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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Additional Science 4463 / Physics 4451

PHY2H Unit Physics 2

Report on the Examination

2009 examination - January series

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Physics
Higher Tier PHY2H

General

The majority of candidates attempted all parts of all questions, suggesting that time was not a problem in completing the paper.

The standard of handwriting was generally good. However, some candidates would clearly benefit from having a scribe assigned to them if they are eligible for such. Candidates should be encouraged to use a black pen, and to contain their answers within the confines of the allocated space. If they wish to use continuation sheets, they should clearly indicate that they have done so.

Question 1 *(Standard Demand)*

(a) Most candidates ticked the correct box, although the directions of the frictional force and the gravitational force were favoured by a significant minority of candidates.

(b) Whilst most candidates recognised that riders had different masses, too few had the confidence to write succinct answers. There was a tendency to 'hedge bets' and negate correct responses by referring to speed, position, and involuntary movement. Many candidates read the question too superficially and referred, for example, to where the rider was on the slope.

(c)(i) The majority of candidates gave correct answers.

(c)(ii) Most candidates gave a correct answer. The two commonest errors were in calculating the actual weight of the rider, 800 N, not the apparent weight, and substituting 80 and 30 correctly but multiplying them to obtain just 240.

Question 2 *(Standard Demand)*

(a)(i) Most candidates obtained the correct answer although a few candidates multiplied 9 × 2 instead of dividing.

(a)(ii) The majority of candidates knew that the unit of acceleration was m/s^2.

(a)(iii) The majority of candidates gave the correct answer.

(a)(iv) Most candidates produced a straight line with a ruler from the origin to (2,9). Those who did not obtain full marks were generally not accurate enough. A number of candidates did not link the idea of constant acceleration with the need to draw a straight line.

(b)(i) Many candidates correctly chose B but then failed to compare this shoe with both A and C or mention that it was the best shoe on all three surfaces. However a significant number of candidates did score all three marks.

(b)(ii) The majority of candidates obtained the mark, usually giving answers in terms of variations in human athletes eg weight / size of foot may be different and they run at different speeds. A common fault was to be too vague and say that the robots are

more accurate or they remove human error; a few answered with the standard response 'it's a fair test' without qualifying the statement.

Question 3 ***(Standard Demand)***

(a)(i) Most candidates who showed their working out multiplied 5 x 6; indicating an understanding of series resistors.

(a)(ii) Less than 50 % of candidates were able to answer in terms of it being a series circuit. Very few of the wrong answers suggested it was a parallel circuit; most answered vaguely about currents but left out the idea of the resistors being in series.

(a)(iii) This was generally poorly answered. A common incorrect answer was 2.4 A (i.e 6 x 0.4) suggesting a serious misconception.

(a)(iv) There were many correct answers in terms of potential difference being shared equally, although some candidates lost credit by not giving the word 'equally'. Many candidates gained credit by calculating the p.d. as 2 V.

(b) Many candidates gained two marks for the calculation but failed to score the unit mark. The most common unit was probably the joule.

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

(a) The majority of candidates understood that the dust and ash were *attracted* to the positive plate for collection however they were insufficiently precise in their descriptions of how the dust and ash became charged which resulted in the loss of marks.
Many answers read as if the dust and ash were *already* charged before encountering the grid and plates, others failed to say that the dust and ash *passed through* or *contacted* the negative grid in some way to pick up charge.
To improve attainment, candidates need to be more precise and concise in explaining electrostatic devices. They should state how particles gain charge, what charge is gained and the consequences of this.

(b) Many candidates had an idea that a high charge and high p.d. were needed for a spark to be produced however, most were too vague in their answers failing to specify that charge had to *build up* or that the p.d. was *between the dome and the earthed conductor.*

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

(a) Many candidates picked up a mark for correctly stating that d.c. flows in one direction but fewer gained the second mark for a.c. being a current that changes direction. Too many candidates did not indicate direction in their responses ('a.c. changes; d.c stays the same'); many were not specific enough about how a.c. changes direction ('a.c. flows both ways'). A significant minority appeared to associate - intentionally or not - d.c with series circuits and a.c. with parallel circuits ('a.c. goes though all routes' or 'a.c. can go in different directions').
A handful of candidates added V-t graphs to illustrate their answers; sometimes, these helped to confirm a mark but usually they lacked headings and labels on their axes and so would have been insufficient on their own.

(b)(i) Approximately half of candidates scored full marks for correctly calculating '10 A'. There were various common alternatives: the most likely were 0.01 (2.3/230) and 4.6 (230/50). Although the equation is given to the candidates, many appear to struggle when asked to identify a quantity from its unit.

(b)(ii) Most candidates correctly chose the most appropriate fuse (13 A if previous answer was 10 A but errors were carried forward (allowing 1A from 0.01 or 5 A from 4.6 A, for example).

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

Parts (a), (b) and (c)(i) were generally well answered.

(a) The most common mistake was to give the number 92.

(b) Atomic mass was a frequent incorrect response.

(c)(i) Many candidates could use the information to identify alpha emission.

(c)(ii) There was a lot of confusion here. Correct answers were often well expressed; eg 'because the number of protons changes and this determines the element'. However the vast majority of candidates gave incorrect answers including 'loses protons and neutrons', 'loses protons and electrons'. Only the correct answers appreciated that the atomic number could increase.

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

This question was generally not well answered.

(a) The major issue with candidate responses is that few have any idea about writing an answer structured to contrast the differences. The second part of a comparison often appearing in a different part of the text. Some candidates failed to identify which model was which and many candidates merely described the two diagrams. There was a commonly expressed belief that the plum pudding model was a positively charged particle overall and often that it was a large nucleus. The position of the electrons in this structure was frequently thought to be superficial, and in a significant number of cases it was thought that the label on the model meant that the electrons were positive.

(b) Answers were often unclear, with evidence that candidates had not always read the information given in the stem of the question. Many candidates wrote about alpha particles passing through rather than about the deflections. Others wrote about electrons being deflected. Many candidates believed that the deflections were due to interaction with electrons.

(c) Most candidates were unable to link the information provided to the idea of change and the reasons why scientists may decide a scientific model is no longer acceptable.

Mark ranges and award of grades

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