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Examiners' Report January 2009

GCE

GCE O Level Physics (7540)

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7540/01 Physics Paper 1

Question 1

Q1(a) Most candidates were able to name the forces as air resistance and weight respectively.
Q1(b) Most candidates were able to score the 'not equal' mark. A pleasing number stated that there was only one body but far fewer commented on the different type. The main error was to claim that 'the forces were not opposite'.
Q1(c) Most candidates calculated the resultant force and stated its direction correctly.
Q1(d) This was well done using the value of force from (c). An occasional error was due to inability to transpose the equation to find acceleration but its unit was well known..
Q1(e) Arrows were drawn but not always correctly labelled.

Question 2

This was the best-answered question on the paper.
Q2(a) The second mark for the deceleration part of the graph was more often scored than the first where candidates showed uniform acceleration rather than uniform velocity.
Q2(b) The area under the graph being the distance travelled was well known but some responses repeated the question and could barely fit this on a line that only needed a one-word answer.
Q2(c) This calculation was extremely well done even where the error was carried forward from the candidate's graph.

Question 3

Q3(a) The explanation of the process of convection was better than in previous years although a disappointing number still refer to 'hot molecules' and 'less dense molecules'.
Q3(b) This item produced the greatest number of blank lines and many of those who attempted it stated that evaporation increased in weightless conditions. They also equated weightless conditions with a vacuum. For the second mark many stated that the filament got hot quicker rather than got hotter.

Question 4

Q4(a) Expansion was well known.
Q4(b) Some candidates did not realise that 'copper expands more' gave the two pieces of information required for the marks and went on to introduce ideas on conduction and specific heat capacity. Many thought that the rod bent upward because the copper was heated first and another common answer was 'have no room to expand horizontally so expands upwards'
Q4(c) 80% of candidates chose the correct answer of 'up' from a choice of two..

Question 5

5(a) The explanation of pressure exerted on a plastic bag containing air often lost the second mark for not referring to collisions with the bag.

Q5(b) The reading of 32 kPa from the graph was well done and this value or an error was carried forward to the Boyle's Law calculation which was disappointingly done with a wrong answer of 0.001875 resulting from 100 x 0.0006/32 often appearing.
Q5(c) The routine question about assumptions that follows most gas law questions was very badly answered this time. Candidates often knew that temperature was constant but frequently added that the product pV is a constant.

Question 6

Q6(a) Some candidates seemed to be confused by the question and sometimes gave the description of electric current as the answer to Q6(b). Also the stem of (b) 'movement of protons' was given as the answer here.
Q6(b) This was very poorly answered with no reference to the proton being charged.
Q6(c) This was well answered with the main error being non-conversion to seconds.
Q6(d) Most scored the first mark for 'current increases' and some scored a second for 'current doubles'. Again with this two-mark item many candidates did not realise when they had done enough for the marks and added unnecessary detail.

Question 7

Q7(a) The assumption that the resistance of a reverse-biased diode is very high was not well known.
Q7(b) Over 90% of candidates scored the mark for the step in the calculation to show that the ammeter reading was 0.25 A.
Q7(c) The majority of candidates failed to state 0.20 A as the current through the diode with 0.45, 0.25 and 0.225 A all equally popular. Among those who correctly quoted 0.20 A, 30 ohm was given as the final answer.
Q7(d) The effect of a diode when connected in an a.c circuit was not well known.

Question 8

Q8(a) Not all candidates knew the direction of conventional current in a circuit but the much more difficult direction of the lines of force in the magnetic field of the wire was no worse answered.
Q8(b)(i) The question 'What is shown by the direction of a magnetic field line?' rarely scored. Many repeated the question in various forms or gave answers in terms of current.
Q8(b)(ii) Many candidates scored two out of four for sprinkling iron filings on the card and then did not score any further marks for also placing a compass on the card. A significant number mentioned the grip rule to get the direction.

Question 9

Q9(a) This was well answered .
Q9(b)(i)(ii) Candidates did not know what the tracks in a cloud chamber were made from with some suggesting smoke particles. Surprisingly only half of the candidates knew that the property of radioactive particles responsible for the production of the tracks was ionisation.
Q9(b)(iii) This was well answered with giving more information than needed for the two marks with 'thick, straight and the same length'. Not many mentioned the same energy but a number described alpha properties instead of alpha tracks.

