PHYSICS

Paper 0625/01

Paper 1 (Core)

Question Number	*Key*	*Question Number*	*Key*
1	**A**	21	**A**
2	**A**	22	**B**
3	**B**	23	**A**
4	**A**	24	**B**
5	**B**	25	**C**
6	**B**	26	**D**
7	**C**	27	**D**
8	**D**	28	**C**
9	**C**	29	**B**
10	**D**	30	**C**
11	**D**	31	**A**
12	**D**	32	**C**
13	**A**	33	**C**
14	**D**	34	**A**
15	**A**	35	**A**
16	**A**	36	**C**
17	**B**	37	**B**
18	**B**	38	**B**
19	**A**	39	**D**
20	**C**	40	**C**

General comments

There was an increase in the number of candidates from last year. The mean mark was 29.657, within approximately 0.5 of that for November 2000, but lower than in June 2000. The standard deviation was 6.295.

The highest numbers of correct responses were for **Questions 1**, **19**, **27** and **33**, all having a facility of 90% or above. The worst answered items were **Questions 11**, **16**, **18**, **23**, **34**, **35** and **36**, which were answered correctly by less than 60% of candidates.

Comments on specific questions

Questions 1 – 2

These questions, on measurement, attracted 98% and 82% correct responses respectively.

Questions 3 – 4

These questions, on speed, distance and time, were also well answered, with 89% and 86% of candidates answering correctly.

Question 5

Although nearly three quarters of candidates knew that force has the same unit as weight, most of the rest believed the answer to be mass.

Question 6

On a similar theme, **D** was the most popular distractor (17%) in this question. Apparently a factor of 10 was remembered, but not the fact that mass does not change.

Question 7

There was no such problem for the unit of density, with 89% of candidates answering correctly.

Question 8

Again, there were no problems with this question, with 89% of candidates answering correctly.

Question 9

This question worked well, but 15% opted for **A**, showing a lack of connection between constant speed and balanced forces.

Question 10

Not surprisingly, options **B** and **C** were the most popular, since these were the other two forms of energy involved in lifting and running.

Question 11

This was the first really difficult question. Only 32% of candidates correctly chose **D**, with nearly half of all candidates selecting **A**. This either showed a lack of understanding of the link between loss of gravitational potential energy and gain of kinetic, or candidates failed to read that there was no friction to consider.

Questions 12 – 14

These questions were well answered, all having over 80% correct responses.

Question 15

Although the target 75% of candidates were correct, nearly one in five chose **B**, presumably simply because 25ºC was between the two values given.

Question 16

This was found to be the next difficult question, with nearly two out of three candidates making an incorrect response. By far the most popular of these (31%) was **C**, suggesting that many believed melting ice in a warm room must be increasing in temperature.

Question 17

This question was answered well.

Question 18

This question proved demanding. Only 58% of candidates correctly chose **B**, with all distractors being popular.

Question 19

This straightforward question on thermal conduction caused few problems, with 91% of candidates answering correctly.

Question 20

This question caught out 17% of candidates, who chose **B**, failing to notice that the wavelength was not constant, thus this is worth reinforcing. The next most popular distractor, **A**, (10%) showed that others were not aware of the large amount of diffraction produced when the gap size is similar to the wavelength.

Question 21

This question produced a good response, with 79% of candidates answering correctly, and with all distractors working almost equally well.

Question 22

Less than two thirds answered this question correctly, with **C** the most popular error. The term *internal* reflection needs to be stressed here.

Question 23

Difficulty arose again with this question. Just over half of candidates were correct, with 28% choosing **C**. This is straight recall, and needs to be learnt.

Question 24

84% of candidates responded correctly.

Question 25

This question worked well, with **D** being the most popular distractor.

Question 26

Similarly, this question worked as intended.

Question 27

Candidates enjoyed this question, with 92% answering successfully.

Question 28

Again, this question worked well, with 76% of candidates answering correctly.

Question 29

Although 76% of candidates correctly opted for **B**, nearly one in five chose **A**, apparently not remembering that opposite charges attract.

Question 30

This question was found to be relatively simple, with 81% of responses being correct.

