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Examiners' Report/ Principal Examiner Feedback

Summer 2010

GCE O

GCE O Physics (7540) Paper 01

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General Points and Observations

Some candidates still repeat parts of the question before starting their answers and, as the paper consists of short answer questions, they then find it difficult to fit their answers in the remaining space. The majority of candidates were able to attempt all parts of the paper in the time allocated and there was no evidence that candidates had run out of time. At times it appeared that students were unfamiliar with the ideas behind the question and that, at such times they resorted to more complicated, wrong answers than were actually required. It would have been simpler to know the physics. A quarter of the marks were gained from calculations and these were usually well done although sometimes all steps in working were not shown and incorrect units were used or left off altogether.

Question 1

Q1(a) Most candidates were able to calculate the mass of the boat correctly. Some still ignore the instruction on the front page to use 10 m/s^2 for g.

Q1(b) The deceleration was generally calculated correctly but some candidates gave the unit as m/s or did not provide one. Many candidates confused elastic behaviour and Hooke's law. The reason elastic behaviour was needed was to return the cable to its original position. A number of candidates gave their answer as a negative acceleration rather than a positive deceleration but this was ignored in the marking.

Q1(c) Answers to this question were often poor and used physics terms incorrectly or wrote explanations using everyday words such as impact. Many realised that the boat would apply a large force to the lock gate but failed to provide an acceptable reason. Having just calculated the acceleration in the part (b) they were expected to state that the direct collision would happen in a short distance or time and hence the deceleration would be very large leading to a large force. Too many wrote at length to explain what would happen if the gate broke and the water flooded out.

Question 2

Q2(a) A majority of candidates were able to say that the graph from 0 to 0.8 s was a straight line or had constant gradient. Sadly some students missed gaining this mark as they were able to identify that the gradient gave the acceleration but did not go further to say that it was constant.

Q2(b) Most candidates calculated the acceleration correctly although a small number tried to use only a part of the straight line, resulting in an incorrect answer but were credited with one mark if they showed their working.

Q2(c) Many candidates did not realise that decreasing acceleration meant that the graph from 0.8 to 2.4 seconds would be a curve, drawing instead a straight line and often not terminating this sloping line at the correct time. The third mark was for a horizontal line which terminated at 9.7 seconds. A minority drew a straight line from 0.8, 6.0 down to 2.4, 0, implying that the runner had stopped, and then drew a sloping line to 9.7, 11.5 and this showed they did not relate the graph to how an Olympic sprinter would complete this race.

Question 3

Q3(a) The vast majority of candidates showed how they calculated the volume.

Q3(b) Candidates found this question easy to answer. Most showed their working and were able to cope with the very small mass. A common error was omitting the unit or writing it as kilogram rather than gram.

Q3(c) The calculation was usually well done but a number of candidates added 273 and failed to score. Again the majority showed their working but some used incorrect units.

Question 4

Q4(a) Most candidates calculated the moment of the force correctly with the correct unit.

Q4(b) Again most candidates calculated the stretching force correctly. A few chose the wrong distance or omitted the unit.

Q4(c) Many candidates realised that the stretching force would increase but did not always explain that the weight of the beam would provide an additional clockwise moment.

Q4(d) There were a number of ways in which the stretching force could be increased and many could select two of them. Some candidates suggested changing the clamp or fabric, which was not acceptable and a few failed to read the question and wanted to increase the amount of sand. Too many wanted to increase the length of the beam when perhaps they intended to make the distance from the pivot to the sand longer. Some students were able to correctly identify a suitable action but were not awarded the mark if they did not state whether an increase or decrease would produce the desired effect.

Question 5

Q5(a) This usually scored well but some candidates seemed to feel that at least one of the three responses should be different from the other two.

Q5(b) Most students attempted the calculation, many with correct answers. The most common error was a failure to convert correctly into Kelvin. This was far more common than any mathematical error in the calculation.

