



**General Certificate of Secondary Education**

**Physics 4451**

**PHY3H Unit Physics 3**

**Report on the Examination**

*2008 examination - June series*

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# Physics

## Higher Tier PHY3H

### General

Most candidates did relatively well on the How Science Works questions, but some showed a poorer understanding of the Physics context.

In answering questions that involved calculations, some candidates failed to secure a mark, which they may otherwise have gained, by not setting down their method of working or failing to provide the appropriate unit.

In questions that involved extended writing, some candidates were hindered by poor expression and inadequate knowledge of the correct scientific terminology.

Questions 1 and 2 were identical to questions 6 and 7 on the Foundation Tier paper.

### Question 1 (*Standard Demand*)

- (a)(i) (ii) Most candidates knew that the angle is the angle of refraction and that the dotted line is the normal.
- (b) About a half of candidates suggested photographic film though some had it as photographic paper; LDRs were sometimes proposed but there were few correct references to the light sensors in digital cameras.
- (c)(i) A high percentage of candidates recognised that this is a converging or convex lens.
- (c)(ii) The diagram had been reduced to fit the page but, regrettably, the dimensions 1.4cm had not been altered. However no candidate was disadvantaged. Numerically correct answers obtained by measuring or by counting or by using the dimension in some appropriate combination were awarded both marks. Where, for example, a correct method and calculation had been used but a minor mistake had been made, eg the object had been miscounted as 21 small squares rather than 20, then one mark was scored.
- (d) Few candidates seemed to understand that, in order to have an effect on the light sensor; light must fall on it.

### Question 2 (*Standard Demand*)

- (a)(i) Most candidates were able to come to a correct conclusion on the relationship but some spoiled their efforts with references to proportionality and/or references to orbital distance. Ambiguous answers which failed to make it clear whether 'longer' referred to time or to distance were not given credit.
- (a)(ii) The most popular correct responses were that there is insufficient data and that information from the Internet is not always reliable, some candidates received no marks because they failed to answer the question in terms of the features of the data and just wrote down what they thought they knew about satellites.
- (b) Most answers referred to the idea that gravity (between the Earth and the Moon) provides the centripetal force required to keep the Moon in orbit, although some candidates failed to make the connection.
- (c) Most candidates correctly stated that there will be no sound because there is a vacuum or empty space (and hence no particles to vibrate).

- (d) This was generally well answered, with most candidates expressing an opinion; either explaining why they agreed that space should or should not be explored. Candidates also gained credit by partly agreeing. For example, 'Exploring space provides new knowledge and understanding which may be beneficial but it costs a lot of money that could be better spent'.

**Question 3 (Standard Demand)**

- (a) The calculation was generally correct, although some candidates multiplied the 45 000 N by 10. However, a significant proportion of candidates either failed to give the unit, or gave an incorrect unit or could not write newton metres correctly either in words or as the symbol (Nm).
- (b) Almost all candidates showed some understanding of the principle involved and scored at least one mark. A large proportion failed to use scientific terms, such as clockwise/anticlockwise moments, correctly, or wrote about centre of mass but failed to show understanding of where it is or should be.

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

A significant proportion of candidates seemed to think that the answer to at least one part of a question on this subject must be 'big bang'.

- (a)(i) This question was generally well answered and though fusion was often spelled with a double 's' there were few obvious fudges between 'fusion' and 'fission'.
- (a)(ii) Just under half of candidates failed to answer the question and instead gave more details of the process of nuclear fusion; however the most popular incorrect response was 'big bang'.
- (a)(iii) There was a surprising range of answers to this item, with 'gravity' and 'big bang' being the most common wrong answers.
- (b) Few candidates were confident that this statement is supported by the available evidence or is not contradicted by the available evidence or that the available evidence extrapolates to this idea. Many candidates simply wrote down something they thought they knew about the universe.

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

- (a) Most candidates secured both marks by writing that ultrasound has a frequency greater than 20 000 Hz and so cannot be heard by humans. However, some candidates offered responses which are true for sound in general, 'It's not as fast as light' for example, and did not gain any credit.
- (b)(i) Most candidates realised that the pulses are caused by ultrasound being reflected, though some candidates did not secure the mark because they offered 'rebounded' or 'bounced'. Most candidates thought that pulse A indicates the crack and pulse B indicates the back of the block, or the back of the crack. Either interpretation gained credit provided that both pulses were identified.
- (b)(ii) Most candidates correctly offered an answer in the range 88–92 (mm).

**Question 6 (High Demand)**

- (a) Most candidates were able to rearrange the numbers to  $75 \times 32\,200 \div 230$  and so correctly gave 10 500 as the number of turns, a minority of candidates incorrectly added a unit.

- (b) There were many incorrect answers. Some candidates seemed to have invented their own set of questions; 'Is this a step-up or a step-down transformer? How do you know and what else might it be used for?' Others wrote about current or, voltage, flowing through the core to the secondary coil. A significant minority of candidates misunderstood the term 'turns' and seemed to think that the coils rotate.

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

A five mark response such as the following was rarely seen:

'The coil cuts through the magnetic field (1) and a potential difference is induced (1) across the ends. As the coil is part of a circuit (1) this causes a current in the lamp (1). The slip rings and brushes enable the coil to be connected to the rest of the circuit without twisting the wires (1)'.

### **Question 8 (High Demand)**

- (a) A minority of candidates realised that, as velocity is speed in a particular direction and the direction of each moving carriage is changing then each moving carriage must be accelerating.
- (b) Only a minority of candidates stated that the acceleration is towards the centre of the wheel.
- (c) Most candidates correctly identified the resultant force as a 'centripetal' force.
- (d) Examiners were pleased to note that a significant proportion of candidates were able to identify the other factor as the radius of the wheel and were able to state that the greater the radius the smaller the resultant force.

### **Mark ranges and award of grades**

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