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Examiners' Report Summer 2009

GCE

GCE O Level Physics (7540)

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Summer 2009

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GCE O Level Physics

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7540-01 Paper 1

General Points and Observations

This paper required candidates to answer questions in the spaces provided on the examination paper. It was disappointing to see that, despite requests in previous examiners' reports, 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 third of the questions involved 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

(a) Most candidates were able to calculate the weight correctly. Some still ignore the instruction to use 10 m/s^2 for g.

(b) This was generally answered well. Although a number of candidates failed to gain the third mark by not stating that the 15 m was less than the 20 m given. Answers to this question frequently demonstrated that candidates did not appreciate that the question related to uniform motion, with references to braking and calculations of deceleration. Very few candidates answered the question with the alternative working using the time involved. Most candidates stated that the force was friction.

(c) Answers to this question were often poor, in that it was clear that the relationship between force and mass (let alone equal deceleration) was rarely understood. The large variety of misconceptions suggests that there was a lot of guessing or vagueness going on. Many answers concentrated on the aspect of braking distance, linking this to the same speed so therefore same braking distance. Statements about stopping distance not depending on mass were common, as were comments suggesting that the important factor was reaction time of the driver. Extremely few candidates gained the second mark showing that "two marks requires two points" was not understood.

Question 2

(a) Too many candidates just repeated the words from the question, stating that heavier objects fall more quickly than lighter ones rather than recalling that all objects accelerate at the same rate.

(b) Most candidates made mention of a resistive force, but few were able either to recognise or to articulate the greater effect of air resistance on the lighter object. Lighter balls were often assumed to have more air resistance.

(c and d) Many candidates showed good knowledge of the relevant formulae. In 2(c) answers were often correct, with the majority of correct answers also having correct units. In 2(d), however, many candidates forgot the accelerated motion they had used in 2(c) and assumed uniform motion instead (leaving the answer at 16 m/s), suggesting that the difference between the two types of motion is not clearly understood.

Question 3

(a) Candidates often gave a correct answer but many tried to explain in terms of force rather than pressure, something that persisted in later parts of the question.

(b) Candidates found this question difficult to answer. Rarely did candidates appreciate that the weight of water on the LHS was causing a pressure. Quite a few commented about the atmospheric pressure on the open arm. They often did not appreciate that they needed to compare the pressure in both arms for part (i). Attempts at answers to part (ii) often did not contain sufficient detail. Water being pushed by the gas, or a statement of pressure on the water without comparison was common. Very few candidates achieved full marks. It would appear that this part of the specification is not covered appropriately.

(c) The calculation was usually well done but some candidates forgot that the correct equation involves the use of *g*.

(d) Again candidates failed to include sufficient detail. Those that scored usually stated that the water would be blown out. Many just said it was not long enough without saying for what or that it could only measure up to differences 0f 0.14 m when the diagram clearly showed this to be untrue.

(e) Candidates scoring this mark used a more dense liquid, which could be inferred from the equation in part (c). Many suggested a longer tube without considering that 150 kPa was much bigger and so would need a much longer tube.

Question 4

(a) Many candidates were able to provide two acceptable types of energy. A number used the term "mechanical" rather than "kinetic" for the energy source.

(b) Most candidates scored both marks although a few used the % symbol inappropriately or quoted an efficiency greater than 100% by dividing 150 by 60.

(c) Students often used unscientific expressions, like 'natural' or 'cheap' or 'free', without clarifications. There were also quite a few answers where multiple possible answers were provided.

Question 5

(a) This usually scored well as there were five possible marking points which were acceptable. However candidates sometimes gave assumptions rather than precautions.

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

(c) About half of candidates responses were correct. Answers not scoring included –273 K, 0 ^{0}C, 273 ^{0}C or vague terms such as absolute temperature.

Question 6

(a) As with Q4(a) many candidates were able to provide two acceptable types of energy for each part. A number used the term "mechanical" rather than "kinetic" for the energy source of the generator and a few thought that the lamp converted light energy to heat energy.

(b)(i) A majority of candidates were able to read an acceptable value from the graph.

(b)(ii) Many candidates were able to obtain 0.02 s as the periodic time T and then use f=1/T to find the frequency but some then failed to provide a correct unit. The most common error was thinking that T was 0.04 s.

(c) Accurate answers were fairly common, with the amplitude part of the question posing fewer problems than the frequency part. Of those drawing a wrong frequency wave, most opted for a higher frequency than a lower one. Candidates sometimes failed to be sufficiently accurate in their curve drawing with peak values often not exactly the same as printed, although clearly meant to be and those with higher frequencies could score provided the first peak and trough were both the correct amplitude.

