



**General Certificate of Secondary
Education**

Science B 4462 / Physics 4451

PHY1F Unit Physics 1

Report on the Examination

2012 Examination – June series

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Science B / Physics
Foundation Tier PHY1F**General**

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

It was pleasing to see that most students attempted all parts of every question, including the more challenging ones, common with the higher tier paper. The few calculations on the paper were well done in general, but there were indications that some students had attempted them without access to a calculator. Marks were awarded for working but students who simply supplied a final, incorrect answer did not benefit from this.

As usual there were some problems for examiners trying to interpret answers that were too faint to read easily. Decimal points were all but invisible in some cases. Students should be made aware of the instruction on the front of the paper to answer questions using black ink or a blackball-point pen.

Often candidate's responses were simply a rewrite of the stem of the question in the students' own words. No credit was given in these cases.

Question 1 (Low Demand)

Most students scored 4 marks.

Question 2 (Low Demand)

- (a) (i) There were many correct answers here. Use of 'J' as a unit for the answer was the most common error.
- (a) (ii) Most students correctly identified 'heat' as the wasted energy.
- (b) Most students correctly gave 'K' as the most efficient TV. Of those students, nearly three quarters then went on to supply a correct reason for their choice. Students who simply quoted values from the Sankey diagrams and attempted no comparison did not score the second mark.
- (c) Most students were able to multiply the number of kWh by the cost per kWh to get 120 or 12 000. However less than a half of those students were able to give the appropriate unit to match their numerical answer.

Question 3 (Low Demand)

- (a) (i) Nearly three quarters of students scored this mark.
- (a) (ii) This was well answered with 'accurate' and 'precise' being the most popular responses. However a significant number of students expressed the view that the thermometer needed to be taken out of the can before it could be read.

- (b) This question was poorly answered with only a few students scoring both marks. Many students thought that the black can absorbed more heat and therefore remained warmer than the white can. Consequently they chose 'A'. These students failed to understand that the cans were losing heat in this process. There appears to be much misunderstanding with regards to the 'emission of heat' with widespread confusion between the terms 'conduction' and 'emission'. Another common incorrect response was 'black attracts heat and so is warmer'.
- (c) (i) Most students scored this mark.
- (c) (ii) Many students appeared to believe that lighter coloured surfaces did not absorb **any** heat and that black surfaces absorb **all** the heat incident upon them. Such absolute answers gained no credit. They did not state that darker surfaces absorb **more** heat than lighter ones. Again the 'attraction' of heat towards black surfaces was a common incorrect response.
- (c) (iii) Just over two thirds of students gave a creditworthy response, even if not simply replacing one word as the question asked.

Question 4 (Low Demand)

- (a) Most students scored this mark.
- (b) Surprisingly only three fifths of students correctly identified 'B' as the analogue signal with only a few students able to give a creditworthy reason for their choice. Most students settled for a description of the shape of the signal and therefore did not score the second mark. The correct responses generally gained this mark by a correct reference to the properties of the digital signals (the fact that they have two states or values) rather than the 'continuously varying' aspect of analogue signals.
- (c) Only two fifths of students were able to identify 'payment' as an economic issue to score this mark.

Question 5 (Low Demand)

- (a) (i) This was surprisingly badly done. Some students, perhaps thinking of a similar question from a past paper, suggested advantages of a telescope in space. Other students were concerned that in orbit the telescope was moving and would be difficult to use. A common misconception appears to be that a telescope on the surface of the Earth gives clearer and more detailed images.
- (a) (ii) Just over four fifths of students scored this mark.
- (b) Many varied answers were seen here, with only about two fifths of students correctly identifying the necessity of being beyond the Earth's atmosphere.

Question 6 (Low Demand)

- (a) (i) This question was well done with two thirds of students scoring the mark. A common incorrect response was to give a range of '0 to 200'.

- (a) (ii) This was poorly done with only a third of students being able to obtain the correct time from the graph.
- (a) (iii) Most students did not realise that they had been led to the value of the half-life in part (a)(ii). Consequently many students began to calculate the half-life value again, mostly with little success. Only a quarter of students scored this mark.
- (b) (i) Only just over half the students scored this mark.
- (b) (ii) Just over three fifths of students were able to correctly identify 'lead'.
- (c) Most students were able to identify a correct conclusion to score this mark.

Question 7 (Standard Demand)

- (a) Many responses stated that a renewable source can be 'used again and again' and therefore did not gain any credit. The idea of a source that 'does not run out' or that it is 'replaced as fast as it is used' was only presented by a small minority of students.
- (b) Many vague assertions such as 'better for the environment' or 'eco-friendly' gained no credit. Other students thought that the waste consisted of 'dead animals'. Most correct responses came from the idea of the availability of animal waste or the fact that the farmer "saves money" in this process.
- (c) Over three fifths of students scored this mark, although the fact that units were ignored by examiners was a saving grace for some.
- (d) Surprisingly only three fifths of students managed to score at least one mark for this question. Those that did not usually discussed the advantages and disadvantages of wind turbines but made no reference to biogas generators. Some students thought that the products of combustion (carbon dioxide and water) could be used on the farm.

Question 8 (Standard Demand)

- (a) (i) This was well answered with three quarters of students scoring both marks.
- (a) (ii) About three fifths of students realised that a thinning of the ozone layer would allow more UV radiation to reach the surface of the Earth. However fewer students were then able to give a consequence of this i.e. that it would cause an increase in the incidence of skin cancer or sunburn. Some students thought UV was heat, so making the Earth hotter or contributing to climate change.
- (b) (i) 'The position of the dummy head' was by far the most common response. The students had been told in the question that the scientists were investigating 'the type of surface' but only a few students realised that this was the independent variable.

- (b) (ii)** Many students suggested that the reliability could be improved by repeating measurements. However only a small minority then went on to say that an average or mean of the data could be calculated. There is an assumption that simply repeating measurements alone makes the data more reliable. The use of ‘more dummies’ or using ‘real people’ were common incorrect responses.
- (b) (iii)** Although many students chose ‘snow’ as the best reflector, the mark was given for the reason for their choice. This was not done as well. Students appear to think in absolute terms i.e. ‘snow is a reflector’ or ‘sand is an absorber’ and therefore gained no credit for such an answer. Not many responses quoted data from the table.
- (c)** Having answered NO, many students were able to say that some UV radiation was being transmitted by the goggles to score one mark. However only a very few students made any reference to the behaviour across all the wavelengths shown. For those students that answered YES, many still went on to say that some UV was transmitted, missing the point that the manufacturer had claimed 100% absorption of UV.

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