CONTENTS

PHYSICS

Paper 0625/01

Multiple Choice

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

General comments

The mean mark of 28.44 was lower than last year, but still close to the 30.00 target mark. At 5.82, the standard deviation was slightly lower than in 2003.

Candidates performed strongly (over 90% correct) in **Items 5**, **12**, **29**, **30** and **32**. Most difficulty (less than 60% correct) was experienced with **Items 9**, **14**, **18**, **23**, **24**, **26**, **38** and, particularly, **39**.

Comments on specific questions

Item 1

This caused few problems, with option **C** distracting 8% of candidates.

Item 2

Confusion led over a quarter of candidates mistakenly to calculate the frequency, thereby choosing **A.**

Item 3

One in four were confused and opted for **D**, presumably looking for the smallest acceleration rather than the greatest time.

Item 4

Response **D** was by far the most popular distractor, although the question gave the distance travelled by the train, not the direct distance.

Item 5

Candidates answered this item well.

Item 6

Option **A** attracted 26% of candidates, who calculated the mass of half the oil, without subtracting this amount again from 0.90kg to find the mass of the bottle.

Item 7

Determination of density was well understood by most.

Item 8

Option **B** caused the main difficulty.

Item 9

This was found very taxing, with nearly two thirds of candidates choosing either **A** or **D** – those opting for **A** failed to calculate extension, and those choosing **D** also missed the incorrect scale on the vertical axis. It would be advisable to stress the difference between extension and measured length.

Item 10

This was well answered.

Item 11

This item did not cause problems for most, although 15% chose **C**, confusing the direction of energy change.

Items 12, 13 and 14

The pressure items, **12** and **13** were found easy, but **Item 14** led over two thirds to opt for **C**, these candidates believing molecules in a solid to be stationary.

Item 15

Selection of response **B** demonstrated that 28% thought molecules expand with temperature rise.

Item 16

One in five chose **C**, failing to spot the large change in atomic spacing.

Item 17

A large number opted for **A** (73%), demonstrating confusion between temperature change and energy supplied.

Item 18

All three distractors were chosen, missing the point that the vacuum does not affect heat loss by radiation.

Item 19

Understandably, distractor **D** proved most popular, but those choosing this option failed to appreciate that there would be a convection current in the water.

Item 20

Distractors **A** and **C** were each chosen by 13%, showing a lack of understanding of the transverse nature of water waves.

Item 21

Most false responses were **C**, despite the link between water depth and wave speed being supplied.

Item 22

The fact that dispersion of white light starts at the first air/glass interface should be stressed, as **A** was the distractor chosen by most.

Item 23

This clearly caused problems – several candidates had learnt a list, but failed to consider relative wavelengths.

Items 24 and 25

The popularity of option **A** in **Item 24** showed lack of understanding, but fewer were caught out by **Item 25**.

Items 26 and 27

It was distractor **C** in **Item 26** which caused most errors – understanding again, but the other magnetism item, **27** was proved less challenging.

Items 28, 29, 30, 31 and 32

Electricity appears to have been well understood, as shown by good performance in **Items 28**, **29**, **30**, **31** and **32**.

Item 33

It was mainly distractor **D** which led candidates astray in this item, showing some uncertainty of the need for a complete circuit for any lamp to light.

Items 34 and 35

Candidates found these questions quite straightforward.

Item 36

All options attracted some candidates.

Item 37

It was option **C** which was the most popular distractor.

Item 38

This item caused problems for most, with more than one in four choosing **D**, and nearly one in five opting for **C**. Items in this form are more taxing than those showing numerical values, but it is pleasing to see that almost half of the candidates correctly identified the answer.

Item 39

By far the worst answered item on the paper. Nearly three quarters chose **D**, failing to read that the structure of the nucleus was required, not the complete atom.

Item 40

This was generally well answered, although 13% opted for **B**, presumably giving the number of neutrons in the nucleus.

Paper 0625/02

Paper 2 (Core)

General comments

Many candidates produced excellent scripts in this examination. There were several questions where they were required to write more than just a one-word or a one-sentence answer, and most candidates made good attempts, even if their Physics was sometimes incorrect. Similarly, numerical questions usually produced good answers, with even the weaker candidates scoring some marks. Work was usually well set out, with working shown where appropriate, and very few candidates failed to use appropriate units. Teachers are to be commended for setting their candidates good scientific practices to follow. There was no question on the paper which proved beyond the ability of a large number of candidates, and even weak candidates managed to score some marks on most questions.