Question 31

Although this question represented no problem for nearly four out of five candidates, option **B** distracted most of the rest, suggesting that the rated voltage of the lamps was not considered.

Question 33

In contrast, this question proved easy, with 90% of candidates answering successfully.

Question 34

Only 40% of candidates answered correctly, with nearly half choosing **B**.

Question 35

This question was also poorly answered, with only 47% answering correctly. 43% of candidates opted for **C**.

Question 36

Only 58% of candidates were correct in this recall question.

Question 37

This question worked well, although 20% of candidates chose **C**, confusing charging and discharging.

Questions 38 – 39

C was the popular distractor in these, otherwise well answered, questions.

Question 40

81% of candidates answered this final question correctly.

Paper 0625/02
Paper 2 (Core)

General comments

This examination was performed well, with a good spread of marks. Some candidates scored very highly, but there were a number of other candidates who failed to score even reasonable marks. In such scripts there appeared to be whole areas of the syllabus of which the candidates had little or no knowledge. In some, it was the area of light (**Questions 4** and **5**), with others, it was radioactivity (**Question 8**) and so on. This paper only tests the core of the syllabus, and candidates expecting to achieve a respectable grade must show competence over the whole syllabus. Whilst the majority presented their work in a very neat and orderly manner, it is worth commenting that a small minority of candidates took very little trouble in this area, even to the extent (in one or two cases) of writing an answer of which parts were impossible to read. Markers make every effort to understand the answers of the candidates, many of whom are writing in their second or third language, but nothing can be done to give the benefit of the doubt if the writing cannot be read.

Comments on specific questions

Question 1

Most candidates could answer this question, but some misread the scale, most commonly as 21cm or 15.1cm. There were some weaker candidates who could not calculate the circumference from the length of string, by dividing by 8. Many of these attempted to use $2\pi r$ or some variant of this formula.

Question 2

Answers generally expressed the two things being sought, even though markers sometimes had to use good interpretation skills.

Question 3

In part **(a)**, most candidates realised that the answer was to heat the bar, but some added things like ‘in all directions’ or ‘in the middle’. The other parts were frequently intelligently answered, although in **(c)** answers were frequently given which related more to part **(d)**. Answers to these two parts were often vague, but markers were instructed to interpret them generously.

Question 4

Some candidates coped well with this question, but there were others who showed very little understanding.

(a) Surprisingly, there were quite a few candidates who did not show the emerging ray in this part as parallel to the incident ray, either through ignorance or through careless drawing.

(b) A good proportion of candidates scored at least some of the 3 marks for this part. Total internal reflection was often shown, although not always at the correct angle, and many knew that this had something to do with the critical angle having been exceeded, even though this was often poorly expressed. Answers like 'the ray is bigger than the critical angle' were given credit, on the basis that the candidate probably did know the answer. However, it should be pointed out that answers like these are very close to being marked wrong, so Teachers should try to ensure that candidates can say exactly what they mean.

(c) By no means all candidates showed the ray in this part passing through the block without deviation at either surface. Perhaps this is something which is missed when studying this topic.

Question 5

This was a slightly different approach to dispersion by a prism. A disappointingly small proportion of candidates could identify the two mistakes in the 'student's drawing'. Hardly any candidates could identify an instrument to detect infra red radiation, and many could not show where it would strike the screen. In part **(c)**, most candidates could name at least one other invisible part of the electromagnetic spectrum, but there was a fair sprinkling of 'water waves' and even 'visible light' included in the list. Quite how visible light can be invisible is a mystery!

Question 6

(a) The majority of answers suffered from the twin problems of ignorance and vague/unclear description. Many candidates thought that the aluminium rod would be attracted by the small bar magnet, and likewise many thought the unmagnetised iron bar would not be. A good number of candidates did realise that the unmagnetised iron bar would be attracted, but did not realise that this was not a conclusive test until both ends had been found to be attracted. Similarly, attraction is not a test for the permanent magnet.

