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PHYSICS

Paper 0625/01

Multiple Choice

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

General comments

The mean score of 31.332 was very similar to that for last year, and the standard deviation of 6.430 was slightly higher.

The best answered items (facility 90% or better) were items **3**, **6**, **15**, **18**, **25**, **31** and **36**. Only items **12**, **24**, and **40** were found particularly difficult (facility less than 60%).

Comments on specific questions

Item 1 was well answered, but 14% opted for the impractical option **B**. In **Item 2**, 8% chose **C**, failing to divide by six. The straightforward **Item 3** caused little difficulty, but in **Item 4** nearly a fifth of candidates believed that objects fall with a constant speed. There were no particular favourite distractors in **Items 5**, **6** or **7**, but in **Item 8** option **B** was clearly the most plausible. In **Item 9** both **C** and **D** were popular, suggesting guesswork rather than reading the 'extension' information given. In **Item 10** 17% chose **B** - careful reading of the question is needed, and in **Item 11** more than one in five believed it was 'impossible to tell', possibly failing to notice that the boy and girl took the same time to run up the hill.

Item 12 proved the worst answered on the paper, with only 27% correct responses; each distractor was chosen by a fair number of candidates, but as many as 43% believed the pressure at S to be atmospheric. The simple barometer is clearly a topic worth attention. Although the pressure **Item 13** was well answered, more than one in ten thought that boy X would produce a smaller pressure on the ground than boy Y. Nearly a quarter of candidates opted for **D** in **Item 14**, believing that the volume of air in the pump would not change as the handle was pushed in. **Item 15** presented few with any problem, although several thought the molecules would become larger. Nearly one in four chose **A** in **Item 16**, confusing change of temperature with change of state. It was option **C** in **Item 17** which attracted 9%, who probably had failed to read the question carefully. **Item 18** was well answered, with **D** being chosen by 7% who could have misread the question or confused conductors and insulators. **Item 19** showed significant confusion over convection involving a source of cold air - both **A** and **B** were popular. In **Item 20** significantly almost a quarter believed the effect to be called 'diffraction'.

All distractors worked effectively in **Item 21**, although the key was quick to identify for those familiar with the term 'wavefront'. In the recall **Item 22** it was option **D** which was chosen most often, and **B** was slightly favoured by those unable to answer **Item 23**. The second difficult item was the lens **Item 24**, with almost one in three opting for **D**, but **Item 25** was well answered. In **Item 26**, option **A** proved quite popular with those candidates failing to appreciate that XY was horizontal and would therefore not reflect sound to P. Option **C** distracted most in **Item 27**, possibly because they knew only an electrical method for demagnetisation. In **Item 28** several chose **A** (the only reference to electricity in the options). **Item 29** proved that nearly all candidates knew that a voltmeter is connected in parallel, since **D** was by far the most popular distractor. Uncertainty over the law of electrostatic charges led nearly one in five to choose **A** in **Item 30**.

Item 31 was very well answered. **Item 32** showed quite good understanding of switches in circuits, although each distractor was chosen by several, and this was also true for **Item 33** and the fuse **Item 34**. In **Item 35** option **B** was the popular distractor, and **Item 36** caused little difficulty. All distractors worked well in **Item 37**, and also in **Item 38**, where option **B** was particularly popular. In the half life **Item 39**, each incorrect response was chosen approximately equally often. The poorly answered final **Item 40** showed slightly more candidates opting for **B** (the number of neutrons) than the correct **C**. Either they misread the question, or were unfamiliar with the syllabus term 'nucleon'.

Paper 0625/02

Paper 2 (Core)

General comments

This is the first of the recent papers which has not been attempted by the more able candidates (those capable of grades A and B). It would therefore be expected that the average ability of the candidates sitting this paper would be less. This fact was clearly evident, but there were a good proportion of candidates who performed very well, if with less of the consistent flair expected from candidates aiming at the higher grades. Such candidates are to be congratulated at having chosen the option which enabled them to show what ability they had, rather than struggle with Paper 3, and possibly get a poorer grade. Even much weaker candidates were able to achieve worthy marks.