Comments on specific questions

Question 1

There were clearly some cases where stability and centres of gravity could have received more study, because part **(a)** was poorly done by many candidates. Many drew diagonals and marked *G* at the intersection, and some put *G* on *AB* or *SR*, but very few had a genuine idea of where it should be. Anywhere to the left of the “vertical” through the centre of *AB* would have been acceptable for the mark, but few got this. There were similar problems with Fig. 1.2. However, **(b)** and **(c)** brought some good responses, most knowing the correct reasons. In **(b)** some weaker candidates thought that **A** was safer (correct), but that the reason was that the flask did not have as far to fall if it should slip.

Question 2

Answers to this question ranged from the irrelevant to the excellent. The impression was that some candidates knew the answer, but lost marks because they were not skilled in organising their thoughts into a logical sequence, and so omitted important points. It is suggested that the practice of formal report writing, with an “Aim”, a “Method” etc. has a lot to recommend it for building up this skill. It is a pity that candidates who probably do know all the things required by the mark scheme lose marks because they do not organise their thoughts.

Question 3

Many answers to this question were disappointing, because this is a fairly standard energy transformation question, of a type which has been used many times before. Of course, some candidates scored full marks, but there were also many who only seemed to know about *PE* and *KE*, and filled in the boxes with a selection of these two. Some candidates seemed to think that there is a difference between what they called gravitational energy and potential energy (not strain energy). Some thought that the stationary rocks at the bottom still had *KE*. Any appropriate variation in the naming of the correct types of energy was acceptable in this question.

Question 4

Generally, this question was well tackled. Most candidates had a good understanding of the relationship between pressure and area and were able to apply their understanding to the three situations. Quite a few omitted to involve weight in their answers to **(b)** and so were penalised one mark.

Question 5

As has often been the case in the past, ray optics is a weak area in many candidates’ understanding, as is the ability to draw a careful and accurate diagram. It is just as important for an answer given in the form of a diagram or a graph to be accurate, as it is for a numerical answer to be accurate. In the past, drawing normals on rectangular blocks etc has been no problem for most candidates, but large numbers were incapable of accurately drawing the normals on Fig. 5.1. Perhaps it was the fact that the two surfaces were not either horizontal or vertical which caused candidates to err, but some even went as far as to draw them along the line BD. Whether or not a candidate had the normals correct, many showed refraction towards the normal (i.e. the two rays diverged). Pleasingly, though, a large number realised that the ray to P would continue straight on. A tiny number said that it would be split (into 2), and of course this was acceptable, but not that it was dispersed.

Question 6

This was a straightforward "recall" question which candidates were able to answer easily or not at all.

Question 7

This question was well done by nearly all candidates, and even weak candidates usually scored well. The most common cause of lost marks was to confuse the functions of the two meters in Fig. 7.2 (i.e. to say that meter 1 was an ammeter and meter 2 a voltmeter). Very few failed to read the meters correctly in **(b)(v)**, and virtually all knew and could use the appropriate equation to find the resistance and the resistance per metre.

Answer: 25 Ω, 0.5 Ω/m.

Question 8

There were many excellent answers to this question, although the comment on **Question 2** is relevant here as well. Equal credit was given to the method using iron filings and that using one or more plotting compasses. Quite often answers were only spoiled by the omission of some pertinent detail. Some weak candidates simply drew their version of the magnetic field of a bar magnet and then proceeded to describe what they had drawn - "The field line comes out of the North pole and then ...." Many candidates, even some good ones, could not answer **(b)** clearly enough to merit the mark. For instance, "Test it with the *N* or *S* pole of another magnet" was not adequate.

Question 9

If part **(a)** had been asked in the form of Proton Number *Z* and Nucleon Number *A*, it is possible that more candidates would have scored well. As it was, lots did not know the answers. Most knew that one or more of the three things decreased, but fewer knew by how much. It would seem that half-life is fairly well known in most Centres. Once a candidate had spotted that three half lives were involved, there were not many who could not also do the correct sum.

Answer: 400 count/min.