Q9(c) Candidates found this difficult, the most common answers relating to range in some way e.g. 'the cloud chamber is too small' or 'beta/gamma have too long a range' or 'can penetrate too far'.

Question 10

Q10(a)(i) Radio waves being transverse waves was well known.
Q10(a)(ii) The majority scored the first mark in this calculation but a disappointing number ended up with incorrect powers of ten.
Q10((b)(i) Apart from those candidates who calculated distance from speed/time there was an even split between those who did and did not remember to divide by two.
Q10(b)(ii) This question did not require recall and was poorly answered. Reasons for the longer return time were erroneously given as energy loss, air resistance, change of wave speed, collisions, or wind direction.

Question 11

This was the worst-answered question on the paper.
Q11(a) Lots of writing often gained few marks. Most described the arrangement of apparatus rather than explain what they should do with it to get an image. Many wanted to remove the mirror and replace it with the screen. A few were confused by the triangular object and wanted to use the screen to make a new object with cross wires. It was obvious that many candidates had not done the experiment.
Q11(b) Rather than measure from the lens to the screen, many measured from the mirror or said 'image' or 'focal length' for an answer.
Q11(c) Often the only correct answer was 'inverted' although many contradictory answers such as 'upright and inverted' were seen.

7540/02 Physics Paper 2

General Points and Observations

This paper again required candidates to answer questions on 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 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 generally answered well although units were still being missed off or written incorrectly. In such questions 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.

Question 1

The calculations were usually well done.

Q1(a) By giving 'define momentum' as the first question which students answered as mv, the examiners hoped that candidates would continue with defining equations. A surprising number gave the definition of kinetic energy in terms of energy possessed by a moving body. This was given full credit, but sometimes candidates didn't quite get it right and so didn't score. A better answer would have been ½ mv^2. Similarly with gravitational potential energy, energy due to position was accepted but a better answer would have been mgh.

Q1(b) The calculation was done correctly by many candidates who were expected to use average speed multiplied by time. Too many candidates used the difference between initial and final speeds, some then even dividing this by two, and failed to score. Some used the equations to calculate the acceleration and then the distance. This was difficult to fit in the two lines provided but was given full credit if completed correctly.

Q1(c) Many candidates scored full marks here.

Q1(d) A few candidates misread data and sadly were unable to score in part (i) by using an incorrect mass of 0.3 kg rather than the correct value of 0.03 kg. Where candidates consistently used 0.3kg in parts (ii) and (iii) they could still score the remaining 3 marks.

Q1(e)(i) Candidates found it difficult clearly to explain what they meant and often said that the ticker timer would slide down the ramp, that it would not work fast enough or problems that might occur **after** the collision. Few stated clearly that the tape would wrap round the rotating ball and that it would be difficult to fix the tape to the ball.

Q1(e)(ii) Many ignored the fact that in part (i) they had been asked to explain why a ticker timer would not work and suggested a ticker timer or just simply, and inappropriately, stated

they would use v = s/t. Many showed a poor understanding of the unreliability of using a stopwatch for the very short times involved in an experiment such as this.

Q1(f) Candidates demonstrated a good understanding of centre of gravity, and most could draw two suitable lines to show where the point was located. In (iii) only a minority were able to give answers in appropriate Physics terms. Too many ignored the question in (iv), suggesting changes to be made after the start or to be made to the block. It was not sufficient to say they would use a longer slope unless they explicitly said that the ball would then place the ball higher up.

Question 2

Many candidates found it difficult to apply their physics knowledge to this situation.

Q2(a)(i) Few gave a sensible advantage whereas most commented on the disadvantage of fragility.

2(a)(ii) Although many candidates obviously knew about the maximum density of water at 4 ^{o}C, they often failed to suggest that this was unusual and then could not apply their knowledge to explain the unreliability of this rudimentary thermometer. A number thought that water froze at this temperature.

Q2(b) Most usually scored full marks with some giving an incorrect unit and only a very few trying to add 273 to the temperature difference.

Q2(c) Many candidates seemed to think that sealing the top excluded the air from the tube and so drew a line above the original one. Very few of those who drew a line starting at an acceptable position did not appreciate that the increasing pressure would make the line curve over. Consequently in (ii) the vast majority failed to state that there was a vacuum above the mercury and instead tried to give a property of mercury.