Question 7

(a) Many correct circuit diagrams were seen but many candidates also added more components than were required for the simple task of determining the resistance of the conductor. These were ignored unless they affected the result, for example adding a rheostat and then placing the voltmeter in parallel with the cell rather than the conductor.

(b) The resistance was usually measured correctly.

(c) Most candidates realised that the current would be halved, those failing to score assuming it would be doubled.

(d) Again most candidates could suggest at least one correct variable. Some ignored the instruction to give two variables and wrote three in which case the third one was ignored.

Question 8

All parts of this question scored well although many candidates looked at the diagram and said it was step up, presumably not considering that the power supply was connected to the left side of the transformer rather than as is conventional. The calculation was more often correct than not. Almost all named iron as a soft magnetic material and could then give a correct reason.

Question 9

(a) Many candidates could give a suitable source of background radiation. The most common correct response was cosmic rays although a few still think that sunshine was an ionising radiation. Few other sources were accepted because candidates responses were vague saying rocks, food, air rather than saying it was radioisotopes in them.

(b) Many candidates were able to give a convincing reason for the source being alpha and then frequently contradicted themselves by saying that the count at 12 cm was due to alphas rather than background. Very few scoring the background mark went on to explain that radioactive decay is random.

(c) A majority of candidates were able to complete the decay equation correctly with those that failed to do so could not recall the correct numbers for an alpha particle.

Question 10

(a)(i) Most candidates were able to calculate the speed of sound successfully but have problems when rounding to a sensible number of significant figures. This mathematical error was ignored provided that their answer rounded to 345 m/s.

(a)(ii) Most candidates gained the first mark but failed to state that the speed of light is **much** faster than the speed of sound. Good candidates recalled values for the speed of light and compared them to the speed of sound which was pleasing to see even though such detail was not required to score the second mark.

(b) Whilst showing knowledge of why the calculated time was longer candidates often missed out on detail here with superficial answers given e.g. wind, time was wrong or the stopwatch was faulty. However very few failed to give a correct cause of the second, quieter sound.

Question 11

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

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

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Examiners' Report June 2009

7540-02 Paper 2

General Points and Observations

Many candidates found most parts of this paper very accessible and scored high marks. This paper required candidates to answer questions in the spaces provided on the examination paper. It was still disappointing to see that, despite requests in previous examiners' reports, some candidates repeat parts of the question before starting their answers and then find it difficult to fit their answers in the remaining space. A number of candidates extended their answers beyond the space provided or continued their answers on one of the blank pages without indicating clearly that the answers continued elsewhere. The majority of candidates were able to attempt all parts of the paper in the time allocated but in a few cases there was evidence that candidates had run out of time. Candidates are encouraged to allocate their time appropriately. Many wrote good answers to questions requiring explanations of physical principles but some of it was irrelevant, incorrect and could be contradictory. A third of the marks were gained from calculations and these were very well answered well although units were still being missed off or written incorrectly. In such questions a few candidates did not always show all steps in their working and could not be given any credit where an incorrect answer was the result of an arithmetical error. In the two questions asking candidates to show an answer all steps had to be shown to gain full credit and a few candidates simply repeated the number given in the question rather than the full result of their calculation.

Question 1

This question was very well answered and good candidates often gained full marks.

(a)(i) to (iii) Many candidates completed all parts correctly and gave correct answers only losing marks for units or giving the final answer of (ii) as 70 m/s rather than the required 72 m/s.

(a)(iv) and (v) Many candidates seemed to think that the ball travelled along the ground and so gave friction as an answer and showed the arrow acting somewhere other than through the centre of the ball (which had been marked with a dot as a hint to candidates). Too many still call the weight or pull of gravity just gravity and so fail to score. Candidates must take more care when drawing such direction arrows as many were seen which were not vertical or horizontal and it would help if they used a ruler although a carefully hand drawn straight line was all that was required.

(b) The calculations were done correctly by many candidates who showed a good understanding of the concept of momentum. A few lost marks by not reading the question and using the expected momentum instead of the actual momentum, terms which had been emphasised by using italics for the words. Candidates who had seen how to compensate for friction completed parts (iv) and (v) well although the description of the adjustment was often vague.

Question 2

Again many candidates were able to apply their Physics knowledge well to most of this question and scored well.

(a)(i) Most gave either conduction or convection but too many gave radiation which was not acceptable in this situation.

(a)(ii) Most did put the heater at the bottom but some either put it lower down which was not enough to score and some put it in the middle and then compounded this by describing heat transfer by conduction rather than convection in part (iii).

(a)(iii) Many candidates gave a good account of the convection process but some tried to use a molecular explanation, saying molecules expand and become less dense, which did not score.