Question 10

Graphs! Most, but not all, could plot correctly, but large numbers plotted with enormous blobs or large crosses, many of which were not drawn carefully. It was expected that all points should be within ½ a small square of the correct place. A lot of candidates were very close to losing between 1 and 3 marks because of their careless plotting. Candidates were not asked to draw a line through their points, and there were no marks for this, but many did draw a line and it is worth commenting that most were very poorly drawn, and would have lost the mark if there had been one allocated for it. Identifying the incorrect extension was not a problem for most, although it is worth pointing out to candidates that the instruction said to circle the incorrect extension *on the table*. The vast majority circled the point on the graph. This was not penalised if the correct point was circled, but candidates should appreciate that if instructions are not followed, it *can* lead to loss of marks.

Question 11

Most candidates could answer all three parts of **(a)** correctly. Some used 110° and –10° for **(i)** and **(ii)** respectively, and a few used 28° somewhere, but usually correct answers were given. Many candidates clearly did not know a typical temperature for a freezer, but any temperature shown below 0° was acceptable here. Almost invariably, answers to **(b)** were too vague to be worth the mark e.g. "resistance of a thermistor" was acceptable, but not just "resistance" or "a thermistor".

Question 12

As with other numerical questions, this question was usually very well done, with many candidates scoring all 5 marks. Surprisingly, lots of candidates misread 8000 turns as 800 turns. If their working was otherwise correct, this mistake only cost them 1 mark.

Answer: 200, 200, 400.

Paper 0625/03

Paper 3

General comments

The impression gained by the Examiners was that the larger entry contained many excellent candidates with fewer very weak entries. Nevertheless, in purely mark terms, scores were slightly lower right across the ability range. This was possibly due to the difficulty that even the good candidates had with **Questions 1 (c)**, **5 (b)** and **11 (c)**.

The general standard of explanations was similar to that seen in previous years, that is only just acceptable. There seems to be a wrong assumption that to write a great deal is a certain route to high marks. The lines, spaces and numbers of marks are meant to give a guide as to how much is required. Sadly there is little evidence that most candidates use these clues when forming their answers.

As always, accounts of experiments or experimental procedures were poorly described. This seems to be made worse by a lack of logic in the order of presenting information.

Calculation skills continue to be strong, with a great number gaining full marks on **Questions 2** and **10**. This was true even in the cases of relatively weak candidates. However, **Question 4 (c)** proved to be an exception to the rule, with relatively few correct answers seen. Units on final numerical answers continue to be largely correct but the usual confusions arose between the units of speed and acceleration, specific heat capacity and specific latent heat and between energy and power.

The majority of the entry coped very well with both the reading and writing of English, but a significant minority showed clearly in their answers that their lack of command of the language was a serious drawback.

Comments on specific questions

Question 1

(a) The graph work was correctly answered by the majority of candidates. In part **(iii)** those who used the area method generally succeeded in finding the correct area, but a significant number did not. Very few successfully used the average speed x time method, much more usual was to multiply a single speed by time.

(b) The candidates performed well on both parts, with a high proportion of full mark answers. The unit of acceleration was often wrongly given as m/s.

(c) Part **(i)** was very poorly answered with many candidates just leaving it blank. The most frequent wrong answers stated that the graph directly showed constant speed, constant velocity or constant force. Many of those that started correctly from constant acceleration stopped at that point. Only a small number went on to quote F = ma and hence tie the constant acceleration to constant force.

A surprisingly large number gave the wrong direction for the centripetal force in **(iii)**.

Answers: **(a)(i)** 7 s, **(iii)** 22 m; **(b)(ii)** 1.9 m/s^2

Question 2

(a) A high proportion scored full marks. There were few incorrect units for pressure. The most common error was to try to use pressure = force/area, which led nowhere.

(b) Again a high proportion of fully correct answers, although a number could not deal with the dimensions in mm, and the conversion to m.

Answers: **(a)** 500 000 Pa; **(b)** 5250 N.

Question 3

(a) The vast majority scored the two marks available but a few had the child of mass 18 kg nearer the pivot.

(b) There were two points here, numerically equal moments and moments in the opposite sense. Many candidates made the first point but not the second.

However anticlockwise moments = clockwise moments covered both points and scored the mark.

(c) This straightforward moments calculation produced a high proportion of correct answers. As expected the usual mistake was to multiply the forces by the wrong distances.