(b) Most candidates knew the core was made of iron. The commonest incorrect answer was 'copper'. Very poor answers were usually given to the other two parts. Many of these were caused by the fact that the candidate had just assumed the coil to be connected to a battery, so answers like 'close the switch' appeared with disappointing frequency.

Question 8

Very few candidates could describe what happens during radioactive decay.

(a) Many candidates scored no marks at all for this part, and many others only scored the mark awarded for saying that a particle was emitted.

(b) There were some reasonable answers to this part.

(c) However, a lot of candidates had no idea at all about answering this part. Some of these candidates would appear to have interpreted the question as being about the charge on particles.

Question 9

(a) Most candidates scored full marks in this part, although it was a good thing that markers were not penalising spelling. A few interchanged ammeter and voltmeter, but were not penalised on the next line, provided they put the correct letter for their meter. Most candidates, although not all, correctly identified the variable resistor, but its purpose was not so frequently known. In this case, 'to change the resistance' was not accepted.

(c) Answers in terms of finding the gradient immediately scored the mark, but answers involving V/I were often too imprecise to merit the mark. A good proportion of the better candidates could deal with the calculation, but there were a few who could not take readings correctly from the graph, or who divided them the wrong way, or who multiplied them. A mark was awarded for the correct unit.

(d) Candidates were undecided about the resistance of the wire in this part, and of those who correctly identified it as greater than before, a sizeable minority showed the gradient of their lines as less than the one printed on Fig. 9.2. Although the question clearly stated to answer this on Fig. 9.2, quite a few drew a new graph in the space below part **(d)**. This was not penalised if the candidate's graph could be clearly understood, but it is not wise for candidates to ignore a clear instruction in a question.

Question 10

(a) Most candidates spotted that 'aluminium' was the answer to all four parts of this section, and gave a reason in **(a)(i)** which could be understood as appropriate, even if not very well expressed.

(b) Again, it was usually only the weaker candidates who did not score both marks in this part.

(c) Only answers relating to pressure were acceptable in this part. Most candidates seemed to have some idea of the answer, but many lost marks because the answer was too vague or so badly expressed that a mark was not justified.

Question 11

Most parts of this question were well answered by most candidates. A few answered 'heat', or '100ºC' in **(a)**, and a few thought that shaking the thermometer or holding it up to your eye would check the zero mark in **(e)**, but otherwise answers were good. Teachers should remind their students that in **(e)**, the ice needs to be melting and pure.

Question 12

This was a slightly unusual question, but candidates answered it surprisingly well. Part **(a)** was the part they found most difficulty with, but parts **(b)** and **(c)** were well answered.

Paper 0625/03
Paper 3 (Extended)

General comments

After a number of years of steadily improving standards, the results of this examination can only be described as disappointing.

The number of candidates who struggled to express themselves in English rose markedly. This showed itself particularly where there was great disparity between parts of the same question requiring explanation and calculation. Whilst the calculations were generally correct, the explanations were so poorly expressed that awarding any credit was difficult. There was also considerable evidence that significant numbers of candidates misread or misunderstood what the question was actually asking due to a lack of English comprehension.

Other disappointing features were an increase in the proportion of very weak candidates scoring less than 10 marks on the paper, and far fewer outstanding candidates capable of attaining full marks on the majority of questions.

On the positive side, some Centres presented a very high proportion of very able, well prepared candidates who were able to score more than 60 marks out of 80.

In general, questions or parts of questions requiring explanation were poorly answered whilst calculations, with the exception of the one in **Question 5**, were very well answered.

Questions that required some experience and knowledge of experimental work have been poorly answered in the recent past. This examination continued this depressing trend, with the answers to **Question 3** being particularly poor.

Comments on specific questions

Question 1

(a)(i)(ii) Whilst most candidates scored full marks, it was disappointing to see so many who were unable to extract simple information from a graph with the required degree of accuracy.

(iii) Most candidates made reasonable attempts, mostly correct once 'error carried forward' had been allowed. Those who used the simple method of 'area under the graph' had no problems.

(b) The majority of candidates correctly quoted the appropriate formula for deceleration but a large number could not substitute correctly to obtain the answer. As in parts **(i)** and **(ii)**, wrong values from the graph seemed to be the major problem.