Question 6

Q6(a) Most candidates knew that the particles were negative electrons.

Q6(b)(i) A majority of candidates realised that the stand must be a conductor.

Q6(b)(ii) Many candidates were unable to express their answers clearly, stating that if the stand were a conductor, then the charges would move away from the metal but without saying where they could go to.

Q6(c) Many candidates are still trying to answer questions on electrostatics in terms of both positive and negative charges moving, some even stating that protons would move or were attracted to the left side of **B**. Part (a) of this question should have cued them towards of the electrons in the metal sphere **B** being repelled by the like charges in **A** and so moving to the right.

Question 7

Q7(a) This question required candidates to read the data given before answering. Some looked at the parallel circuit and assumed the current in **H** would be the same as in **G**; a few inexplicably gave 3A as the answer. Many said that the resistance of a voltmeter was negligible or just large rather than infinite or very large. It is clear that many confuse voltmeters and ammeters. The reading on the voltmeter was often calculated correctly.

Q7(b) This part of the question was intended to test the more able Physicists and certainly did so. A lot of guessing went on but better candidates said no and that **H** would have different temperature. Good candidates said **H** would be hotter. Only a very few went on to use an appropriate formula to calculate the energy transfer in each resistor.

Question 8

All parts of this question scored well although some candidates confused the left and right hand rules or tried to apply the grip rule. Most candidates realised that a larger current would increase the force and many also gained credit for stating that they could have moved the wires closer. In (c)(ii) some thought the force would become zero.

Question 9

Q9(a)(i) Many candidates only seemed to have learnt about diffraction at a gap and wanted to refer the gap size. Some candidates misunderstood the diagram and were not able to recognise the lines as being wavefronts and so tried to talk about the gaps between them rather than the wavelength. These students then incorrectly talked about the length of the lines as being the wavelength. Others thought that the difference in wavelength shown was caused by diffraction or that there was a change of speed. The word diffraction was not always used in their answers, instead using bending.

Q9 (a)(ii) Candidates again failed to read the question and tried to relate the amount of diffraction to changes in wavelength ignoring the fact that they were told to explain it for a particular wavelength. The students needed to correctly identify the inverse relationship between the gap size and the amount of diffraction to gain the mark.

Q9(b) Many candidates realised that VHF had a shorter wavelength than the other two but then ignored the first part of the question and failed to give explanations in terms of diffraction. Silly answers were seen suggesting that VHF would destroy the hill and cause rocks to rain down on the house.

Question 10

Q10(a) Most candidates gained a mark for saying that the angle of incidence is equal to the angle of reflection but fewer knew that the incident ray, reflected ray and normal would lie in the same plane. Some students were mistaken in thinking that properties of the image were laws of reflection.

Q10(b) A majority of candidates realised that the image would be behind the mirror but many were fairly careless in drawing the ray diagrams and some neglected to identify the position of the image using the letter 'I' as requested. The best answers had an image placed opposite the object and the same distance behind the mirror as the object was in front, a line drawn from object to image which was perpendicular to the mirror and then two lines drawn from their image to the mirror and then passing through the mirror.

Question 11

Q11(a) A majority of candidates chose the correct responses although clearly those that did not were guessing.

Q11(b) Many candidates correctly identified the focal length but there was more guessing with the object distance, image distance and magnification. Most knew that the image was virtual.

Q11(c) It is possible that by the time they got to this final, easy question the candidates were tired. About a third of responses seen chose answers B or C. Those that answered correctly often wrote vague answers rather than just copying the original statement changing the words slightly to say that objects are seen because light travels towards the eye from the object. Some students went on further to describe the refraction occurring in the lens after the light enters the eye – this was not required for the mark.

PHYSICS 7540, GRADE BOUNDARIES

Grade	A	B	C	D	E
Lowest mark for award of grade	**72**	**62**	**53**	**48**	**28**

Note: Grade boundaries may vary from year to year and from subject to subject, depending on the demands of the question paper.

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