Answer: **(c)** 2.25 m.

Question 4

(a) Long involved answers were common, sometimes not in molecular terms. Clear statements that the heating gave extra energy to some of the molecules and that if these molecules were at the surface they were likely to escape the liquid were rare.

(b) Good answers were seen from most candidates. Both marks were given for either the surface/body of liquid comparison or the one temperature/all temperatures comparison.

(c) The standard of answer given was poor for a calculation similar to ones set in the past that had produced good answers. The main reason seemed to be a confusion between specific latent heat and specific heat capacity. Some, using the wrong formula, tried to use a temperature rise of 0°C.

Answer: **(c)** 2250 J/g.

Question 5

(a) Almost all candidates correctly gave nitrogen in **(i)**, but the explanations in **(ii)** were generally poor. Few realised the importance of bonding in reducing expansion and so most concentrated their answers on the separation of the molecules.

(b) Both parts were very poorly answered, the majority scoring zero. The common mistake in **(i)** was to confuse sensitivity with accuracy thinking only of high sensitivity. Linearity seemed to be largely unknown. The best way for candidates to answer this type of question is to state simple definitions, but most did not do this.

Question 6

(a) A wide spread of answer quality was seen with a high proportion gaining full marks. Some gave two fronts when the question asked for three.

(b) Almost all tried to use the correct wave equation, mostly completely successfully. Common mistakes were the use of the index 4 instead of 14, wrong transposition of the equation and an inability to deal with negative powers of 10.

Answers: **(b)** 6×10^{-7}.

Question 7

The general standard of the ray diagrams was unacceptably poor. That said, a minority of candidates answered perfectly and scored full marks. It seemed surprising that so many apparently able candidates could not correctly mark the two foci of the lens on a full-scale diagram when given a value. The only mark scored by many candidates was the ray through the centre of the lens. Otherwise attempts at “rays” could only be described as random lines.

Most candidates scored a mark in **(e)** even when their ray diagrams showed a real Image.

Question 8

(a) A good set of answers, many scoring all 3 marks. Common errors were only a positive scale, 1.5 waves instead of 3 and waves of different amplitude.

(b) As expected this produced a wide range of answers, perhaps not of the high standard seen with similar questions in recent papers. The most common error was a confusion with an electric motor.

(c) Well answered even by those who had described a motor in **(b)**. Some started with the person turning the handle providing energy from potential/chemical energy which did not gain extra credit.

Question 9

(a) There were few sensible answers to **(i)** but **(ii)** was mostly correct. The third part was very poorly answered. Where a standard voltage was applied to the oscilloscope hardly any candidates stated that this must be applied to the Y-input. Even fewer compared the subsequent reading on the screen to the standard voltage applied.

(b)(i) Surprisingly few read between corresponding points on the traces and so their values fell outside acceptable limits.

(ii) There were mostly correct answers once a carry forward error from **(i)** had been applied.

(iii) Answers were spoilt by not being sufficiently exact, for example "for races" needed to be "to time a small interval between first and second".

Answers: **(a)(ii)** 1.6V; **(b)(i)** 6.1 cm, **(ii)** 30.5 ms.

Question 10

All parts of the question produced a high proportion of wholly correct answers, together with correct units. Where full marks were not scored, many candidates improved their score by showing clearly the equations used and their substitution. This allowed carry-forward to be allowed between parts. In the few cases where bare wrong answers were given no credit was allowed. The main errors were in **(b)(i)** where obscure calculations were done instead of using the algebraic sum of the currents is zero at a junction and in **(b)(ii)** where energy and power were confused.

Answers: **(a)** 12.5A; **(b)(i)** 7.5 A, **(ii)** 90 W, **(iii)** 1.6Ω.

Question 11

(a) The better candidates had no problem with this routine question.

(b) Large numbers of candidates had the particles moving either to the N pole or the S pole by attraction. Others merely said upwards which could have meant towards the N pole or out of the paper. Those who used the phrase "out of the paper" were safe and scored the marks. Only a small minority stated a curved path or drew a curved path.

(c) In part **(i)** clear statements that radiation levels were monitored by a detector outside the body were hard to find. Most stated that a detector detected the presence of the isotope directly. There were many improbable methods suggested including removing blood samples for analysis.

