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## **General Certificate of Secondary Education**

# **Physics 4451**

**PHY3H      Unit Physics 3**

# **Report on the Examination**

*2010 examination – January series*

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## Physics Higher Tier PHY3H

### General

There was a generally satisfactory response to the 'How Science Works' features of the paper but some candidates demonstrated a less satisfactory response to items based on more traditional content such as moments, centre of mass and electromagnetic induction.

There were some examples of poor spelling and a few examples of almost unreadable handwriting, tiny handwriting and responses written in very pale ink. However, most candidates attempted all the items.

In question parts which involved extended writing, for example in Question 4(b), some candidates were hindered by lack of knowledge and understanding, combined with poor expression.

It was pleasing to see some confident use of mathematics in Question 2(a)(i) but an inability to re-arrange the equation correctly in 5(b) limited the marks available for a number of candidates.

### Question 1 (Standard Demand)

- (a) (& (b) (i) Most candidates could identify the correct variables /data from the table.
- (b) (ii) Less than half of the candidates could pick out the correct piece(s) of data not fitting the previous relationship in (b)(i).
- (c) (& (d) Most candidates correctly referred to Mars rather than to Earth and correctly indicated that the two moons will be at different positions at different times.
- (e) Most candidates knew that it is a gravitational force but more than half of candidates reversed the order of direction and speed, not realising a moon in orbit continually changes in direction.

### Question 2 (Standard Demand)

- (a) (i) Most candidates were able to take appropriate numbers derived from the diagram and to use them in the given equation correctly.
- (a) (ii) Most candidates were able to correctly name **F**.
- (a) (iii) Many candidates were able to identify an appropriate detail from the diagram although, for some candidates, there was a tendency to list everything noticed.
- (b) (i) A typical correct response was 'when the distance doubles from 5 cm to 10 cm the magnification does not double'. However, some candidates found it difficult to give a clear answer.
- (b) (ii) Most candidates stated that 'as the distance increases so does the magnification' or words to that effect.

- (b) (iii) Less than a quarter of the candidates identified the correct response of there is 'no evidence' outside this range.

**Question 3 (Standard Demand)**

- (a) Many candidates gained 1 mark, but not the second, because they failed to mention that an ultrasound wave is a sound wave.
- (b) Some candidates did not make it clear that the cleaning fluid vibrates but successfully linked the ultrasound to removal of dirt.
- (c) Some well-reasoned responses were offered. However, a common error was to make an unfocussed point such as 'humans are not mice' or to make a valid initial point and then not follow it up.

**Question 4 (Standard / High Demand)**

- (a) (i) Just over two-thirds of the candidates could relate being stable to not falling over, or that the centre of mass remains above the base. Very few candidates gained the second mark, the effect of a small push.
- (a) (ii) Most candidates correctly stated that the moments are equal.
- (b) The few candidates who gained all 3 marks generally started their responses with the statement that the centre of mass of the monitor is not in the same place now the screen has been tilted. Many candidates realised that 'something' went outside the base and /or caused a (resultant) moment.

**Question 5 (Standard / High Demand)**

- (a) (i) Most candidates knew that the core of a transformer is made of iron.
- (a) (ii) This is a standard transformer question but only a minority of candidates could link a changing magnetic field to subsequent induction in the secondary coil. Nearly half of the candidates scored zero. References to the core conducting electricity were not uncommon.
- (b) Over half of the candidates gave a numerically correct answer. The most common error was a failure to rearrange the equation correctly. (The resulting calculation was almost always correct!).

**Question 6 (Standard / High Demand)**

- (a) The great majority of candidates realised that faster-flowing oil would increase the maximum p.d. across the coil.
- (b) Many candidates realised that the distance between the coil and magnet changes whilst fewer candidates linked a magnetic field to cutting the coil. Few candidates mentioned both elements of the answer.

- (c) Most candidates were able to gain at least 1 mark for an appropriate change to the design. However, the suggestion of 'a bigger magnet' is not equivalent to the correct suggestion of 'a more powerful magnet' and many candidates referred to more 'coils' not 'turns'. It is also important to specify the change, 'strength of magnet' does not score.

### **Question 7 (High Demand)**

- (a) A number of candidates realised the importance of gravity but fewer candidates used the term 'radiation pressure' to score both points.
- (b) Most candidates stated that nuclear fusion is the process by which other elements are formed and some candidates were able to give hydrogen to helium and other 'light' elements as examples. However, only a small minority of candidates were able to indicate the conditions required to form 'heavy' elements. Some candidates confused their answers by referring to chemical reactions.

### **Mark Ranges and Award of Grades**

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