Calculations were usually well done, where the candidate knew the underlying Physics. Unfortunately, the same compliment could not be paid to the standard of graph drawing. Points were frequently plotted with giant blobs, often over a small square in diameter, or with large crosses only approximating to the point concerned. Curves were usually poorly drawn and often with a pencil which had not been sharpened. Some even drew graphs in ink, which is not advisable because of problems when they inevitably make a mistake. Many candidates lost marks for poor graphs, and many scored marks which they would not have scored in a more rigorous regime.

Very few candidates could not at least attempt all of the questions, and there were no questions which proved beyond the ability of at least a good proportion of candidates.

Comments on specific questions

Question 1

Very nearly all candidates, surprisingly, struggled with this question.

(a) A lot scored the mark for this, although there were many who gave the answer as 3 or 2 or 15. This was one of those questions where teachers can illustrate the virtue of asking "Is my answer sensible?", because there were also ridiculous answers of thousands of seconds.

(b) Virtually all candidates divided by 6, missing the point that there are actually 5 intervals between the first and sixth strokes.

(c) Similarly, most multiplied by 11, rather than 10.

Answers: **(a)** 10s; **(b)** 2s; **(c)** 20s.

Question 2

(a) There were lots of correct answers to this, but many others lost marks because of careless drawing or for showing the arrow as a curve. The position expected for the arrow was the extreme end of the rail, but anything within about 1 cm of the end was awarded full marks.

(b) A lot of candidates did not seem to be familiar with the term moment.

(c) There were many intelligent attempts at helping the designer. One common answer which was not acceptable was to increase the length of the rail, which actually increases the force, due to the increased weight of the rail. Attempts involving springs and ropes generally did not reduce the (total) force, or were so unclear as to be not worth rewarding.

Question 3

This question was well answered by large numbers of candidates, but clearly some were not competent at dealing with such graphs.

(a) Correctly answered by most.

(b) Correctly answered by most.

(c) The calculations for the distances in **(i)** and **(ii)** were well attempted, although a sizeable proportion forgot to divide by 2 for the area of the triangle. Calculations using equations of motion were acceptable. The mark for **(iii)** was awarded for correctly adding the previous two answers, so that an earlier mistake was not penalised again. Many candidates did not know how to find the average speed. Common errors included (20 + 0)/2 and 0.

Answers: **(c)(i)** 1000 m, **(ii)** 500 m, **(iii)** 1500 m, **(iv)** 15 m/s.

Question 4

(a) It was disappointing to see how many did not know how to calculate work done. Answers frequently included speed, time, power, weight or rope length.

(b) A good proportion realised that the second person's barrow would move faster, but only the best candidates spotted that because of the unbalanced force, there would be acceleration.

(c) Those who realised that **B** had the greater power, generally could give at least one valid reason for their answer (often two). Those who got **(i)** wrong struggled to give convincing reasons.

Question 5

There was much confusion in the minds of candidates about this topic, and it would seem wise for candidates to devote more time to this and related topics.

(a) Most candidates thought that the temperature would go up, although their answers to **(b)** struggled to explain this. Large numbers had clearly initially written "Reading goes down" but then crossed out "down" and replaced it with "up", possibly after realising that they could not justify it in **(b)**.

(b) Many answers involved molecules leaving the surface, some even saying it was the more energetic molecules which did so. However, most seemed to think that this was because the jet of air heated the water. The stem of the question makes it clear that rapid evaporation is taking place, so this should have signalled that there would be cooling.

(c) Lots of examples of evaporation were given, but very few relating to cooling caused by evaporation, which was the point of the question.

Question 6

It seems that this part of the syllabus is not at all well understood by core candidates.

(a) This was very poorly done by most candidates. Very few related their answers to heat or internal or thermal energy. Some simply used information from **(b)** and answered "thermal capacity" or "specific heat capacity", neither of which was acceptable. Quite a few answered as if the question asked where the energy was stored, to which some replied "in the insulation".

(b) This part also was poorly done. Most failed even to mention thermal capacity, despite the instruction in the question. Of those who did, most thought that copper had the higher thermal capacity. Other candidates tended to answer in terms of conductivity or volume or surface area.