In part **(ii)** far too many gave the usual absorption properties of alpha and beta particles without relating these to the situation in the question. Some good references to cell damage by ionisation were common and were given credit.

Paper 0625/04

Coursework

General comments

The candidates at the small number of Centres involved in coursework 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. All of the samples illustrated clear annotated marks and comments, which was helpful during the moderation process.

It is pleasing to see that points made from previous Moderators' Reports were noted. The assessment criteria were successfully applied and the marks awarded to candidates were not adjusted.

The following two points are still relevant to all Centres for the future:

- 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:

- 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 sound. Very few candidates failed to attempt all sections of each of the questions. There was no evidence of candidates suffering from lack of time. Many candidates dealt well with the range of practical skills tested. Each question differentiated in its own way and it was pleasing that the majority of candidates showed evidence of good preparation for all the different types of question in the examination.

Comments on specific questions

Question 1

(b)(c) Full marks were awarded here, to candidates who recorded all the temperatures showing decreasing temperatures and who gave all temperatures to better than $1^{o}C$. Many failed to show this level of accuracy. A disappointingly large number of candidates did not complete the column headings in the table by inserting the units for time (s) and temperature (^{o}C).

(d) The graph was generally accurately plotted but a suitable time scale (50, 100, 150 etc.) avoiding the use of 10 graph squares representing some multiple of 3 (e.g. 60, 120, 180 etc.) was seen less often. Some candidates lost marks since their lines were too thick or poorly judged best fit curves. Marks were carelessly and needlessly lost by candidates who failed to label the two lines as instructed.

(e) Most candidates correctly stated which container cooled more quickly. A significantly larger proportion of candidates than in previous examinations justified their conclusion by reference to the graph, with a pleasing number comparing the steepness of the curves. Other candidates attempted a theoretical answer. They should be advised that theoretical answers are not required in the practical examination.

Question 2

(b)–(f) Most candidates took the readings carefully and accurately and followed up with correct calculations. Some candidates lost a mark by failing to show that they could read the metre rule to better than the nearest cm. Errors in the calculation were rarely seen. Few candidates gave incorrect *y* values that were the result of merely writing the position on the rule (e.g. 75 cm), rather than the distance to the pivot. Candidates who carried out the experiment with care and precision obtained two *t* values that were within 0.5 cm of each other and this level of accuracy attracted a mark.

(g) Candidates gained full marks if they showed how to calculate the average and gave their final answer to 2 or 3 significant figures with the correct unit (most chose cm as this was indicated in the question, but an answer correctly given in m or mm was allowed).

Question 3

(a)–(i) Most candidates seemed to understand what was required here and were able to draw a ray diagram that indicated familiarity with this type of experiment. A few candidates appeared to have no previous experience. Some candidates lost marks by drawing lines that were either too thick or not straight, or both. Increasingly in this examination, candidates were placing their pins at least 5 cm apart. It is pleasing to see that they have been trained to do this but part **(i)** answers suggest many do not understand the reason for this (see below).

(j) Most candidates measured the distances correctly, but disappointingly few had carried out the experiment with sufficient care to be awarded the mark for **AY** and **YX** being equal to within 10 mm.

(k)–(l) This section was rarely well answered. The question wording included 'in spite of carrying out the experiment with care'. This was apparently ignored by most candidates who gave answers that effectively said 'I did it carelessly'. When carrying out practical work during the course, candidates should be encouraged to think about and discuss measurements that were in some way difficult to take and possible inaccuracies that may be due to the apparatus itself regardless of the care with which the experimental work is done. For example, in this case the thickness of the mirror or the pins.

Similarly, when thinking about the lining up of the pins, it is clear that it is very difficult, whilst adjusting the position of a pin to get it aligned correctly, and to ensure at the same time that the pins are vertical. To overcome this problem it is good practice to line up by viewing the bases of the pins. So to answer part **(l)** a candidate could score both marks by writing 'I lined up the pins by viewing the bases of the pins. It does not then matter if they are not vertical'. There are other precautions that could be used and many different ways of wording the explanations. The Examiners will always give credit for good physics. The example given here is to illustrate the type of answer the Examiner is looking for and that a long explanation is not required.

