General Certificate of Secondary Education

Additional Science 4463 / Physics 4451

PHY2F Unit Physics 2

Report on the Examination

2012 Examination – January series

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ADDITIONAL SCIENCE / PHYSICS

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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 majority of students attempted all parts of all questions. However a significant number of students failed to attempt parts (b)(i) and (b)(ii) of question 7. This suggested a lack of knowledge rather than lack of time.

The questions involving calculations were generally well answered, although once again there was evidence that a significant number of students did not have access to a calculator.

Question 1 (Low Demand)

(a) Nearly 80% of students scored both marks.

(b) About 40% of students completed the calculation correctly with approximately 26% of these students being able to identify the correct unit. The most common error was to use the mass of the bar rather than the weight of the bar. Considering how often students are asked to give a unit it is surprising how few are able to recall the more common ones.

(c) This was poorly answered. The majority of students gave answers other than zero. Those students choosing zero were often unable to give the correct reason for choosing this value.

Question 2 (Low Demand)

(a) Just over 60% of students chose A. However of these only 11% could give a correct reason why. The majority of answers were in terms of the trace showing the supply to be continually switched on and off.

(b) A lot of students seemed to get confused between a socket and a plug and did not use terminology correctly. A significant number of students seem to be under the impression that a fuse melting would automatically lead to a fire. Most students rather than focusing on the current drawn through the wiring / socket being too high and making the wiring / socket too hot, would say that the appliances or plugs would get hot. Where it was mentioned, the connection between a high current and overheating seemed to get lost within the descriptions.

Question 3 (Low Demand)

(a)(i) This was poorly answered. The simple answer of bowling/ throwing the ball faster was given by only 27% of students. Most students talked in terms of faster run up, changing the mass of the ball or putting spin on the ball. Those students that said to bowl the ball with a greater force did not go on to say what the effect of this would be on the speed of the ball.

(a)(ii) Nearly 90% of students completed the calculation correctly. This time over 50% of students were able to identify the correct unit.

(b)(i) The better students were able to answer this question.

(b)(ii) This was poorly answered with over 70% of students scoring zero. Many students simply restated the question or they confused momentum and energy, writing in terms of the kinetic energy of the ball staying the same.

Question 4 (Low Demand)

(a)(i) Nearly 50% of students scored both marks. A common error, but still gaining one mark, was to divide by 10 minutes rather than 600 seconds.

(a)(ii) Few students understood the connection between energy transferred each second and power. Only 10% of students gave the correct answer.

(b)(i) Range seems to be well understood as the vast majority of students gave the correct answer.

(b)(ii) Nearly 74% of students gave the correct answer.

Question 5 (Low Demand)

(a) Just over 67% of students scored all three marks. A further 25% scored two marks. The most common error was to identify car A as being stationary, this was despite the word 'moving' being in bold in the stem of the question.

(b)(i) Nearly 90% of students scored this mark.

(b)(ii) Just over 90% of students scored this mark.

(b)(iii) This was not so well answered, with only 43% of students realising that the forces would be equal.

(b)(iv) The majority of students (92%) realised the reason for attaching the sensors to the dummy.

Question 6 (Standard Demand)

(a)(i) Few students scored the maximum mark for this part question. Although many students understood that the polystyrene beads became charged by friction with the plastic pipe, there was less understanding of the nature and origin of this charge. Having been informed that the beads were negatively charged when they left the pipe, there were many responses in terms of either the beads or the plastic pipe being negatively charged before they came into contact. There were too many answers in terms of 'positive electrons' or the transfer of protons /positive charge.

(a)(ii) Many students were aware that the polystyrene beads were one of the control variables but far too many responses vaguely alluded to the amount of beads rather than the volume being used. Students that qualified 'amount' by adding 75cm^3 gained the mark.

(b)(i) This part question was answered well with 83% of students giving the correct relationship.

(b)(ii) Many students realised that a shortening of the pipe would lead to a decrease in the charge. However fewer of the students were able to explain why. A significant

number of students thought that the beads started with a charge and since they would be in the pipe for less time would transfer less of this charge and so arrived at the conclusion that the final charge would be greater.

(c)(i) Although many students chose the correct size of particles, few students were able to provide a scientific reason for their choice.

(c)(ii) This part question was not well answered with far too many suggestions provided which would have involved a change to the industrial process. Many students chose to change the size of the particles but were divided as to whether it should be to larger or to smaller particles. Worryingly many students either wanted to change the plastic pipe for one made of an insulating material, or to a metal as it is a good insulator! The use of an earth wire was rarely seen.

(d) A small minority of students answered this correctly by stating that it allowed a comparison of the relative risks. Most students simply stated 'fair test' or listed a combination of the words accurate / precise/ reliable as a way of trying to cover all eventualities.

Question 7 (Standard Demand)

(a)(i) Only 8% of students could explain the difference between nuclear fission and nuclear fusion. Only a further 7% could describe one of the processes correctly. The majority of answers simply stated that fusion was natural and fission happens in power stations.

(a)(ii) There were a large number of different answers given, unfortunately few were correct. Approximately 37% of students did gain a mark, generally for either energy or heat.

(b)(i) Just over 20% of students failed to attempt this question despite it being a straight recall of information from the specification. Approximately 35% of students gave a correct answer.

(b)(ii) Only 22% of students gained this mark. The most common error was to state that the number of neutrons would be the same.

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UMS conversion calculator www.aqa.org.uk/umsconversion