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General Certificate of Secondary Education

Physics 4451

PHY3H Unit Physics 3

Report on the Examination

2009 examination - January series

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Physics
Higher Tier PHY3H

General

Questions 1 and 2 (Standard Demand) were identical to questions 7 and 8 on the Foundation Tier paper but the other questions only appeared on this paper.

There was a generally good response to the How Science Works features of the paper but there was a less confident response to items based on more traditional content such as question 3 (a transformer) and 4 (a convex mirror).

Question 1 *(Standard Demand)*

(a) Most candidates answered this correctly.

(b) Nearly all candidates gained the mark for this question.

(c)(i) & (ii) Most candidates could give an industrial use and a medical use for ultrasound.
It should be noted that vague answers such as 'scanning organs' or 'scanning babies' did not gain credit.
Candidates needed to be more precise eg 'scanning the kidneys' or 'scanning an unborn baby'.

(d) Most candidates were able to interpret the diagram, and the information given about the scale, and correctly deduce that the time interval is 8 microseconds.

(e) Over half the candidates gained one mark by deducing that if the time interval is known then the distance can be calculated but few of these candidates were able to state what the distance is in this case.

(f) Nearly all candidates obtained a mark for the suggestion that, in this event, we should stop using ultrasonic waves and about half of these candidates had a sensible qualification to make such as the need for further research.

Question 2 *(Standard Demand)*

(a) & (b) A large majority realised that the data shows that as the load increases the maximum safe distance decreases but fewer could explain why the crane driver's conclusion is correct.

(c) Several hazards were mentioned with the majority of candidates stating that the mobile crane may topple over, or words to that effect.

(d) A large majority of candidates correctly selected 'results of experiments on this crane' as the appropriate source for the data in the table.

Question 3 *(High Demand)*

(a)(i) & (ii) It was a common erroneous statement that the core of a transformer conducts electricity.

Many candidates, in their responses to (a)(ii), failed to include any reference to the changing or alternating nature of the input, of the magnetic field or of the output. Few candidates explained why the coils are made of insulated wire.

(b) Most candidates gained both marks.

Question 4 ***(High Demand)***

(a) Most candidates showed little understanding of what to do. For example, rays of light with direction arrows showing them coming out of the eye and images between the eye and the mirror were not uncommon. Only a small minority of candidates made use of the centre of curvature. The question asks not only for the position of the image but also for '…how the student sees the image' and on the given diagram this can be done, and all four marks gained, by making use of both the centre of curvature and the principal focus.

(b) The most common correct answer was 'the image is behind the mirror' but only a minority were able to offer a correct response.

Question 5 ***(High Demand)***

(a)(i) The small minority of candidates who recognised, in part (a)(i) that 1430 is half of 2860 generally had few difficulties in going on to complete their explanation and gaining both marks. Some candidates chose to ignore the instruction to use the data for Saturn and Uranus but did not find that any other data was more helpful.

(a)(ii) Most candidates correctly concluded that the greater the distance from the Sun the less the orbital speed.

(b) About half the candidates realised that distance from the Sun and orbital speed had to be given as average values because in an elliptical orbit the distance from the Sun is not constant.

Question 6 ***(High Demand)***

(a) Most candidates realised that the scientists must have made observations and gave an example of the data, such as the rate at which Phobos is approaching Mars, they would use to help them make their estimate of 100 million years.
However, only a minority were able to gain the second mark by explaining how the data could be used.

(b) Most candidates knew that the centripetal force must be increasing and correctly explained this by stating that the radius of its orbit is decreasing or that Phobos is getting closer to Mars.

(c) Most candidates realised that the explanation is that the gravitational force will increase as the moon gets closer to Mars.

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

Many candidates 'confused' chemical reactions with nuclear reactions. They should note that there are nuclear fusion reactions and nuclear fission reactions. Candidates who did not clearly refer to the correct term did not gain credit.

Mark ranges and award of grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA website.