Question 7

(a) A lot of candidates scored both the marks for this part, which would be expected as it can be deduced from the question. There were, however, many who knew that light was the fastest of the three, but were not sure which was slowest, with sound being chosen rather than water waves.

(b) The majority of candidates failed to score the full 3 marks for this part.

(c) Most, but by no means all, knew that light does not need a substance in which to travel, but some thought that either sound and/or water waves also do not.

Question 8

This question is basically very simple. Those candidates, who were able and prepared to think carefully through the situations in this question, scored well. Those who did not fit into this group generally wrote nonsense, sometimes even writing things like "Positive" or "North pole". It was common to find that bars **A** and **B** had been correctly identified, but that **C** and **D** were interchanged.

Question 9

(a) Even candidates, whose knowledge of Physics was weak, should have been able to score all 3 marks for plotting the points. The fact that many failed to do so, and that many more would not have done so if Examiners had been instructed to adopt a more rigorous standard, reflects the casual attitude to this skill which characterises large numbers of core candidates. Many plotted points with large blobs. If the blob was not grossly large and the centre was within acceptable limits of the correct point, it was not penalised. However, it cannot be guaranteed that such a generous regime will apply in future examinations, so teachers really need to instil in their candidates the need to plot small points with a sharp pencil. The other extreme was points so faintly plotted that they were obliterated by the line drawn through them. If no evidence of a point can be seen, it cannot be awarded a mark. Of those who plotted with crosses, a large number lost marks because the centre of the cross was more than the accepted limit from the proper place. It seems that small points, carefully plotted and surrounded by neat small circles, is the best way for candidates at this level to show points on a graph.

(b) Similar carelessness characterised the drawing of the curve through the points. Thick lines, wavy lines and sketched lines were the order of the day for vast numbers of candidates. A pleasing note was that there were very few who joined successive points with straight lines.

(c) This was generally not well done. Of those who seemed to know how to find the half-life, the same careless attitude was apparent as in **(a)** and **(b)**. However, most simply did not know how to find the half-life.

(d) This part was intended to test candidates' ability to use their knowledge to predict something. Most found this hard to do, and it was rare to find a candidate who scored both the marks.

Answer: **(c)** ~ 1.2 weeks.

Question 10

This question was well done, even by many of the weaker candidates.

(a)(i) Most knew that a step-down transformer has less turns on the secondary than on the primary. There were a few answers of the standard of "because the arrows point down", but generally this was correctly answered.

(ii) There were many correct answers, usually with the working shown. Some candidates did not show their working, which is silly because an incorrect answer can still score marks if some of the working is correct. If no working is shown, these marks cannot be scored. A few candidates who did not know the maths of transformers tried to do this using what looked like a version of Ohm's law.

(iii) All three options drew a lot of support, which was interesting because candidates mostly agreed that the train would run more slowly, regardless of their answer to the previous part.

(b) This question was an attempt to help candidates, whose first language is not English, to describe the stages in the operation of the electromagnetic relay. Many coped very well with this format, and scored all 3 marks. Even those who did not answer completely correctly were able to identify some stages, and score 1 or 2 marks. Only the very weakest failed to score any marks.

Answer: **(a)(ii)** l0V.

Question 11

Most of this question was well answered, showing that the topic has been well covered. It also shows that even the weakest candidates can cope with straightforward maths in a question, and score some useful marks.

(a)(i)(ii)(iii) A good number of candidates scored full marks on part **(a)**. Virtually all spotted the light-dependent resistor, with a little more uncertainty being shown about **(i)** and **(ii)**.

(b)(i) Generally well tackled. Some appeared not to know what an equation is, because they did the calculation correctly, even though they had not answered the first part. Common causes of loss of the mark for part **1** included writing down the VIR triangle without developing it into an equation, writing R = I/V, simply writing V/R (i.e. not an equation) and writing an equation involving Q. In part **2**, most candidates, but by no means all, wrote the unit along with their answers. The importance of correct units is important in all the sciences. In Paper 0625/02 candidates are not penalised a lot for wrong units or lack of units, but that does not mean that they are not important, and they *will* be tested on every 0625/02 Paper.