(c)(i) Arrows were drawn in every possible direction, with less than half showing the correct direction towards the centre of the track.

(ii) Simple answers such as 'keeps the train moving in a circle' were seldom seen, many candidates writing a great deal and giving little of value.

(iii) Very few candidates seemed to understand that the curve of the track meant that the track exerted a force on the wheels to provide the centripetal force needed.

Answers: **(a)(i)** 10m/s, **(ii)** 14s. **(iii)** 140m; **(b)** 1.9m/s^2.

Question 2

(a)(i) Most candidates knew the formula and obtained the correct numerical answer, but the unit was often wrong.

(ii) Those candidates who used force = rate of change of momentum usually obtained the correct answer, whilst those who insisted on using force = mass x acceleration seldom did.

(b) Many candidates correctly gave kinetic energy to heat. As always in these examples, kinetic energy to potential energy was a common error.

(c) Answers to this question were good, although too many tried to use force x distance and failed. A number quoted the formula correctly but then failed to square the velocity.

Answers: **(a)(i)** 4050kg m/s, **(ii)** 3380N; **(c)** 91kJ.

Question 3

The answers to this question were of a very low standard, even from the best candidates. The use of the term 'strong cotton' was misunderstood. Perhaps thread or fine string would have been better. Far too many candidates used bundles of cotton wool on one side of the ruler and both sets of masses on the other. It was very difficult to give much credit to these candidates.

(a) Many arrangements drawn could only be described as bizarre, which seemed odd as this should have been a very familiar standard moments experiment. However the majority of candidates did get full marks for this part.

(b) Vast numbers of candidates seemed only too keen to quote the principle of moments, which did not answer the question. Equally large numbers insisted on placing equal masses at equal distances from the pivot, without any adjustment whatsoever. The few who made adjustments were not inclined to explain why, i.e. to balance the ruler or make the ruler horizontal. The few who measured the distances from the pivot at equilibrium generally assumed the values of the masses or ignored them altogether. Far too many assumed that two sets of values were the mass and distance of one mass at each side.

(c) Few marks were scored here. Values of distance from the pivot seemed either to be many metres which were impossible on a metre rule, or a few centimetres which would have been nearly impossible to balance. In the same way, the scale of the masses was often quite absurd with 10kg not uncommonly high.

Question 4

(a) Many candidates took one look at the diagram and assumed this question was about Brownian motion, making the clearly stated molecule M into a large particle. Many others added air molecules to the enclosure which were not mentioned in the question. Amidst all this muddle it was possible to reward the majority, who explained that the many collisions were responsible for the irregular motion.

(b) Few candidates had a clear idea that the random motion was the reason for the displacement being small. Many were convinced that the collisions reduced the velocity of the molecules. Air molecules were claimed to be much more massive than M, and so stopped the gas molecules from spreading. Very few candidates referred to the diagram to point out that after many collisions, M ended almost back where it started.

Question 5

(a) For reasons that the Examiners could not see, candidates found this part of the question impossibly difficult. One candidate after another tried to work out the specific heat capacity and the specific latent heat and subtract the two. Matters were made much worse by an overwhelming desire to work in kg when the question was clearly about 1g. About 5% of the entry understood the question and had no difficulty in working out the answer.

Answer: **(a)** 1840J.

(b) This question was generally well answered. The idea of bonds or forces between liquid molecules was understood, and also that energy was needed to separate the molecules during evaporation.

(c)(i) Answers to this question were too vague. All that was required was that the change in property (length, volume) per degree was a measure of the sensitivity.

(ii) Answers to this question were vague and confused. All that was wanted was the difference between the highest measured temperature and the lowest measured temperature.

(iii) Some correct answers were seen. A simple statement that a linear scale meant equal intervals between each degree on the scale was all that was required.

Question 6

(a) This question was well answered, the only common error being to think that the frequency changed.

(b)(i) Constructions were on the whole good, although a significant number invented spurious rays which gave a real image.

(ii) Too many candidates gave an unsupported answer of x2, which was accepted for a correctly constructed image, but not where the construction was wrong. Eye positions were commonly on the wrong side of the lens.