Question 4

(b)–(g) The majority of candidates recorded the lengths and voltages correctly with *x* values given to 3 dp in metres and *V* values given to at least 1 dp in volts. Full marks for *k* were awarded if the values were arithmetically correct, all to 2 or all to 3 sf, the unit V/m and all the values the same to within ten percent. Many candidates scored most of the available marks. The most common cause of a lost mark was inconsistency in the number of significant figures to which the *k* value was recorded.

(h) It was more difficult for candidates to look at their results and write a conclusion. Many candidates were able to record that as the length increased, the voltage increased. The best candidates were able to conclude that the voltage was proportional to the length and to justify that by writing that *k* is constant (within the limits of experimental error).

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:

- 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 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 practised without doing experiments – 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.

Some candidates have a good overall understanding of what is required, backed by personal practical experience and therefore score high marks. Others, obtaining lower marks, appear to have limited experience.

Comments on specific questions

Question 1

(a) Those candidates who realised the significance of having a metre of string described wrapping it round the tube a number of times and then dividing the length used by that number to obtain the circumference value. Unfortunately many candidates missed the point and suggested a range of inaccurate or impractical methods.

(b) Candidates who did not realise how the blocks should be used often showed them as supports for the tube to rest on. Most candidates measured the length correctly although some ignored the end part of the tube.

(c) Most candidates calculated the volume correctly and gave the correct unit, cm^3.

(d) Very few candidates seemed able to estimate the required volume. A reasonably wide tolerance was allowed but many were well outside the acceptable values. A surprisingly large number of candidates launched into calculations involving the volume of a sphere and the like. Some candidates added their estimated value to *V* instead of subtracting.

Question 2

(a) Many candidates correctly measured the angle of incidence having drawn in the incident and reflected rays and normal. To gain full marks the lines must be drawn neatly and in the correct positions. This is an example of where, in this Alternative-to-Practical Paper, the candidates are asked to do something of a practical nature; in this case, measuring angles and drawing lines. The Examiners expect, therefore, a high level of care and accuracy as candidates demonstrate their practical skill.

(b) Most candidates continued the lines as expected and gained marks for accurately measuring the two distances. Fewer, however, had drawn their lines with sufficient accuracy to score the mark awarded for the two distances being within 10mm of each other.

(c) This section was rarely well answered. The question wording included 'in spite of very careful work'. This was apparently ignored by most candidates who gave answers that effectively said 'The student did it carelessly'. When carrying out practical work during the course, candidates should be encouraged to think about and discuss measurements that were in some way difficult to take and possible inaccuracies that may be due to the apparatus itself regardless of the care with which the experimental work is done. For example, in this case, the thickness of the mirror or the pins.

Question 3

(a) Most candidates correctly showed the position of the pointer.

(b) Most candidates correctly identified the variable resistor. To gain full marks in the table, candidates had to write in the correct units (most did but some apparently ignored the instruction), and then perform correct calculations giving the answers consistently to either 2 or 3 significant figures. Many correctly suggested using the variable resistor to vary *V* (the most obvious answer the Examiners expected to see) but credit was also given for other workable suggestions, e.g. changing the number of cells.

(c) Here it was clear that some candidates are not familiar with setting up circuits and in particular do not realise that the ammeter must be in series with the component(s) carrying the current to be measured, whereas the voltmeter must be in parallel with the relevant component(s).

Question 4

(a) Most candidates chose a good scale that filled the grid. Some merely wrote the readings from the table equally spaced along the axes. These candidates lost the mark for sensible choice of scale and also the marks for accurate plotting since the scale rendered the plots meaningless. They were however still awarded the line marks if appropriate. Others chose a scale that used less than half of the available grid and so lost the mark for good choice of scale. Some line work was poor: large plots, thick lines, 'dot-to-dot' lines and carelessly placed best fit lines.

(b) Many candidates were able to calculate the gradient correctly but a significant number lost a mark because they failed to follow the instruction to show clearly on the graph how they obtained the necessary information. The most careful candidates drew a clear, large triangle.

Question 5

(a) Many candidates scored full marks here. It is pleasing to see better understanding of the concept of identifying and controlling variables.

(b) Most candidates recorded the temperature of 64°C correctly but the expected wrong readings (60.4°C and 76°C) were also seen.

(c) Around half of all candidates correctly interpreted the graph and realised that beaker **B** cooled most quickly. Most of the others suggested beaker **C** and a few suggested beaker **A**.