CONTENTS

PHYSICS **2**
Paper 0625/01 Multiple Choice 2
Paper 0625/02 Paper 2 (Core) 3
Paper 0625/03 Paper 3 5
Paper 0625/04 Coursework 9
Paper 0625/05 Practical Test 9
Paper 0625/06 Alternative to Practical 11

PHYSICS

Paper 0625/01

Multiple Choice

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

General comments

This paper produced 32.015 as a mean score, close to the target facility. The standard deviation was 5.933, slightly higher than in 2003.

Items with a facility of over 90% were items **1**, **2**, **6**, **7**, **8**, **13**, **26**, **27**, **31**, **33** and **38**, whereas only item **9** was found very difficult.

Comments on specific questions

The straightforward measurement **Items 1** and **2** (and "easy" start) caused little difficulty. In **Item 3**, understandably option **C** was the most popular distractor. **Item 4** was in a different format from most previous items, and all distractors were effective, particularly option **A**. In **Item 5** nearly one in ten candidates opted for mass as the name of the force, and in **Item 6**, options **A** and **C** were almost equally popular. **Item 7** on springs was well answered, as was **Item 8** on energy change. The difficulty caused by **Item 9** meant that 47% opted for **C**, suggesting candidates either failed to read the word 'level' in the stem, or did not link this to there being no change in gravitational energy. In **Item 10** a third of candidates chose roughly equally between the three distractors, showing a lack of understanding of the simple link between height and gravitational energy. In the better answered **Item 11**, most incorrect responses involved the choice of **C** or, to a lesser extent, **B**. The figures for **Item 12** were very similar, with option **B**, followed by **C**, as the popular errors – those choosing **B** appear to have incorrectly linked width of tube to pressure.

The simple **Item 13** caused little difficulty, but in **Item 14** it was options **A** and **C** which distracted nearly one in four candidates who failed to link constant temperature with constant molecular energy. The recall **Item 15** caught out some, but more were unable to answer the more challenging **Item 16**, with all distractors being effective – this item was carefully worded to ensure that the key would be clear. **Item 17** on density was generally well answered, but **Item 18** showed lack of basic revision of waves by several candidates. This weakness was more apparent in the refraction **Item 19**, in which nearly a quarter of candidates opted for **C**, despite the reminder in the stem about the link between depth and speed. **Item 20** involved recall, and once again showed lack of revision. Responses in **Item 21** were better, but it still caused problems for several. In **Item 22**, almost one in four chose **B**, reading the clock without considering the reflection. Of those unsure of **Item 23** most chose **A**, which was closest to the correct answer, but still showed lack of revision. In **Item 24**, the majority of incorrect candidates chose **C** – they appreciated the difference in speed between light and sound, but misremembered which was the higher. The magnetic field **Item 25** confused roughly one third of candidates, but **Item 26** was much better answered, as was **Item 27**.

Most candidates were well prepared for **Item 28** and **Item 29** on resistance, but option **B** attracted 13% of responses in **Item 30** from candidates unsure of consistency of current in a circuit. Although **Item 31** caused little difficulty, in **Item 32**, almost one in four candidates failed to link parallel resistors with decreased resistance. The purpose of fuses was well known – **Item 33**, but 25% of candidates believed that a 10A fuse would be best in **Item 34**, failing to understand that the fuse rating should be lower than the wire which it protects. In **Item 35** **A** and **D** were the more popular distractors, possibly showing at least partial understanding of transformers. Several candidates lacked knowledge of electromagnet core material in **Item 36**, and more than a fifth in **Item 37** took their cue incorrectly from 'thermionic' to lead them to ions as the particles involved in the process of emission. **Item 38** was well answered, but fewer were sure about penetrating power in **Item 39**. The inclusion of the final **Item 40** was easy to predict in some form, but not all candidates were able to answer correctly.

Paper 0625/02
Paper 2 (Core)

General comments

There were many candidates who produced excellent scripts in this examination – not many outstanding scripts, but nevertheless many who had clearly prepared well for this examination. There were several questions where they were required to write explanations, and many candidates made good attempts. Most candidates found that they had ample opportunity to demonstrate their competence. 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. Even weak candidates managed to score some marks on most questions. It has to be commented that the standard of handwriting often left something to be desired. Candidates are not penalised for this, nor for poor English, but if the Examiner simply cannot make out what the candidate is trying to say, there is no way that marks can be awarded. This is a silly way for candidates to lose marks.