Answer: **(b)(ii)** x2.

Question 7

(a) Answers were either very good and scored 2 or 3 marks depending on the direction chosen, or were just a mass of lines mostly not passing through A and B and generally crossing one another.

(b)(i) Mostly, a correct line was drawn through C but about one third of candidates chose the wrong direction.

(ii) The concept of a line of force as indicating the direction of the force was seldom seen. Lines repelling one another was not considered sufficient explanation at this level.

(iii) There was a high proportion of fully correct answers to this question.

Question 8

This was easily the best answered question on the paper, with many candidates scoring full marks on parts **(a)**, **(b)** and **(c)**.

(a) Even where the current at X and Y were wrong, many candidates correctly added the values to get the current at Z.

(b) There were very few wrong answers to this question, with both the whole circuit and the reciprocal formula methods used successfully.

(c) There were very few wrong answers to this question.

(d)(i) It was disappointing to see so many correct answers spoiled by not referring to the values worked out, thereby not fully answering the question.

(ii) There was some degree of muddle, but most candidates understood the advantages of switch placing in a parallel circuit.

Answers: **(a)** X = 2.5A, Y = 1.25A, Z = 3.75A; **(b)** 64Ω; **(c)(i)** 0.83A, **(ii)** A, 80V, B, 160V.

Question 9

(a) Every possible wrong connection was seen, with a large number connecting the d.c. supply to the c.r.o. About half the candidates had the connections correct.

(b) Very few correct answers were seen here, with many candidates not making any attempt. 0.4V and 4.4V were popular wrong answers. Very few candidates showed any working, so it was not possible to trace the source of wrong answers.

(c) Even good candidates found this hard. Those attempting to compare the resistances of the two instruments made little progress, but those that stated that the c.r.o. would display variations such as a.c. scored the mark. The vast majority of candidates wrote that the c.r.o. is more accurate, which was not accepted.

Answer: **(b)** 1.4V.

Question 10

(a) A satisfactory number of candidates scored both marks. Common errors were to add nothing to the electron symbol or to invert the 0 and −1.

(b)(i) The vast majority of candidates had the curve in the correct direction. This was often a mark scored by even the weakest of candidates.

(ii) This was very well answered by the majority of candidates.

(c) The large numbers of non-attempts made the Examiners wonder if some candidates had not turned to the back page in spite of the clear instruction to do so.

(i) All that was needed was a radioactive source at one side of the paper and some form of detector at the opposite side, together with labels. There were large numbers of attempts which met and, in some cases, greatly exceeded this basic requirement.

(ii) This was poorly answered in many cases because the candidates did not make it clear that a count rate was taken, and then the paper was moved or replaced by another sheet before a second count rate was taken. The conclusion from the results was usually correct. Many references to background count only added to the general confusion.

Paper 0625/04

Coursework

General comments

The candidates at the *majority of Centres* were given many opportunities to demonstrate their practical skills using a varied range of tasks from different areas of the syllabus. Clearly a large amount of good work has been completed by Teachers and candidates. It is pleasing to see that points made from previous Moderator's reports were noted. The assessment criteria were successfully applied and the marks awarded to candidates were not adjusted.

Comments on specific aspects of coursework

The following two points are relevant to a couple of Centres.

- Three skills should not be assessed in one task. It is acceptable to assess two skills using one task. The combinations that are most frequently used are ***C1*** and ***C2***; ***C2*** and ***C3***; ***C3*** and ***C4***.
- It should be noted that, although Moderators do not expect to see written evidence of ***Skill C1***, they do expect to be provided with details of how candidates achieved the marks awarded.

Paper 0625/05

Practical Test

General comments

The aim of the examination is to enable candidates to display their knowledge and understanding of practical physics techniques. These include the following,

- graph plotting;
- tabulation of readings;
- manipulation of data to obtain results;
- drawing conclusions;
- dealing with possible sources or error;
- control of variables;
- accurate measurements;
- choice of the most effective way to use the equipment provided.

