



General Certificate of Secondary Education

Physics 4451

PHY3H Unit Physics 3

Report on the Examination

2011 Examination – June series

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Physics
Higher Tier PHY3H**General**

Questions 1, 2 and 3 were standard demand targeting grades C and D; questions 4 to 7 were high demand, targeting grades A* to B. The paper as a whole covered a wide range of the specification and most candidates seemed to be able to respond to each question positively, with very few unattempted questions or part questions.

Question 1 (Standard Demand)

- (a) Nearly all candidates identified the microphone correctly.
- (b) (i) Only two fifths of candidates correctly identified the amplitude; there was some confusion with wavelength and many answers that gave the total height from trough to crest.
- (b) (ii) This was well answered with just over three quarters of candidates gaining the mark; some candidates lost the mark by referring to 'noise'.
- (c) Just over four fifths of candidates gained this mark.
- (d) Although most candidates gained this mark there were a significant number of candidates that showed no understanding of cause and effect with answers written in terms of the amplitude affecting the distance.
- (e) Although just over three quarters of candidates correctly identified the full range of human hearing it is surprising that this figure was not higher. The range of human hearing has been a frequent question.

Question 2 (Standard Demand)

- (a) (i) Only half of candidates gained this mark; weaker candidates found it difficult to explain the meaning of the term 'moment'. There seemed to be a lot of confusion between moment and momentum.
- (a) (ii) Over four fifths of answers were correct; a few candidates made reference to the clamp keeping the bench stationary/upright.
- (a) (iii) This was well answered with just over two thirds of candidates gaining both marks for recognising the 1:7 ratio; some candidates correctly referred to this as being directly proportional. Most one mark answers elaborated on moments at the expense of the numerical relationship.
- (a) (iv) Over four fifths of candidates gained this mark.
- (b) Very few candidates failed to gain 2 or more marks for this question. The equation was given to candidates in the form they had to use, and the only two numbers given to them simply had to be multiplied. Just under a third of candidates failed to score the unit mark. There were many totally incorrect units given as well as incorrect variations of

Nm. If in doubt, candidates would be well advised to use full words for units rather than symbols.

Question 3 (Standard Demand)

- (a) Over four fifths of candidates gave a correct answer. Incorrect answers often included references to the Sun or the Earth. A small number of candidates thought that GPE was responsible for the force.
- (b) Some candidates found the distribution of points challenging, failing to appreciate that the line of best fit should pass through the origin, in which case they tended to score only the mark for a correct reading taken from their graph. A proportion of responses showed lines joining the points 'dot to dot'. Of those candidates that had attempted a line of best fit, of which straight lines were more common, many intersected both 'x' and 'y' axes rather than appreciating the need to use (0,0). Just over a third of candidates gained both marks.
- (c) This was very well answered, with nearly all candidates gaining the mark. A minority of candidates referred to the length of the orbit rather than time and a few candidates could perceive no relationship at all.
- (d) Many candidates gained the mark for references to advances in space research although the term 'satellite' was often used to refer to probes such as Voyager; there was an awareness of the advantages of Hubble being outside the atmosphere.

Question 4 (High Demand)

- (a) Surprisingly, only four fifths of candidates answered this correctly.
- (b) Just over a tenth of candidates scored all 4 marks. Many candidates treated the diagram as for a lens rather than a mirror so there were variations of both 'reflected' and 'refracted' rays, many of which did not score the first two marking points. However, by including virtual rays behind the mirror leading to an image, and correctly drawing arrows to indicate direction, many candidates retrieved some credit. It was pleasing to see some very accurate diagrams, drawn with great care and precision, from candidates who had clearly learnt the optics of convex mirrors thoroughly.
- (c) Just under a half of candidates gained both marks; some answers contradicted themselves: virtual/real; smaller/magnified.

Question 5 (High Demand)

- (a) Just over three quarters of candidates gained this mark.
- (b) (i) Just under nine tenths of candidates gained this mark.
- (b) (ii) Only two thirds of candidates gained this mark. Some candidates described the lens as reflecting the light into the eye. A number of responses were too vague eg 'improving eyesight', and did not address the physics principles.

- (c) Just over half of candidates gained either 2 or 3 marks. Many candidates did not make it explicit that the rays spread out/diverge/move further apart before refraction by the cornea/lens of the eye to focus directly on the retina.

Question 6 (*High Demand*)

- (a) Considering how often this or a similar question has been asked it is surprising that few candidates gained all three marks. Weaker candidates gave vague responses such as 'forces are equal' without being specific about the type of forces or their direction. Some candidates took the alternative route of saying that there is sufficient hydrogen available to keep the fusion reactions going for a long time but there was rarely a reference to this happening at a continuous/steady rate.
- (b) Most candidates correctly identified the opinion as being 'that the Sun will remain stable for several billion years into the future', but then failed to give the idea of evidence or correct usage of the facts given in the passage to suggest how scientists could justify this.

Question 7 (*High Demand*)

- (a) Almost three fifths of candidates correctly calculated the p.d. across the secondary coil. This was pleasing as candidates were required to rearrange the equation. Where there were calculation errors, some appeared to stem from efforts to resolve the calculation without the aid of a calculator. There are still issues about the relative sizes of letters to enable award of the unit mark, kV.
- (b) Again, considering the frequency of this question it is surprising that only two fifths of candidates answered correctly. Many answers referred to electricity instead of current and there were frequent incorrect references to, not only electricity but also, potential difference flowing in the core. Other incorrect responses referred to either 'heat'/'energy loss' or related to safety issues such as risk of electrocution/shock.
- (c) Very few candidates gained all 3 marks. This was probably the question which was least well answered out of the whole paper with just under half of candidates scoring zero. Very few candidates sequenced their answers. Mentioning that the p.d. across the primary causes a current to flow in the primary was rarely seen. However, better candidates that omitted this did say that the p.d. created an alternating magnetic field in the core which then causes an induced p.d./current in the secondary coil. Some candidates still believe that current flows directly through the core of the transformer from one coil to the other.

Mark Ranges and Award of Grades

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