Comments on specific questions

Question 1

Most candidates coped well with this. The only regularly occurring mistake was to use 96 as the volume in **(c)**, or to do the division upside-down.

Answer: 96, 0.05.

Question 2

Part **(a)** was usually correctly answered, although occasionally the movement of the two levels was reversed. In part **(b)**, candidates were frequently confused between force and pressure, especially as related to area. So, it was common for the answers "same" and "greater" to be reversed in **(b)**.

Answer: 21.

Question 3

As is often the case, the calculation in part **(a)** was usually competently performed, except by those who insisted in trying to convert to cm and g. This question also tested some knowledge of units. It was pleasing that so many scored the marks for these – a few forgot or mixed them up, especially those trying to work in cm etc., but most scored the marks. Candidates found much more difficulty with **(b)**. Only the better ones realised that the density difference was due to the air in the corrugated cardboard. Some of those who mentioned air, thought that it would add to the density of the paper.

Answer: 0.06 m^3, 120 kg/m^3.

Question 4

Beyond KE and PE (by whatever names they are called), most candidates seem to have little understanding of energy. There were a few candidates well-drilled in energy transfers, but for most, answers almost seemed a random choice. Weaker candidates sometimes confused types of energy with energy transfer processes, which of course this question also involved. Thus, such answers as “conduction” and “radiation” were given for **(a)(i)**, and elsewhere.

Question 5

Most had some idea about what is seen through the microscope in **(a)**. Indeed, it was good to see, from the wording they used, how many had apparently actually made this observation for themselves. Not so many were clear about what it was they were seeing. Quite a few thought they were looking at air particles/molecules moving about. Some thought that the specks of light they could see were due to air and smoke particle colliding and giving off sparks. In **(b)**, a great number, possibly a majority, referred to smoke particles bombarding air particles, rather than the other way round. However, a big proportion made no mention of air particles, and talked about smoke particles colliding with each other, or even that the light beam caused the changes of direction of the smoke particles. Most made a sensible attempt at **(c)**.

Question 6

Surprisingly, by no means all candidates scored all three marks available for **(a)**. Quite a few missed out one or more of the metals and cork and polystyrene were often included in the selection. For those who answered “non-conductor” to part **(b)**, it should be pointed out that this repeats the question, and that “insulator” was the intended answer. Some of the candidates must have very strange cooking pots and kettles, if answers to **(c)** are to be trusted! There were lots of cooking pots with polystyrene or cork bases, and even one or two kettles with gold handles. In **(d)**, a good proportion could name or describe convection, but fewer could clearly explain why the element in a kettle is at the bottom, even though any intelligent mention of convection currents would have sufficed.

Question 7

The calculation in **(a)** generally proved no problem, except for those who assumed this was an echo situation. However, very few realised the assumption they were making in the calculation, namely that light travel instantaneously/very fast. Most gave no answer or something irrelevant. It was not acceptable simply to say, as some did, that light travels faster than sound. Other options were acceptable, but very few offered anything worth marks. Candidates often made intelligent attempts at **(b)**, and most scored at least one mark. Some said the speed of sound would be faster and others gave ambiguous answers, which could be interpreted as this or as the sound reaching the girl in shorter time e.g. “The sounds travels faster to the girl.”

Answer: 320.

Question 8

As is often the case with electrostatics, this question usually scored poorly. By far the most common set of answers was top two lines correct, bottom three lines incorrect. Like charges are clearly known to repel, but surprisingly line 3 did not often lead to the answer “attraction”. Virtually no candidate realised that a charged body and an uncharged body attract, so the last 2 marks were rarely scored. Most said “nothing” to these two.

Question 9

There are still a large number of candidates who do not know that the current is the same at all points in a series circuit. For some reason there were a lot of 0.3A and 0.03A answers. Most, but not all could find the combined resistance in **(a)(ii)**. There were a mixed selection of answers to **(b)**, but probably no worse than those to **(a)**. The positive side was that good candidates were scoring all the marks on this question.

Answer: 3, 3, 20, 1.5, 3, 5.