The general level of competence shown by the candidates was pleasing. Candidates often dealt well with the variety of practical skills tested. Each question differentiated in different ways, but it was noticeable that most candidates coped equally well with each of the questions indicating a pleasing breadth of preparation for the examination.

Comments on specific questions

Question 1

The majority of candidates recorded the lengths correctly with correct units. Calculations were almost always carried out correctly, but a mark was lost if a candidate gave the final answers for volume to other than 2 or 3 significant figures.

In **method 2**, about 1 metre of string was provided and candidates were expected (for full marks) to wind the string round the tube at least 5 times and then calculate the circumference. This gives a more accurate result than just one turn of string and candidates are expected to realise how to use the equipment provided to obtain as accurate a result as possible. Some candidates ignored the string completely, measured the diameter with the metre rule and then calculated the circumference, which is clearly not an accurate method. Candidates should be advised that the apparatus is provided to be used and that there are no 'distractors'.

Question 2

Many candidates were able to take readings of current and voltage successfully. Some gave results that were clearly a power of 10 (or more) out, in relation to the units given. This was most common in the current column. Some candidates failed to gain the mark for the correct unit of resistance (Ω), and a few gave no units for current, voltage and resistance. For full credit, candidates were required to give current readings to better than 0.1 A and voltage readings to better than 0.5 V. Resistance values should be given to 2 or 3 significant figures and the number of significant figures should be consistent within a table column.

The diagram was usually completed, with most candidates drawing the lamps in parallel. Some did not know where to place the voltmeter on the diagram and others drew in extra connecting leads that served only to provide various short circuits. Credit was not given to candidates who included more than one voltmeter.

Question 3

The readings from the diagram were taken with a pleasing degree of accuracy by most candidates and recorded using correct units. The calculations were generally correctly carried out, but some candidates lost a mark by giving the final answer to other than 2 or 3 significant figures, or by including a unit for refractive index.

The ray diagram was often drawn well using thin, but clear, straight lines. The most common cause of lost marks was in placing the pins too close to each other. A more accurate result can be obtained if the pins are far apart, so the minimum distance apart allowed here to score the available marks was 5 cm. Some candidates lost marks by failing to mark the pin positions as asked in the question, or failing to complete the trace. Another cause of lost marks was using lines that were too thick. A good guide here is to advise candidates to draw lines with the same tolerance as graph lines (i.e. no thicker than the thick lines on the graph paper).

Some candidates were able to suggest a suitable precaution, for example, placing the pins as far apart as possible, viewing the bases of the pins or checking that they were vertical. It was not enough to record 'I avoided parallax', the candidate had to explain how this had been achieved.

Question 4

The actual temperatures that candidates will (correctly) record are, of course, difficult to predict because of the number of possible variables (room temperature, temperature of the hot water provided, draughts, etc.). The Examiners are not looking for a particular set of readings, therefore, but rather recording skills (in the table and on the graph) and the ability to draw a valid conclusion from the results as displayed on the graph.

A few candidates recorded room temperature as the starting temperature instead of the temperature of the hot water, but most completed the tables well. Those that scored full marks showed consistently in the table that they were recording the temperatures to 0.5ºC.

Graph plotting was often satisfactory. The most common causes of lost marks were poor judgement of the best fit lines, a line that was too thick (i.e. thicker than the thickest lines on the printed graph grid), misplots, *y*-axis not labelled, and an unsuitable *y*-axis scale (e.g. not covering at least half the graph grid or a poor choice of scale such as 3 squares representing 10 mm.

Candidates were expected to justify their statement about which thermometer cooled more quickly by reference to readings from the graph. The best candidates were able to make a concise statement, relating their conclusion to the graph gradient.

Paper 0625/06

Alternative to Practical

General comments

The aim of the examination is to enable candidates to display their knowledge and understanding of practical physics techniques. These include the following.

- graph plotting;
- tabulation of readings;
- manipulation of data to obtain results;
- drawing conclusions;
- dealing with possible sources of error;
- control of variables;
- accurate measurements;
- choice of most suitable apparatus.

It is assumed that, as far as is possible, the IGCSE course will be taught so that candidates undertake regular practical work as an integral part of their study of Physics. This examination should not be seen as suggesting that the course can be fully and effectively taught without practical work.

