write down the correct numerical value failed to obtain a mark because they omitted the unit. There was also evidence that some students knew that the correct answer was 300 000 km/s (as given in the question) but carelessly wrote down the wrong number of zeroes. Just over a tenth of of students did not attempt this question.

(c) Only just over half of students knew that infrared waves have a longer wavelength than visible light waves.

(d) (i) Again poorly answered, only a third of students recognising the process as refraction. Most thought that the process was either reflection or diffraction.

(d) (ii) Many students found it difficult to express themselves clearly enough to gain a mark here. It was common to read answers such as 'the light is not entering at an angle' or 'the light is entering straight'. Some students were writing that there is no normal, while others went further and stated that there needs to be a normal for the light to bounce off.

Question 3 *(Low Demand)*

(a) (i) Almost two-thirds of students could provide a sensible risk that should be considered, although some were more concerned about protecting the students' hearing rather than anything else. Some students thought they were being asked for a control measure, and were describing how the students could make it a fair test.

(a) (ii) Just over two-thirds of students realised that the frequency would increase as the car travelled towards them.

(b) (i) Most students scored at least one of the two marks for this question but only a fifth scored both marks.

(b) (ii) The great majority of students knew of the Big Bang theory.

(b) (iii) About two-thirds of students scored this mark.

(b) (iv) Just over half of students scored this mark.

Question 4 *(Low Demand)*

(a) (i) Nearly all students correctly identified hairdryer A.

(a) (ii) The great majority of students could correctly complete the bar chart.

(b) (i) Surprisingly, less than two-thirds of students were able to calculate the correct answer. Of those that gave an incorrect answer, only a tiny proportion showed a correct substitution to score one mark.

(b) (ii) Only the better students correctly completed this calculation. Many simply multiplied the time in hours by the cost in pence, as these were the two numbers that appeared in the stem of this part of the question.

Question 5 *(Low Demand)*

(a) Few students were able to recall that gas-fired power stations have the shortest start-up time. Almost a fifth of students did not even attempt an answer.

(b) (i) Very few students realised that the National Grid comprises of step-up and step-down transformers, as well as the transmission cables. Most thought that it was simply the transmission cables. A significant number of students included either the power station or consumer or even both.

(b) (ii) Just under half of students were able to score both marks for knowing what a step-up transformer does.

(c) Most students realised that the trend shown on the graph suggests that the percentage will increase over the next ten years.

Question 6 *(Low Demand)*

(a) About three-quarters of students could correctly identify a region of compression in the spring.

(b) (i) There were many excellent responses to this question scoring both marks. However, a significant number of students failed to score both marks because of the careless way in which the lines had been drawn. Examples included angles being nowhere near equal, large gaps between the ray and the reflecting surface and lines starting and finishing large distances from the speaker and the sound sensor.

(b) (ii) Over half of students were able to suggest a suitable reason for the reading on the sound level meter going down.

(b) (iii) About two-thirds of students correctly chose 'makes the sound louder'.

(b) (iv) The calculation of the speed of sound was generally well done with three-quarters of students scoring both marks.

(c) A surprisingly large number of students did not know that a reflected sound is called an echo. Almost a fifth of students did not attempt this question.

(d) (i) Half of the students correctly chose the frequency range from 250 Hz to 750 Hz.

(d) (ii) Only the better students realised that the reason why curtains would be better than carpet is because curtains reflect less sound. Many thought that carpet would be a better choice, in spite of the fact that in the stem of the question they were told that curtains would be better. In some of these cases, it was clear that students thought that reflection of sound was a good thing. In some cases, students thought that because the line for carpet on the graph was higher than the line for curtains, it must therefore be better. Very few students could make a sensible reference to the frequencies shown on the x-axis. Some students thought that curtains and carpet were able to change the frequency in different ways.

Question 7 *(Standard Demand)*

(a) Most students stated that matt black surfaces were good absorbers of radiation, but failed to go on to state that they were also good emitters of radiation. Many of the weaker students tried to explain the reason in terms of conduction or convection, even though the term radiation was used in the stem of the question. There is still a common misconception that 'black attracts heat'.

(b) Although most students could select the correct equation to use, many put the numbers in the wrong way round – possibly because they could not cope with the larger number being on the bottom of the fraction. Of those who did the arithmetic correctly, some added a spurious unit or, if they were expressing the efficiency as a percentage, simply left the answer as 90 without adding the percentage sign.

(c) Only a third of students gave a correct response of light or sound as a way in which energy is wasted from the stove. Some students seemed to have interpreted the word 'way' differently, and stated that some energy is lost when the door is opened.

(d) Just over a third of students scored at least one mark in this question, usually for stating that wood is a renewable resource. A common misconception was that the wood burning stove would not give off any gases that contribute to global warming.

(e) Nearly half of the students were able to calculate a correct value for the energy, but few scored all three marks because they either omitted the unit or wrote down an incorrect unit.

Question 8 *(Standard Demand)*

(a) (i) Few students appear to understand what geothermal energy is. Just over a tenth of students did not attempt this question.

(a) (ii) Most students that attempted this question simply described a hydroelectric system, missing the point about this being a pumped storage hydroelectric system. Many students thought that it was the energy or the electricity that was being pumped; others thought that it was the pump that stored the energy. Almost a quarter of students did not attempt this question.

(b) This was the 6-mark Quality of Written Communication (QWC) question in which students had to discuss the advantages and disadvantages of two proposals: building off-shore wind turbines or laying a cable to connect to renewable resources in Iceland. The best responses came from those who spent a couple of minutes making a grid to show the pros and cons of each in note form. They then used these notes to construct a full response. Most students could provide advantages and disadvantages for the wind turbines, but rather fewer responses successfully referred to the link to Iceland. Some students had clearly not read the question properly, and had failed to notice that the wind turbines were off-shore. Their answers therefore related to the countryside being ruined and land taken up with thousands of large turbines. There were many objections to the underwater cable on the grounds that 'electricity and water don't mix'. Just under a tenth of students failed to make an attempt at this question, however the majority wrote at length.

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