Question 10

Most candidates made a good attempt at this question. There were, of course those who had little idea, but generally there was a good understanding. Candidates sometimes lost one of the 2 marks for each of **(e)** and **(f)**. There were two answers to each of these two parts and even weaker candidates could have picked up this fact from the allocation of 2 marks, whereas all previous parts only had one mark allocated, and also from the change to the use of the word "are". Questions do sometimes have internal prompts like these, which candidates who read the question carefully enough can use to help them.

Question 11

Ray optics always seems to be a problem for candidates who sit this paper, a fact which teachers would do well to remember when they are planning the time allocation for the various parts of the syllabus. A lot did not know what either the principal focus or the focal length of a lens are. Very large numbers tried to answer **(a)(ii)** by using a single letter. It was impossible to specify a length using only one letter, a fact which could be explained to candidates. Of the nearly-correct answers to **(a)(ii)**, AB and DE were popular. In part **(b)**, all sorts of combinations were offered. It can be pointed out that in this question (and in many previous similar ones) the words which might describe the image are arranged in pairs vertically, and the marker marks them in pairs using "right plus wrong equals nought". So, for instance, an image cannot be both real and virtual. Thus a candidate who ticks both of these is bound to score zero marks for that property. There were lots of poor attempts at **(c)**, including many which did not start at the top of the object or did not stop at the top of the image. Some scored the mark because they clearly knew the answer, but many of these would have lost the mark if stricter standards about accuracy had been applied. It is important that the candidates apply the same standard of accuracy to drawings as they do to calculations. An approximately correct calculation is not regarded as acceptable; neither should be an approximately correct drawing.

Question 12

Part **(a)** was done with pleasing accuracy by a large proportion of candidates. This was not the case with part **(b)**. The majority thought that the right hand ornament would be more stable because it is heavier, and that the block **B** would topple first, for the same reason. Some better candidates got into language difficulties trying to describe that the block would topple when the vertical through the centre of mass passes outside the base in contact with the ground. This is particularly difficult to put into words, so if it was clear what they were trying to say, the marks were awarded, even if the expression was not strictly accurate. Some talked about **A** having a smaller surface area, and again this was given credit, even though not strictly relevant. A small minority thought that **B** would topple first because it was further from the hinge.

Paper 0625/03

Paper 3

General comments

On the whole some scripts could only be described as disappointing. However, the scripts from some candidates were excellent with many marks in the seventies and sixties.

Sadly these were the exceptions. Far too many candidates appeared to be unprepared for a test of this standard and scored marks in the low teens or single figures.

The paper seemed to divide into two parts, **Questions 1** to **7** inclusive that were answered well by the majority of candidates and **Questions 8** to **11** inclusive that were answered badly by the majority of candidates. It is a matter of conjecture whether or not the poor attempts at the last three questions were due to lack of time or lack of knowledge, as there were few with no attempts at these questions.

The ability to write in English appeared less good than has been the case in recent years. Apart from a great deal of muddled wording and very poor spelling, a number of candidates did significantly better with calculations than with extended writing answers, usually a sign that they had difficulty reading and understanding the questions or responding to them or both.

Questions involving calculations were generally better done than those without calculation, although this was not as clear-cut as has been the case in the past. One positive feature was that most candidates wrote down the equations used in their calculations and so rescued some numbers of compensation marks where the final answer was wrong. Units, though generally correct, were far from perfect.

<u>Comments on specific questions</u>

Question 1

This question was particularly well answered with full ten mark answers not uncommon.

(a) A few candidates mixed up acceleration and deceleration.

(b)(i) Most gave the correct answer.

(ii) Again most gave the correct answer.

(c) This part was well explained and correctly worked out by a high proportion of the entry.

(d) This part was either fully correct or scored one or zero. A large number just used distance = speed x time and scored zero. Those using area under the graph scored at least one, providing that they attempted to use the correct area. Those using average speed x time usually scored all three marks.

Answers: **(b)(i)** 40 (m/s), **(ii)** 4 (s); **(c)** 10 m/s^2; **(d)** 80 m.

Question 2

This question was particularly well answered with many, scoring all six marks.

(a) The equation pressure = hdg was widely known and correctly applied. Powers of 10 were handled well.

(b) Quite a number wrote force = pressure/area and so scored no marks.