Clearly, some of the skills involved in practical work can be practiced without doing experiments, such as graph plotting, tabulation of readings, etc. However, there are parts of this examination in which the candidates are effectively being asked to answer from their own practical experience.

The answers given by some candidates in this examination point to a lack of practical Physics experience. This is noticeable where candidates are asked to suggest precautions taken or improvements made to improve accuracy or reliability.

The overall standard of work was pleasing.

Comments on specific questions

Question 1

Most candidates plotted the points accurately and chose a suitable scale for each axis. Scales that covered less than half the grid or used the *d* values equally spaced up the axis up were penalised, although this was rare. A more common error was to fail to plot the (0, 0) value from the table. Some lines were too thick and therefore lost a mark. A helpful guide is that the lines drawn on the graph should be no thicker than the thickest lines on the printed graph grid.

Most candidates were able to read the depression produced by a load of 2.5N correctly, but some lost a mark because they did not show on the graph how their value was obtained.

Part **(b)** was straightforward for candidates with the relevant experience, who realised, for example, that a metre rule would need to be clamped in position, close to the centre of the wooden strip, and to be vertical. The end resting on the floor was sufficient to illustrate this last point, or, of course, use of a set square).

Question 2

The first part of this question enabled candidates to show that they could interpret the scale on an ammeter. Most candidates coped well, but some made the mistakes one would expect, such as failing to look closely at the scale and assuming that one division represents 0.1A. Most candidates correctly calculated the resistances and scored full marks if the arithmetic and unit were correct, and all the answers were given to 2 or 3 significant figures.

Many candidates drew a correct diagram. Those that lost marks usually either drew a series circuit or included one or more short circuits. A mark was lost if a candidate drew more than one voltmeter.

Question 3

Accurate measurement was expected here as it is (albeit in a very limited sense) an opportunity for candidates to do some actual practical work, i.e. use a rule. Most candidates carried this out correctly, but some lost a mark for either calculating *t* incorrectly or failing to give its unit. Some candidates were out by a power of ten, writing *h* = 1.8mm or 180mm.

Many candidates calculated *V* correctly and gave a unit consistent with the earlier work.

Some candidates lost one or both of the marks for the value of *d* by using 1 or 4 significant figures, writing 2.57 instead of 0.00257 or 2.57^{-3} instead of 2.57×10^{-3}.

Part **(b)** was designed to enable candidates to show, from their experience, that they had a 'feel' for the correct position of the 100g mass. Full credit was given to those who calculated the position and then showed it on the diagram, even though the calculation was not required. A significant proportion of candidates placed the 100g mass on the wrong side of the pivot, or, if on the correct side, so far from the correct position that a mark could not be awarded. This would suggest that such candidates had little or no personal experience of a moments experiment.

Question 4

Most candidates calculated the temperature changes correctly. There were few careless errors. In part **(a)(ii)**, most candidates correctly suggested using the same heating time, the same volume of water, the same distance from the heater or the same size cans (any two of these gaining full marks). However, some candidates made suggestions that showed a lack of understanding of the purpose of the experiment described (e.g. use the same colour of paint on each can, or insulate all the cans with the same material).

In part **(b)(ii)**, few candidates were able to show the likely trend for the lines *A*, i.e. continuing the shallow curve back towards the common starting temperature (room temperature). The mark was not awarded if three separate lines were drawn straight across to the temperature axis, this being a common error.

Question 5

This question provided another opportunity for candidates to do something practically. The Examiners were therefore giving credit for accurately drawn, thin lines and the angle (30º) correct to ±1º. Part **(b)** caused much difficulty, again indicating lack of practical experience. The precautions expected were pins being placed as far apart as possible and either checking that the pins are vertical (using a set square, for example) or viewing the bases of the pins. Most candidates, in part **(c)**, were able to take the measurements correctly and to calculate the refractive index. To gain full marks here, candidates had to have obtained a value for refractive index corresponding to accurate distance measurements and to give the value to 2 or 3 significant figures, with no unit.