Version : 2/27/2008

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Separate Science Physics 4451

PHY3H Unit Physics 3

Report on the Examination

2008 examination - January series

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Set and published by the Assessment and Qualifications Alliance.

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Physics
Higher Tier PHY3H

General

Many candidates had been entered for, what was for them, the more appropriate tier.

However, for the future, centres should note that it is in the best interests of their candidates that they are not entered for the Higher Tier paper unless this choice is justified. This needs to be in terms of the particular candidate's general ability and his or her scientifc knowledge and understanding of the whole of the content of the Physics 3 Unit, including those parts identified as only for the High Tier. Candidates who are inappropriately entered will be faced with a paper which may not be matched to their abilities and which may not allow them to demonstrate adequately what they know, understand and can do.

Most candidates did well on the How Science Works aspects of the unit but showed a relatively poor understanding of the more traditional Physics content.

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

In parts that involved extended writing, some candidates were hindered by lack of knowledge and understanding combined with poor expression and inadequate knowledge of the correct scientific terminology.

Question 1 ***(Standard Demand)***

1(a) Nearly all candidates knew that a turning effect is a moment.

1(b) Many candidates gained one mark because they offered '400'.
However, less than half took account of the units and gave the correct response of '4 (Nm)'.

1(c) Almost all candidates knew that increasing the force and using a longer spanner could increase the turning effect and so obtained full marks.
However, only a small minority expressed themselves in practical terms, for example, 'fit a pipe over the handle (of the spanner)'.

Question 2 ***(Standard Demand)***

2(a) Nearly all candidates knew that sound waves are caused by vibrations. However a small minority were incorrect to state that sounds are caused by molecules in the air colliding with each other, since countless billions of them are continually doing that in silent places.

2(b) The great majority of candidates correctly identified graph K.

2(c)(i) Nearly all candidates correctly showed reflection at the surface towards microphone X and, by eye, the angle of incidence appeared to equal the angle of reflection.
However, some candidates did not a gain a second possible mark because they failed to indicate the direction with an arrow.

2(c)(ii) Most candidates were able to give an appropriate reason such as 'to keep the other conditions the same'. However, those who just offered 'so it's a fair test' did not gain the mark.

2(c)(iii) Nearly all candidates correctly identified 'wood' however, some were not able to translate the data into a proportion and many just suggested 15 (arbitrary units).
The examiners credited one quarter, 0.25, 25%, and 1:3 but not 1:4 which was a fairly popular, but incorrect, response for those who attempted to express the proportion as a ratio.

2(d) Almost all candidates were able to gain a mark for a practical suggestion, such as 'fit wood panelling' or 'plaster the wall' or 'plaster to a greater thickness', but some just went on to 'repeat the question' by way of explanation. For example, '…and this will reduce the transmitted noise' rather than, for example, '…and more of the sound will be absorbed/reflected back'.

Question 3 ***(High Demand)***

3(a)(i) The correct term 'ellipse' was the response of about two-thirds of candidates; 'eclipse' and 'ellipsis' were also offered but these were not taken as minor spelling errors because they are the correct spellings for other technical terms.

3(a)(ii) Less than one in twenty knew that the Sun is at one focus of the ellipse.

3(a)(iii) Nearly all candidates correctly identified this as 'gravity'.

3(a)(iv) Nearly all candidates were able to give a correct relationship between average distance from the Sun and the time taken to complete the planet's orbit.

3(b) There was no mark just for ticking a box. Examiners were looking for an appropriate reason and were pleased to see that nearly all candidates were able to give a relevant response. Many candidates understand that sufficient reliable evidence is of central importance to scientific knowledge.

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

4(a) There were many examples of incorrect constructions. Only a minority of candidates drew two straight lines; one from the top of the object which continued through the centre of the lens and the other parallel to the principal axis which continued as if from **F** when it reached the lens. However, some of those candidates who got this far went on to secure their third mark by showing the image located vertically with the intersection of these lines marking the top of the image.

4(b) Adjectives and features which may be used to describe images were employed fairly randomly. Diminished/smaller, erect/upright, and virtual/imaginary are correct but only about one quarter of the candidates secured two marks.

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

5(a) Many candidates were able to explain, either on the diagram or in writing, that the line of action from the centre of mass falls vertically and is within the wheel base. However, very few indicated that the weight of the tractor results in a moment which keeps it turned to the slope or alternatively that if the line of action were to fall to the right of the right wheel in the diagram the resulting moment would topple the tractor.

5(b) The great majority of candidates gained two marks because they knew that having a wider wheel base and a lower centre of mass would increase the tractor's stability.

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

6(a)(i) There was no mark just for ticking the second box. Candidates had to explain how they knew that the transformer in the diagram is being used as a step-down transformer. Many failed to do this because they wrote that there are more coils on the output side than there are on the input side. Candidates are expected to distinguish between the terms 'coils' and 'turns' with reference to a transformer. Some correctly stated that there are fewer turns on the output coil.

6(a)(ii) About a quarter of candidates correctly explained that, otherwise, the current would be conducted through the core or would short across the coil. Those who suggested that the insulation would reduce or prevent heat transfer or protect against electric shock did not gain the mark.

6(a)(iii) Most candidates incorrectly thought this was because iron is an electrical conductor. Others had the correct idea when they stated that iron is a magnetic material and they gained a mark for this. Others went further and stated that iron is a soft magnetic material and so it is easily magnetised and easily demagnetised.

6(b) About half the candidates were able to use the equation correctly to calculate the potential difference across the secondary coil.

6(c) Many candidates knew this was to reduce the potential difference. Few candidates knew that it increases the current. The difficulty in insulating high voltage was hardly ever referred to.
Vague statements such as, 'It's safer', did not gain the second mark.

6(d) The most popular form of an answer which gained two marks was to state that if the local power station breaks down then the National Grid will enable other power stations to be used. Very few answers were in terms of supply and demand.

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

7(a) Many candidates appeared to think that the magnet did not have a magnetic field until the wind caused it to rotate and that this generated a current through the voltmeter. This type of response did not gain either mark. What the examiners were looking for, but infrequently saw, was a clear statement that the rotating magnetic field cuts the coil (or the coil cuts the rotating magnetic field) and that a potential difference is <u>induced</u> across the voltmeter.

7(b) The examiners were pleased to note that almost all candidates were able to suggest how to increase the sensitivity of the gauge. In this case, an answer such as 'increase the coils on the nail' did gain the mark. However, there was a small minority of candidates who failed to gain credit because they wrote in terms of increasing the sensitivity of the voltmeter.

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

8(a) Nearly all candidates recognised that the reference at the end of the passage is to a supernova, though some suggested the big bang.

8(b) Most responses were disappointing and did not gain any marks. Few candidates answered in terms of elements and consequently even fewer explained that atoms of the heaviest elements can only be formed by nuclear fusion at the very high temperatures of a supernova.

Mark ranges and award of grades

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