(c) The majority found this easy and gave the straightforward answer of potential energy changed into kinetic energy that gained the marks. Less candidates than usual gave long energy chains that usually scored a maximum of one.

Answers: **(a)** 2×10^5 Pa; **(b)** 1×10^5 N.

Question 3

Well answered on the whole. There were many who scored all six marks, and often some of the weakest scored five.

(a) Only simple outline diagrams were required, but some of the efforts stretched the Examiners' powers of recognition. In spite of the question asking for labels these were often missing or inadequate. On the positive side some really excellent efforts were seen.

(b) Of those who realised that 10 was involved, a significant number wrongly multiplied newtons by 10 to get the value in kg.

(c) It was hoped to see volume of water and volume of water + rock as the answer, but levels and readings were much more common and were reluctantly accepted.

(d) Even when the answer to **(c)** was worthless a correct answer was often given here.

(e) A few gave density = volume/mass or volume x mass but the majority scored the mark for the correct formula.

Question 4

As usual with thermocouple questions this was answered only moderately well.

(a)(i) Many odd suggestions such as putting the whole thermocouple in the hot water, putting the hot junction above the hot water or even at the side of the beaker were made. Clear statements that the voltmeter/galvanometer needed to be read and converted to a temperature in some way were few and far between.

(ii) Whilst the usual rapidly changing/high or low temperatures were given frequently and rewarded it would have been good to see the idea of electrical remote readings stated more often.

(b)(i) Most could understand that the graph indicated that the temperature of the water was rising.

(ii) Very few indeed clearly stated that the heat energy supplied was becoming latent heat of evaporation. Most stated that the temperature was constant which did not answer the question.

Question 5

The responses to this question were adequate with almost all candidates scoring some marks.

(a)(i) The usual mistakes were drawing curved paths or where all the collisions were at the wall.

(ii) 1. Almost all scored the mark for molecules/particles hitting the walls, but few developed this further to score the second mark e.g. hits cause a force.

2. Very well answered with most scoring the two marks.

(b) As expected some had p/v as a constant instead of pv as a constant. A further number started with the correct formula but either substituted incorrectly or transposed the formula incorrectly. Considerable numbers did obtain the correct answer.

Answer: **(b)** 0.14 (m^3).

Question 6

Answers to this question were generally satisfactory with some scoring all six marks.

(a) The common error was to reflect down onto the bottom of the fibre.

(b) Many scored the mark for total internal reflection but many fewer for angle of incidence greater than the critical angle.

(c)(i) There were the usual errors of misquoting the formula, transposing it incorrectly or incorrect substitution. Powers of 10 also caused a problem. However, there were many wholly correct answers.

(ii) A few tried to use sini/sinr. There were many full mark answers

Answers: **(c)(i)** 5.9 x 10^{14} Hz, **(ii)** 1.6.

Question 7

This question was very well answered with a good proportion of full marks scored.

(a) Apart from a few transposition errors almost all scored the two marks.

(b)(i) More than expected could not deal with two resistors in series and got the wrong answer.

(ii) Most coped well with 2 equal resistors in parallel.

(c) Most scored the mark for the power formula in any one of its forms but only about half could substitute the correct values and get the correct answer.

(d)(i) A high proportion gave the correct answer. Others made massive unnecessary calculations ending up with a variety of wrong answers.

(ii) Many wrong answers, the most common being 12 V.

(e)(i)(ii) The weaker candidates appeared to guess, usually wrongly, but those who worked it out from R = sl/A had no difficulty getting the correct answers.

Answers: **(a)** 1.5 A; **(b)(i)** 10 Ω, **(ii)** 2 Ω; **(c)** 72 W; **(d)(i)** 12 V, **(ii)** 6 V.

Question 8

This was very badly answered with many scoring zero or one. Full mark answers were very rare.

(a) Usually scored the mark as mis-spellings were accepted.

(b) The standard of drawing was very poor. Most drew vague curves freehand with no regard to spacing of the lines. Some scored one mark for straight line wavefronts in front of the gap. Very few attempted curved diffracted waves and even fewer centred their curves on the gap edges. The equal wavelength mark was allowed even when the whole waves curved.

(c) Many tried to remember the definition but ended up with waves moving at right angles to the wave which made no sense. Some correct answers were seen.

