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General Certificate of Secondary Education

Science B 4462 / Physics 4451

PHY1 Unit Physics 1

Report on the Examination

2007 examination - January series

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General

It was clear that some candidates were not well prepared for this examination. There was a noticeable increase in the number of the scripts with blank spaces and comments such as 'I don't know' compared with scripts from candidates who in previous years would have been answering questions of a similar standard. Some answers showed that the candidates had no idea of what the question was about. There were candidates who were unable to interpret or use the information given in the questions. There was no evidence to indicate that the candidates had insufficient time to complete the paper.

Question 1 (Low Demand)

Many candidates made a good start with this question. The most common error being in part (c) where candidates were unable to understand that radio waves could be reflected by the Earth's atmosphere.

In part (d) it was disappointing to see that many candidates were unable to match the shortest wavelength with the waves next to the smallest number on the diagram.

Question 2 (Low Demand)

Part (a) was generally answered well, however many candidates lost marks by ignoring the clear instruction in the stem of the question and drawing more than three lines from List A to List B. However a significant minority of candidates had no idea at all and failed to score even one mark.

In part (b), most candidates were aware that the sign indicating the presence of a radioactive source was displayed to indicate the harmful nature of the material being used and responded that precautions were necessary, many even noting the specific damage which could result from exposure to nuclear radiation.

In part (c) the majority of the candidates knew of the penetrating power of gamma radiation.

Most candidates in part (d) were able to extract the correct time value from the graph. However there were relatively few candidates who understood that this value from the graph also indicated the half life of the isotope.

Question 3 (Low Demand)

In part (a)(i) very few candidates were successful in representing a digital signal by drawing a simple diagram of a form of square wave with constant amplitude. Most incorrect responses either showed sine waves or were simply pictures of mobile phone handsets. In part (a)(ii), the correct answer of microwaves was given by only about 50% of candidates.

In part (b)(i) most candidates were aware of the need for identical results to confirm the reliability of an investigation. Although parts (b)(ii) and (b)(iii) were both worth two marks the vast majority of candidates were satisfied, in each part, to supply only one piece of information from the newspaper article. For this reason most candidates scored only one mark for each part.

Question 4 (Low Demand)

Recall of cosmic phenomena was good in parts (a)(ii) and (b)(i), but recall of the term 'red shift' was poor.

Part (c) was very poorly answered, as many candidates were unaware of the meaning of the term optical or were unable to give an acceptable disadvantage.

Question 5 (Low Demand)

In part (a) the vast majority of the candidates showed an understanding of energy transfer and many successfully achieved maximum marks for the calculation in part (b)(i). However, the cost implications of using different power cycles for the washing machine were not widely understood and many candidates were unable to describe how they would undertake research to compare the energy efficiency of domestic appliances. The candidates that were successful generally stated using the Internet.

Question 6 (Standard Demand)

The candidates were generally aware of the ideas of types of variables, control, accuracy and precision and the way that laboratory equipment can be used to simulate large scale situations. Candidates were able to demonstrate the ability to extract information from investigative results.

However, in part (b)(iii) the skill required to explain the results of the investigation was in little evidence, as was the ability to explain a facet of heat transfer in particulate terms in for part (c).

Question 7 (Standard Demand)

In part (a) only a minority of the candidates were aware that the type of electromagnetic radiation which can cause skin cancer was ultraviolet radiation.

In part (b)(i) few candidates could use the information about sunscreen protections factors to successfully calculate the correct answer. A large number of candidates gave an incorrect answer of 42, having simply added 12 to 30. Few candidates in part (b)(ii) could explain why the calculated value gave only a rough idea. Virtually no credit was gained in part (b)(iii).

In part (c) few candidates realised the importance of understanding the dangers in order to make an informed decision.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results Statistics** page of the AQA Website.

Science B / Physics
Higher Tier PHY1H

General

There was no evidence that candidates had insufficient time to complete the paper. Most candidates seem to have been prepared for the paper although there were same surprising gaps in knowledge. A significant number of candidates were unable to use or interpret information given in a question.

Question 1 (Standard Demand)

All three questions in part (a) were correctly answered by the majority of candidates, although the weaker candidates often put insulation as the control variable.

