Examiners' Report/
Principal Examiner Feedback

Summer 2010

IGCSE

IGCSE Physics (4420) Paper 03

IGCSE Science (Double Award) (4437) Paper 09

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4420 Paper 03 Physics Report - Summer 2010

General points and observations

A high standard of work was seen on this paper. Candidates found Question 1 to be straightforward but Question 4 to be much more challenging. Responses indicated that candidates had learned the lessons from going through past papers and, in particular, Q4(d)(i)(ii) on significant figures was well answered.

Question 1

In (a)(i) the majority gave 6 for the answer but a minority gave 5 and a few gave 7 as the answer. Some candidates queried the presence (or absence) of the base of the carrier. The 'bracket' around the 6 discs should have made it clear that there were 6 discs.
In (a)(ii) the majority gave the correct answers 0.8 (N) for 6 discs or 0.7 (N) as an error carried forward for 5 discs. Some candidates doubled the weight of the carrier perhaps thinking that the carrier and the pin each weighed 0.2 N. The diagram should have shown this to be unlikely.

In (b)(i) the majority gave 21.2 (cm) but a few gave 22.8 (cm).
In (b)(ii) the most common answer was 9 (mm), but 0.9 and 90 were also seen often enough to indicate that candidates did not convert 0.9 cm to 9 mm or incorrectly converted 0.9 cm to 90 mm.

In 1(c)(i) most candidates indicated clearly by a variety of methods the region of direct proportionality. In (c)(ii) the graph was very well drawn with very few drawing the additional line/ curve under the original.

Question 2

In (a)(i) most candidates knew that the container was a measuring cylinder although 10% of overseas candidates did not.
In (a)(ii) there was a surprising number of incorrect answers including 30.8, 38.5, 39 and 40.
In (a)(iii), which was much better answered than (ii), incorrect answers include 056, 56.0, 56.00.

In (b)(i) only a few candidates failed to continue their line, joining the two points, to the *y*-axis.
Those that did, correctly gave their answer for the mass of the container as 28 (g) although a few then wrote down 20.8 (g).
Those that did not, often drew a line from (15,40) to (0,0) or gave an answer of
20 (g).
In 2b(ii) the calculation of density from the slope of the graph was well done by stronger candidates although some calculated it as 1.25 g/cm^3 which is the reciprocal of the right answer.
Candidates at the grade C/D boundary were often unable to attempt the calculation.

In 2(b)(iii) candidates did not score well when asked to explain the advantages of taking more than two results. Many referred to increased accuracy and the taking of an average which applies only when performing the same measurement more than once. Phrases like ‘a fair test’ and ‘ensuring that no anomalies occurred’ were seen. The mark scheme is shown below in which a mark was awarded for each of any three points.

1. can plot more points
2. can draw line of best fit/straight line rather than curve
3. reason why two points is unsatisfactory
4. extends the range
5. increases reliability
6. identifies anomalous results
7. repeat or ignore anomalies
8. can see if density remains constant

Marking point 1 was often missed because candidates restated the stem of the question with ‘have more results’. Correct statements regarding anomalies often scored 6 and 7. Where candidates only scored one mark it was usually 5.
Some candidates did not fully understand the term ‘results’ i.e. readings of mass and volume.

Question 3

In (a)(i) candidate managed to score with a rule(r) or tape measure although 9% of overseas candidates did not.
In (a)(ii) candidates had to suggest the difficulty in measuring the distance *d* and how to overcome the difficulty.
Some very good answers were seen but some lacked detail even to the extent of not stating what the difficulty was even though the elements of a reasonable solution could be gleaned from the answer.
Some candidates wanted to change the experiment by breaking the bulb to access the filament. A tape measure was introduced as it was more flexible than a rigid metre rule and could also be wrapped around or stuck to the glass bulb.
Even though the diagram reasonably shows the distance *d* to be from the filament to the centre of the panel some candidates referred to the light being spread over all the panels and hence multiple readings should be taken to obtain an average result.
Although the panel in the diagram is an orthogonal drawing, the lamp and millivoltmeter are drawn as side elevations This appeared to cause confusion in the candidates in that they thought that the line *d* was a sloping diagonal line. Hence some talked about raising the height of the lamp to the level of the centre of the panel or the difficulty in measuring a sloping line which needed the use of Pythagoras’ theorem.