Question 9

A very poorly answered question.

(a)(i) Many diagrams bore little or no resemblance to a transformer. A number simply drew the symbol, which was allowed to score up to two marks if the labelling was clear and correct. Labelling was poor with the essential labels of primary and secondary coils and an iron core missing.

(ii) A good number had a 40:1 ratio, but some were reversed which was not acceptable.

(b) The majority reversed the equation getting a wrong answer of 2 A.

(c) Very disappointing answers. Most missed the central point that there must be a continuously changing magnetic field for continuous induction to take place.

Answer: **(b)** 0.05 A.

Question 10

Possibly the worst answered question on the paper.

(a)(i) Very few gave one of the required answers such as switch, amplifier or relay.

(ii) Most explanations were incorrect or inadequate. All ways of explaining the action were accepted.

(b)(i) The correct symbol was known and properly drawn by about half of the entry.

(ii) There were many correct answers. The most common mistake was not to consider two inputs of zero.

Question 11

Another very poorly answered question.

(a) Many candidates scored the two marks here and little or nothing in the rest of the question.

(b)(i) Many and varied wrong answers, when all that was required was a mention of background radiation.

(ii) Few subtracted an approximate background count and so many gave a wrong answer.

(iii) All values were suggested rather than the 5/6 cm expected.

(iv) Few appreciated that beyond 5/6 cm there were no alpha particles and so the count must be due to background radiation.

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 were well organised and were clearly annotated with marks and comments, which was helpful during the moderation process. The assessment criteria were successfully applied by the Centres and the marks awarded to candidates did not require adjustment by the Moderators.

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. Poor choice of scale and badly drawn best fit lines on the graph were however commonly seen.

Comments on specific questions

Question 1

(b)-(d) Full marks here were awarded to candidates who recorded all the temperatures showing increasing temperatures. Some candidates did not complete the column headings in the table by inserting the units for distance (mm) and temperature (^{o}C).

(e) The graph was generally accurately plotted but a suitable temperature scale using at least half of the available grid was rarely seen. The best candidates produced a good choice of scale by starting the temperature axis at a suitable value (a little below room temperature). A significant number of candidates lost marks since their lines were too thick or they drew a poorly judged best fit curve.

(f) Candidates who suggested a sensible value for room temperature in relation to their experimental readings scored a mark but few scored the second mark. This was because candidates did not usually follow the instruction to use the graph to inform their estimate.

Question 2

(a) Most candidates scored the mark for a sensible d value. A few did not include the unit and so lost the mark.

(b) Many candidates realised how to use the two pieces of wood and drew a good, clear diagram. Sadly, some lost the mark as they did not include the rule.

(d)-(h) Many candidates took the readings carefully and accurately and followed up with correct calculations of T and of T^2/l. A small proportion of candidates failed to use the correct values of l /cm. These candidates usually added the radius (d/2) to x/2 instead of using the equation given, i.e. $l = (x + d/2)$. Candidates were expected to use consistent numbers of significant figures (two or three for the values of T). Candidates who had carried out the experiment with great care scored two marks for the quality of their results judged on all the T^2/l being close to 0.04 (within a reasonable tolerance). One mark was awarded to those candidates whose results were not quite as accurate but nevertheless gave T^2/l values which were equal to each other to the nearest one significant figure.

(i) The best candidates realised that they were being asked to notice that their T^2/l were sufficiently similar to be able to conclude that the T^2/l values were equal within the limits of experimental error. This idea of 'within the limits of experimental error' seems to be generally not understood by candidates.

Question 3

(b)-(h) The majority of candidates completed the column headings correctly with x values in mm, cm or m corresponding to their readings, I values in amps, V values in volts and R values in ohms. A mark was awarded if the voltages were given to at least one decimal point. Full marks for R were awarded if the values were arithmetically correct, all to two or three significant figures and the values correct in relation to each other (within a reasonable tolerance). Many candidates scored most of the available marks.

(i) The first mark was awarded to those candidates who commented that the resistance increased with length. The second mark was available to those who (following the instructions) referred to the resistance and length values in the table to justify their conclusion.

(j) Good candidates were able to use the results to calculate the appropriate value for R but this mark was not scored so easily since the x values were not simple multiples of each other.

