



General Certificate of Secondary Education

**Additional Science 4463 /
Physics 4451**

PHY2F Unit Physics 2

Report on the Examination

2011 examination – January series

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Science B / Physics
Foundation Tier PHY2F**General**

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

Candidates generally found the paper accessible. Few failed to attempt the questions, apart from 7(a)(iii), 8(b)(ii) and 8(b)(iii) which generated a significant number of blank responses. Most candidates were able to use equations correctly, although many fell down on the arithmetic. Short response questions were generally found difficult with candidates struggling to express their thoughts clearly. Hand writing and legibility were generally poor, although spelling seemed marginally better than in previous years.

Question 1 (Low Demand)

This question demonstrated the need for candidates to learn basic facts. Just over a quarter of candidates scored zero and a further two-fifths scored only one mark. There was a large variety of incorrect links, one of the most common being a chain reaction happening in a star.

Question 2 (Low Demand)

- (a) (i) Just under half of the candidates correctly calculated the potential difference across the 3 cells. Common incorrect answers were 6 V and 9 V, perhaps showing that candidates knew from the diagram what to do but did not read the question to know that the p.d. of each cell was 1.5 V.
- (a) (ii) Just over two-thirds of candidates did not appreciate that the p.d. given in part (a)(i) was split equally between the two lamps.
- (a) (iii) Again poorly answered with nearly two-fifths of candidates selecting the correct voltmeter.
- (b) (i) Most candidates added the two resistor values correctly.
- (b) (ii) Disappointingly, few candidates achieved both marks for this part question. The majority of the candidates simply used their total resistance of 30 ohms and multiplied by 0.4 amps to get 12 volts. However, the question specifically asked for the voltmeter reading across the 20 ohm resistance, alone, as shown in the diagram.
- (b) (iii) Surprisingly, few candidates opted for the straight line, most chose option Z.

Question 3 (Low Demand)

- (a) (i) Most candidates subtracted correctly to get the change in velocity, although quite a few multiplied 42 by 60 to get 2520. A significant minority worked out the 12 but then multiplied by 60 to get 720.
- (a) (ii) Most candidates entered the correct values into the equation and completed the arithmetic correctly. Those candidates with an answer of 2520 or 720 for part (a)(i) were generally able to get the error carried forward mark. Less than half of the candidates knew the correct unit for acceleration.

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- (b) The majority of candidates incorrectly chose graph C.

Question 4 (Low Demand)

- (a) (i) Just over half of the candidates could identify the correctly wired plug.
- (a) (ii) Almost all candidates gave plastic or rubber as a suitable material for the casing of a plug.
- (b) This part question was answered well. However it was not uncommon to have a correct substitution shown (2×230) with an answer of 660.
- (c) Unfortunately, few candidates were able to explain correctly the advantage to the householder of buying a plug without a fuse fitted. There were many incorrect responses in terms of the smaller amp fuses restricting the flow of electricity to an appliance in order to save energy (and money). Rather worryingly, there were far too many candidates who thought that the smaller amp fuses were less likely to blow than a 13 amp fuse, and consequently, the 13 amp fuse was in some way safer. A significant number of candidates seem to think that the fuse provides the current.

Question 5 (Low Demand)

- (a) (i) This part question was answered very well with a large majority of candidates scoring both marks. However for those candidates failing to score the marks the main problem seemed to be lack of a calculator, or incorrect use of a calculator, evidenced by the use of lengthy iterative processes or missing zeros in their final answer.
- (a) (ii) Only a small minority of candidates were aware that the momentum of the vehicles were conserved in the collision, the most incorrect common response being that the momentum had decreased to zero.
- (a) (iii) Most candidates failed to appreciate that a stationary car has less momentum than a moving car.
- (b) Just over half of the candidates scored both marks.

Question 6 (Low Demand)

- (a) About one-third of candidates could identify the particle as an electron.
- (b) Just over three-quarters of candidates chose the correct statement.
- (c) Almost three-fifths of candidates named all three particles correctly. Only just over a tenth of candidates failed to name any of the particles correctly.

Question 7 (Standard Demand)

- (a) (i) Most candidates recognised that the constant speed of the swimmer was due to the forces being equal.
- (a) (ii) This part question was not answered well. A simple subtraction of the two forces would produce the correct resultant force but unfortunately, many candidates opted to add, multiply or divide the values of the two forces or simply copy the value of one of the forces.

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- (a) (iii) The majority of candidates either scored zero on this part question or opted to leave it blank. The majority of the incorrect responses involved a decrease in the amount of drag, leading to the swimmer becoming stationary. There were also many answers involving upthrust, gravity, currents in the water and suggestions that the swimmer may, by altering his swimming technique, reduce the resultant force to zero.
- (b) (i) It was surprising that only one-fifth of candidates were able to identify the dependent variable from information in the stem of the question and from the axes of the graph, the most common error being to state the gender of the swimmers or the distance over which the readings were taken.
- (b) (ii) Although some candidates were aware that the collection of more data would be advantageous, their explanations were couched in terms of this extra data being in some way more precise or accurate than data collected less frequently. Few candidates noted that the extra data would provide information regarding the variation of force values in the swimmers dynamic situation or provide a more reliable average. It was clear that to most candidates reliability, accuracy and precision are the same thing.
- (b) (iii) Although many responses were over-generalised, just under two-thirds of candidates scored the mark. Incorrect responses, apart from where the relationship between the variables had been misunderstood, were mostly in terms of factors for which there was no data provided, such as the swimmers mass, muscular strength, size of hands or swimming technique.
- (b) (iv) Just over half of the candidates provided a correct answer to this question. Those failing to gain credit gave responses which ignored the request in the stem to consider only the data supplied, and referred to issues such as body mass or shape, improved exercise and training regimes, etc.

Question 8 (Standard Demand)

- (a) Just over half of the candidates chose the correct statement.
- (b) (i) The stem of this part question clearly stated that the movement of the plastic bottles on the conveyor belt had caused the bottles to become charged so it was disappointing that there were so many responses which attributed the charge to having come from some process involving the ionised air. Very few candidates gained the mark for electron or charge transfer.
- (b) (ii) Hardly any candidates were able to say what an ion is. Nearly one-fifth of candidates opted to leave this part question blank.
- (b) (iii) Those candidates that gained a mark usually did so by realising that the belt was rubber / an insulator, but a considerable number of candidates argued that the charge continues to build up as the bottles are still rubbing against the guides. Some candidates wanted each bottle to be earthed and others claimed that 'static isn't electricity'.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results statistics](#) page of the AQA Website.