Q2(d) A majority calculated the correct value of pressure in (i) although a significant number incorrectly used 0.3 m as the value of h. Too many thought that only atmospheric pressure acted or that they had to subtract their value from atmospheric instead of adding it. Many also failed to explain their reason in acceptable terms.

Q2(e) Candidates should look at the marks awarded for a question when considering their answers. In order to gain four marks they had to make two correct statements for the spacing of water molecules and air molecules followed by two correct statements for their motion. Too many think that water molecules are not close packed, ignoring the fact that liquids are very difficult to compress. Statements about the movement of water molecules were vague, with the answers given really being more appropriate for a gas.

Question 3

This was a high scoring question with rather more candidates than usual scoring the full 20 marks.

Q3(a) A lot of good answers were seen here and most candidates understood that 720 W was 720 joules per second. A few who multiplied the power by 30 then went on to multiply this by 3600 rather than just 60. They were then likely to obtain an answer for (iv) in excess of 100% showing a poor understanding of efficiency.

Q3(b) This was usually answered correctly. Most understood that an ideal transformer was 100% efficient. In part (iii) more candidates than expected erroneously inverted the turns ratio of the transformer.

Q3(c) Many candidates could explain the action of a diode although some thought it changed the direction of the current. In c(ii) and (c) (iii) a surprisingly large number of graphs were seen without labelled axes.

Question 4

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

Q4(a)(i) and (ii) This section showed the importance of reading a whole question before beginning to answer. Although most candidates knew that the refraction meant that light would change direction they often started to explain it in part (i) rather than in part (ii). Candidates who explained it using the correct changes for the speed of light usually scored full marks. Many still try to use the concept of density and clearly confuse it with physical density. The muddled answers often failed to score the marks. Some only talked of refraction as light went from air to glass and missed talking about refraction as light left the glass lens (as instructed).

Q4(a)(iii) Only a small number were able to give a correct reason (as was asked).

Q4(a)(iv) Most realised that the image was real but did not always give an acceptable reason.

Q4(a)(v) Most thought that the image was upright and failed to realise that a magnifying glass did not produce an inverted image and that as the image had already been inverted the image observed would still be inverted. Good candidates used the diagram and followed the paths of the top or bottom rays, seeing that the ray entering the objective lens at the top entered the eye at the bottom.

Q4(b) The graph question was well answered with many candidates gaining full marks. A worrying development was an increasing number who did not label the axes and a few who misread the value from the graph giving the answer as 15.75 mm rather than 18 mm.

Q4(b)(iv) This usually scored well but candidates who used data from their graphs rather than from the table as instructed did not score the first mark. A number failed to give a unit.

Question 5

Many candidates were unfamiliar with the experiment shown in the diagram but were often able to apply their knowledge successfully.

Q5(a) Candidates scored well in (i) and (ii) although the answers in (ii) were not always clearly expressed. In (iii) nearly all candidates scored full marks for the simple speed calculation.

5(b)(i) Most candidates scored the one available mark.

5(b)(ii) Few candidates were able to provide more than two acceptable measurements. Often they simply said distance, time and speed. To score they needed to state clearly what distance they were referring to (i.e. height), what time they would measure (i.e. time between the two peaks) and the length of the bar magnet. Speed is not a measurement for the apparatus shown as it is a calculation.

5(b)(iii) Many candidates wrote good accounts and many gained full marks although there was a wide range of marks scored. Too many had failed to appreciate that time could be obtained from the electronic recorder and wanted to use a stop watch which would not give reliable results with the short time interval involved. However credit was given for knowing that the time needed to be recorded. Although most repeated the experiment for different heights, few appreciated the need to repeat readings for the same height.

5(b)(iv) There was a lot of careless work. These were easy marks but a lot of candidates did not include the units (as part of the column headings) and a significant number gave only distance and speed for the headings and failed to score.

Q5(b)(v) Many candidates failed to score if they ignored the instruction to label the axes and were also penalised if they used the wrong variables on the axes.

Q5(c) The answers to this section were mixed and only rarely good.

PHYSICS 7540, GRADE BOUNDARIES

Grade	A	B	C	D	E
Lowest mark for award of grade	**72**	**61**	**51**	**46**	**27**

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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