In (b) an acceptable answer as to why the investigation should be carried out in a darkened room was:

so that only light from the lamp	1
affects the panel / cells / voltage / results /readings	1

or the converse of this.
Usually this was well done but a lot of candidates only scored one or other of the two marks.

In (c)(i) many candidates drew up a correctly labelled table with the correct units and listed the figures in a correct order. A few listed the pairs of results in random order and lost the mark. A mark was often lost where the column heading did not contain a quantity but two units instead, for example, Millivolts in mV.
In (c)(ii) the graph was very well plotted and drawn. Candidates were given credit for their result from their curve for a distance of 25 cm.
A handful of candidates plotted the graph incorrectly with distance on the *y*-axis and voltage on the *x*-axis. The most likely points to be mis-plotted were obviously (14,190) and (38,80). Marks were again lost here for unsuitable labelling of the axes.

Question 4

In (a) the meaning of 'uniform' was not well understood or at least not very well explained.
In (b) most knew that the symbol was for a switch and a few seemed puzzled that two marks were available here. Some candidates realised that the switch was closed or in the on position. In (a)(b) most candidates lost a mark for one of the reasons given with the vast majority scoring two out of three.

In (c)(i) most gave the correct numbers for meter **X** and meter **Y** although a few reversed the answers. Some tried to give the numbers to a degree of accuracy which was not justified by the drawings in the diagram.
In (c)(ii) about half of the candidates did not realise that **Y** is the ammeter because it is in series with the wire. A typical argument was
'a low voltage supply was shown on the diagram and the reading for **X** was lower than the reading for **Y** so **Y** must be the ammeter' or 'an ammeter always has a higher reading than a voltmeter'.

In (d)(i) the correct answer was usually given to two significant figures. Some confusion remains as to what constitutes 2 sig.fig. where an answer of 0.1 was given which implied that the leading zero was a significant figure.
In (d)(ii) not all candidates appreciated that dividing two numbers given correct to 2 sig. fig. cannot lead to an answer with an accuracy of more than 2 sig. fig..
In (d)(iii) the calculation was usually very well done with most candidates converting 26 cm to 0.26 m. However in (d)(iv) candidates were rarely able to explain why the calculated value of resistance per unit length based on one set of readings was unreliable. Many thought that it must be wrong because it is not possible to calculate this quantity unless a one metre length of wire is used.

In 4(e)(i) most candidate generally offered a correct answer such as 'the reading is changing' or 'the meter might be misread' but a few included 'human error' or 'not accurate'.
In 4(e)(ii) was the most challenging and least well-answered item on the paper. Candidates were asked to suggest and explain how to keep a length of wire, carrying a current, at constant temperature. Many answers included the use of a fridge, water bath, air-conditioning or ice pack to keep the wire cool. Some suggested the use of a heat source. Credit was given where a logical process was described. However, some candidates did not realise that covering the wire with some form of insulator or insulation would trap the heat in and make matters worse for the experiment. Adding a thermistor or a variable resistor to the circuit were other common responses.

PHYSICS 4420, GRADE BOUNDARIES

Option 1: with Written Alternative to Coursework (Paper 3)

	A*	A	B	C	D	E	F	G
Foundation Tier				63	50	37	25	13
Higher Tier	79	67	55	44	33	27		

Option 2: with Coursework (Paper 04)

	A*	A	B	C	D	E	F	G
Foundation Tier				67	53	39	25	11
Higher Tier	81	70	59	48	36	30		

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

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