Parts (b)(i) and (b)(ii) were answered correctly by a large proportion of candidates. Most used the words compare and / or control in part (b)(ii). Part (b)(iii) was less well attempted, with many imprecise answers. There was frequent reference to light rather than heat, and many answers spoke vaguely of the insulation rather than discussing the constituent parts. A number of candidates referred to trapped air reducing convection but failed to mention conduction.

Very few candidates gained any credit in part (c). A number of candidates answered in terms of the particles in the water, in some cases developing this to talk about convection. Candidates discussed the transition between the water and the glass, apparently not appreciating that the glass would be heated first. Other candidates talked about free electrons or heat particles carrying the energy.

Question 2 (Standard Demand)

Part (a) was answered correctly by the vast majority of candidates.

Part (b)(i) was well answered by the majority of the candidates. However parts (b)(ii) and (b)(iii) were only correctly answered by the stronger candidates. In part (b)(ii) the weaker candidates concentrated on skin type, having not fully read or understood the text at the beginning of the question. In part (b)(iii) a significant number of candidates wrote about lighter skins reflecting radiation. Some did talk about extra pigmentation or dark skins absorbing heat / sunlight, but there were comparatively few accurate answers. Too many talked about skin texture or thickness.

In part (c) some answers reiterated that UV causes cancer. Only a small minority answered in terms of making informed decisions.

Question 3 (High Demand)

Many answers to part (a) suggested rote learning with no understanding of the process. Answers included the galaxy moving towards the red end of the spectrum and the galaxies looking red. A significant number of candidates used stars, planets and galaxies interchangeably.

In part (b)(i) many answers quoted speeds from the graphs and talked about galaxies rather than the spectra. Part (b)(ii) was answered well with most candidates scoring full credit.

In part (c) most candidates were aware of the problem of atmospheric distortion. Many candidates quoted light pollution as a problem, unaware that such telescopes on Earth would be sighted away from conurbations etc. Few candidates were able to score both marks.

Question 4 (High Demand)

Part (a)(i) was disappointingly answered incorrectly by almost 50% of candidates. However the answer to part (a)(ii) was well known.

In part (b) many candidates thought that the radiation had to travel through the magnet rather than the magnetic field. Only the strongest candidates realised the significance of the differing readings on the counters and were able to score both marks.

The definition of half-life required in part (c) was not well known.

In part (d) many responses had the correct idea but were poorly explained. A number of candidates did not appreciate what a tracer was for, and said that there was not enough time to kill the cancer.

Question 5 (High Demand)

In part (a)(i) few candidates realised that since both light and radio waves travel at the same speed in a vacuum they are likely to travel at the same speed through air. In part (a)(ii) many candidates calculated the correct answer. The most common error was not to convert kHz to Hz. Part (a)(iii) was not attempt by a significant number of candidates.

Part (b)(i) gave rise to a large number of vague, incorrect responses. Several candidates confused analogue with digital. Many candidates made reference to particular types of waves, especially radio waves. Many of the stronger candidates answered part (b)(ii) correctly, focusing on the relatively easy removal of unwanted noise. Many incorrect answers were in terms of going faster.

In part (c) there were many answers worthy of one mark. Poorer answers tended to be repetitive, rather than making a second point.

Question 6 (High Demand)

Part (a) was not well answered with almost 50% of candidates scoring no marks. Many candidates wrote negatively about fossil fuels rather than about the merits of nuclear fuel. There were many vague comments about a lot of energy, with the stronger candidates being able to relate this to the amount of fuel being used. Some candidates wrote about reliability but some did not gain credit due to the vagueness of their answers.

The vast majority of candidates gained no credit in part (b) most ignored the fact that the waste was buried deep, or that it would be in any way contained.

In part (c) some candidates did not use the information they had been given and others ignored the question's emphasis on the power companies. Many candidates did not distinguish between biofuels and electricity, thinking the power company would be selling the biofuels. The idea of carbon neutral was well identified by stronger candidates, but the weaker ones did not appear to be aware that burning biofuels also gives rise to carbon dioxide emission. A large number of candidates (40%) were unable to use any of the information presented to them and gained no credit at all.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results Statistics** page of the AQA Website.