Question 4

(a)-(h) Most candidates seemed to understand what was required here and drew clear and accurate diagrams scoring marks for careful and complete ray drawings including the angle of incidence and the line JK being parallel to the block. Very few candidates had apparently little or no experience of this type of experimental work. Many candidates scored four of the five marks. The most common reason for losing the fifth mark was failure to place the pins **X** and **Y** at least 5 cm apart.

(i)-(l) To score all five marks in this part of the question candidates were required to measure the two angles to within $\pm$ 2^{o}, y and x to within $\pm$ 1 mm, record both units correctly and have y equal to x (within a suitable tolerance for experimental error – in this case a generous 5 mm). Many candidates were successful in all of these respects.

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 or perhaps a lack of awareness of the significance of the methods and techniques that they are taught.

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 or understanding.

Almost without exception candidates attempted all the questions. The examination appeared to be accessible to the candidates and there was no mark that proved unobtainable.

Comments on specific questions

Question 1

(a) Most candidates were able to record the readings accurately gaining one mark for each and those who included both correct units scored the final mark.

(b) Most candidates took the correct reading from the metre rule. Not all however divided by 5 to obtain the circumference. A calculation involving $2\pi r$ was the most common error. In part **(iii)** many gave a sensible response, for example the gaps between the windings giving a circumference value that was too high, followed by how to correct this in part **(iv)**. Answers which effectively read 'I might have done the experiment carelessly' did not attract a mark. 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.

(c) Most candidates read the depth of water correctly. Only those who gave the surface area to 2 or 3 significant figures, with the unit (cm^2) scored the second mark.

(d) To score both marks here candidates had to recognise that the time must be recorded and at least one other water temperature (very good candidates suggested a series of temperature measurements).

Answers: **(a)(i)** 84°C, **(ii)** 50 cm^3; **(b)(i)** 75 cm, **(ii)** 25 cm; **(c)(i)** 2.1 cm, **(ii)** 31.5 cm^2.

Question 2

(a) In part **(i)** candidates were required to show on the graph (in some clear way) that they had used a triangle to score the first mark. The second mark was awarded if the triangle method was applied with a triangle using at least half the graph line. The third mark was for the correct calculation of *G*.

In part **(ii)** correct calculation of the density from the candidate's value of *G* was awarded a mark and a further mark for those candidates who recorded the density to 2 or 3 significant figures with the unit g/cm^3.

(b) Most candidates realised that the reason for taking several sets of readings is to improve accuracy.

Answers: **(a)(i)** G = 0.38, **(ii)** 2.63 g/cm^3.

Question 3

(a) In part **(i)** most candidates measured the diameter correctly but some went on in part **(ii)** to give an incorrect radius. The second mark was only available to those who gave the correct unit in parts **(i)** and **(ii)**.

(b) In part **(i)** most candidates calculated the length successfully. In part **(ii)** those candidates who correctly divided the time *t* by 20 to obtain the period and gave the results consistently to 2 or 3 significant figures gained both available marks here. Some performed another calculation with the numbers given and so lost a mark. However, the subsequent marks were still available.

(c) Many candidates chose a good scale that made good use of the grid but some failed to follow the instruction about starting the *T*/s axis at *T* = 1.0 s and so lost a mark. 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.

(d) Most candidates were able to read the length value from their graphs.

Answers: **(a)(i)** 2.2 cm, **(ii)** 1.1 cm; **(d)** 58 cm.

Question 4

(a) This mark was often not scored because candidates failed to place the pin positions far enough apart (5 cm was the minimum allowed).

(b) The majority of candidates drew the normal accurately and neatly and went on to measure the angles correctly giving the unit ($^\circ$) in each case.

Question 5

(a) Most candidates correctly calculated the resistance and gave the answer to 2 or 3 significant figures with the unit Ω. Some did not clearly grasp the question before attempting it and so assumed that the second column in the table contained current values and so offered the unit A instead of cm.

(b) The majority of candidates scored both marks for parts **(i)** and **(ii)** with fewer able to cope with part **(iii)**.

(c) It would appear that many candidates were unaware of the use of a micrometer (screw gauge) although it is specified in the syllabus.

Answers: **(b)(ii)** 18 Ω , 4.5 Ω , **(iii)** 72 Ω .