(a)(iv) Many candidates gained full marks for the calculation. Some gave the unit as J/kg K rather than J and too many did not use the correct temperature change or attempted to add or subtract 273 and only scored one mark for use of the equation.

(b)(i) Some candidates seemed to feel they had to do a calculation and penalised themselves as all that was being tested was the knowledge that 1 W is 1 J/s.

(b)(ii) to (iii) The calculation was well done and most candidates could give at least one correct process for heat loss and one correct method of reducing this. Many thought that a heater was not 100% efficient or that there was a fault in the heater neither of which scored.

(c) Although this often was well answered many answers were vague and showed a poor understanding of heat transfer. We still see candidates saying that the air trapped the heat between the two layers or that the double glazed window stopped cold air entering the house. Answers needed to show understanding that insulators slow down the rate of heat transfer and do not stop heat being transferred completely.

Question 3

This was a novel question and some candidates found parts very difficult.

(a) A lot of good answers were seen here but too many just used solar rather than light energy.

(b) Some candidates did not label the terminals of the solar cell, which were labelled, preferring to label the battery. Many could give the appropriate answer, that the diode only allows current to flow in one direction, stating instead that it converted a.c. to d.c. which was inappropriate in this context. In part (iii) most just repeated the answer to (ii) rather than explaining that it prevented the battery discharging.

(c) As with all calculations, this part was well answered. Common errors were incorrect units, forgetting to convert time to seconds in (ii) or failing to show all steps in (iii) not showing the final step (85.7 ohms) and just writing 86 ohms (shown) which was not accepted.

(d) A majority chose the correct response in (i) but failed to note that there were two marks here, one for stating that electrons had negative charge and the other for stating that it went opposite to conventional current. Vague responses omitted the term conventional and this was not enough to score the mark.

(e) Most candidates plotted the points correctly and drew a best fit curve but too many failed to label the axes with units and often failed to indicate on their graph how they obtained the value for (ii).

Question 4

This question required the application of the knowledge of refraction to an unfamiliar context.

(a) This section showed the importance of reading a question carefully before beginning to answer. Most could give one of the many acceptable answers to (i). Parts (ii), and (iii) required them to know that blue light had a shorter wavelength than red. Parts (iv) and (v) needed careful consideration of the graph provided and a coherent account of how the %reflection varied over the visible spectrum. Part (vi) was well answered, as many knew that frequency is inversely proportional to wavelength.

(b)(i) and (ii) Most candidates gave correct answers to this part.

(b)(iii) to (v) Only a small number were able to give correct responses to these three parts. Most took the dark room to mean there was no light rather than there was little light. The diagram showed light entered the room and some candidates said this for part (iii). The majority did not understand the situation for part (iv). A very few candidates gave excellent explanations stating that the reflected image was so bright that the light from the dark room failed to register with the person in the bright room. Although some gave a suitable use to many said mirror or as window glass which missed the point.

(c) Both calculations were usually well done, although some candidates did not use sines, used incorrect numbers or just wrote 42 degrees for (ii).

(d) A majority stated that the angle of incidence was greater that the critical angle and that hence total internal reflection occurred.

Question 5

Many candidates were unfamiliar with the clamp ammeter shown in the picture but were often able to apply their knowledge successfully.

(a) Candidates scored well in (i) and (ii) although the answers in (ii) and (iii) were not always clearly expressed. In (iii) some candidates just stated that 50 Hz was the frequency without explaining its meaning. In (iv) many gave good answers but weaker candidates thought that current passed directly to the ring from the wire.

(b)(i) Many candidates scored the one available mark.

(b)(ii) Many candidates were able to provide more than two acceptable measurements.

(b)(iii) Many candidates gave two acceptable factors that should stay constant.

(b)(iv) Many candidates could score well as there were seven acceptable points and they only needed four. Some missed the point of this device and wanted to connect it in series with the circuit.

(b)(v) Many candidates failed to score if they did not include current and frequency with correct units which was the whole point of the investigation. Some added additional headings which were ignored but needed to have correct units to score the units mark. Some also gave heading for measuring resistance rather than the specified activity.

(c) The answers to this section were mixed and only rarely good. Good candidates realised that it was easier to measure currents as it did not have to be wired in the circuit and that it would not work with direct current. Most answers involved it being too big, too expensive, that it would crush the wires or that it could measure a.c. and d.c.

(d) Most candidates scored at least one mark as it was marked generously. Those that failed to score the second mark did not refer to 50 Hz.

PHYSICS 7540, GRADE BOUNDARIES

Grade	A	B	C	D	E
Lowest mark for award of grade	**76**	**66**	**57**	**52**	**31**

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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