



General Certificate of Secondary Education

**Additional Science 4463 /
Physics 4451**

PHY2F Unit Physics 2

Report on the Examination

2011 Examination – June series

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Additional Science / Physics
Foundation Tier PHY2F**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 vast majority of the candidates completed the paper and there was no evidence of candidates being pressed for time. There was a high compliance to the request for the candidates to write their answers in the space provided for them in the body of the script. Unfortunately, there were rather too many examples of candidates not being equipped with calculators, evidenced either by annotation from the candidate stating their lack of equipment, or attempts at multiplication by complex iterative processes.

Question 1 (Low Demand)

Just under two thirds of candidates gained all three marks.

Question 2 (Low Demand)

- (a) Nearly three quarters of candidates gained both marks.
- (b) Just over a third of the candidates achieved the maximum of two marks for this part question. It was noticeable that there were rather more responses in terms of the candidates believing that the number of electrons defined the atomic number, (a response accepted by the examiners), rather than the correct definition based on the number of protons present. Just over half of the candidates were unable to identify the correct atomic number.
- (c) Just under three quarters of candidates gained this mark.

Question 3 (Low Demand)

- (a) (i) Most candidates were aware that the lorry would have the greatest momentum by reason of its greater mass. Vague responses, such as 'the lorry is bigger', did not gain a mark. Some candidates took advantage of the relevant equation printed on the same page and calculated the momentum of the three vehicles. Incorrect responses generally involved the motorbike and indicated that the candidates were confusing momentum with the ability of the motorbike to accelerate faster than the other two.
- (a) (ii) This part question was generally answered well by those candidates with access to calculators. Candidates should be encouraged to check their calculations carefully as there were a number of instances of errors occurring in the transfer of the numbers from the question stem to the lines provided, to show their method of calculating the momentum of the motorbike.
- (b) (i) Just over nine tenths of candidates correctly answered that the kinetic energy would increase but they had less success in giving an appropriate reason. Most
- (b) (ii) of the incorrect responses were in terms of the motorbike accelerating which had been stated in the part question stem. There were also many vague responses involving changes of force, power, friction, engine efficiency, etc.

- (b) (iii) Just over three quarters of candidates gained all three marks. Those that did not often drew a diagonal line from (4, 14) up to 20 m/s on the y-axis but the lines did not hit (6, 20) and were not subsequently continued horizontally to 8 s on the x-axis.

Question 4 (Low Demand)

- (a) Candidates were generally aware that the two materials rubbed together would create friction and the build up of static electricity. The award of the second mark was more problematical, as although many candidates understood that electrons were involved, the award of a mark was often negated by responses involving positive electrons or contradictions in the polarity of the materials after the movement of electrons. A significant number of candidates thought that protons were transferred.
- (b) Over two thirds of candidates were able to pick the two correct statements, with a further third of candidates being able to pick one correct statement.
- (c) (i) The majority of the candidates were aware that copper would be the choice of material for a lightning conductor because it, being a metal, would conduct electricity. However, some candidates, although receiving one mark for choosing copper, did not receive credit for their reason for their choice because their responses were in terms of heat conduction.
- (c) (ii) Few candidates scored this mark. Most candidates thought that the lightning conductor should have a higher resistance than the building.
- (c) (iii) The unpredictability of lightning storms was appreciated by most candidates who gained credit for stating the place, accompanying weather, timing and severity of the lightning strikes rendered a controlled experiment unlikely. The majority of the responses that did not gain credit were purely in terms of health and safety issues.

Question 5 (Low Demand)

- (a) This question was generally answered well with virtually all candidates recognising that drinking alcohol would increase the chance of an accident occurring. However, a number of candidates failed to achieve the second mark due to identifying that there would be an alteration of the driver's reactions, but not whether the alteration would be positive or negative. Another common error was to state that the 'driver's reaction time decreases'.
- (b) Virtually all candidates understood the idea that a fair test was required to choose the best barrier to slow a car and not break. However few were able to explain how a change of the three different variables would affect the outcome and prevent a valid set of results being produced, that would provide evidence to which crash barrier was the best of the three under trial.
- (c) Just over four fifths of candidates chose the correct answer.

Question 6 (Standard Demand)

- (a) Surprisingly, only just over two fifths of candidates were able to give the correct colour.

- (b) Only a quarter of candidates achieved credit for stating that the plastic obviated the need for an earth wire to be fitted to the hairdryer. Of the incorrect responses, many implied that the whole of the hairdryer was constructed of plastic materials or that the current needed by the hairdryer was so low that an earth wire was not required.
- (c) (i) Most candidates were able to identify switch S_1 as operating the fan, but only about two fifths of candidates were able to identify the switches needed to operate heater 2.
A common error was only giving S_3 for the operation of heater 2. Many candidates' handwriting was such that examiners struggled to distinguish between a suffix 1 and a suffix 2.
- (c) (ii) The majority of candidates scored no marks in this part question. Candidates seemed to be confused about whether the fan part and/or heater parts of the circuit were in series or parallel and how this would affect the different branches of the circuit. Many candidates referred to a 'fan switch' without making it clear which of the three switches was intended.
- (d) Unfortunately many candidates ignored the request to give the appropriate unit and were thus denied full credit for this part question. Incorrect numerical responses were mostly from the candidates using the wrong current, usually by adding the three currents together from the table supplied. It is not encouraging that the presence of more than two numbers caused such confusion.

Question 7 (*Standard Demand*)

- (a) Nearly three quarters of candidates gained both marks for this part question. The main reasons for incorrect responses were either through adding the height of the skip to the length of the plank or by failure to multiply correctly the two numbers required.
- (b) (i) The standard of graph line drawing was high with nearly two thirds of candidates drawing an appropriate line of best fit for the points provided. A significant number of candidates chose to simply join the first and last points or to try to extrapolate their line to (0, 0).
- (b) (ii) This part question was answered well. The main sources of error were candidates' responses in terms of the mass of the brick changing or a change in gravity as the brick gained height.
- (b) (iii) Just under a third of candidates received full credit for translating the result of the student's investigation into the practical requirement of a building site by choosing the long plank and stating that a smaller angle would require less force to move the wheelbarrow. The few candidates who did choose the short plank found it difficult to achieve any marks for the explanation of their choice.

Mark Ranges and Award of Grades

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