(ii) This part was the weakest in **Question 11**. A majority recognised that the current would be less, but a lot said that the current was slowed down or that some current was used up in the resistor. Some thought that the current would be increased, as if the resistor were some sort of battery. The explanations rarely scored a mark, even though all that was expected was that the resistance had been increased. The answers of many candidates indicated that they thought that there had been no resistance in the circuit before the introduction of the resistor, and this was not rewarded. It was probably intuitive to expect the lamp to glow dimmer, and this is how most candidates answered, even many of those who had thought that the current would increase when the resistor was added.

Answer: **(b)(i) 1** 24 Ω.

Question 12

As is common with core candidates, the understanding of even the simple ray optics of this question caused many problems. That said, however, the layout of this question did help produce a good proportion of correct and near-correct answers.

(a)(i) The general carelessness with drawing was continued in the question, but most seemed to know where the image of **A** should be.

(ii) There were a few excellent drawings, although it was fortunate for many that they were not expected to draw the lines using a rule. Many lines were correct in principle, but far from straight. It is hard to understand the thinking of a candidate who is not prepared to do a careful drawing, but who would agree that a numerical calculation had to be done carefully. The majority of drawings were incorrect in one respect or other, but did have some correct parts and so scored a proportion of the available marks.

(iii) Very few could provide the word "virtual" to answer this part.

(iv) Again, few could write down even $i = r$. There were, however, a fair number of attempts involving sin$i$ and sin$r$, mostly wrong even if the question had been about refraction.

(b) Candidates were fairly evenly split between those who could deal with the inversions involved in reflection and those who could not. By no means all who got **(i)** wrong also got **(ii)** wrong, or vice versa, as the skills involved in the two parts were not quite the same.

Paper 0625/03

Paper 3 (Extended)

General comments

This was the first examination when all candidates did not have to sit Paper 2. It would appear that this resulted in a significant rise in the number of very weak candidates being entered for a paper that was much too difficult for them and so single figure scores were not uncommon.

The standard of the paper was in line with previous years. It appeared to discriminate very well with a mark range of 0 to 78 out of 80. The number of marks of 70 and over was very pleasing to see, reflecting the excellence of some candidates.

The impression gained was that the majority of candidates found the calculations more difficult than on previous papers, although in fact they were of exactly the same standard and on the usual topics. Units were more often wrong or missing than has been the case recently.

On the other hand, the standard of answers to questions requiring explanations and descriptions seemed to have improved slightly.

In only a very few scripts was there evidence that a lack of command of English was making it difficult for the candidates to express themselves clearly.

There was no evidence that the paper was too long for the time allowed.

In a number of cases marks were lost because the candidates did not read the questions carefully enough. In some scripts there was a tendency to repeat facts given in the question as answers, when more careful thought would have led to the realisation that different points were required.

<u>Comments on specific questions</u>

Question 1

(a)(i) A majority of the candidates scored the marks for uniform acceleration.

(ii) The answers seen here were generally good, considering that this was quite difficult. It was pleasing to see that many candidates understood that circular motion meant that the velocity and acceleration were changing because of the change in direction whilst the speed remained constant in this case.

(b) Far too many candidates did not read the question carefully enough and answered in terms of the speed instead of the velocity. For the difference, answers in terms of time were not considered markworthy.

(c)(i) Those who worked out the area under the graph usually easily obtained the correct answer, whereas those who resorted to complex formulae often made mistakes. Very few used average speed x time, more often using final speed x time which scored no marks. A number worked out the whole area under the graph and so scored only 1 of the 2 marks.

(ii) Large numbers of candidates tried to use a formula for the circumference of the track and so made no progress. Those who used a correct method, either area under *BCDEB* on the graph or speed x time generally gave correct answers

Answers: **(c)(i)** 60 m, **(ii)** 310 m.

Question 2

(a) A minority gave 7.5 N whilst a number gave a wrong or no unit.

(b) Many candidates tried to use kinetic energy = 0.5 mv2 without first calculating the final velocity *v*, and scored no marks. Some did manage successfully to work out the correct answer this way, but involved themselves in much more calculation than the majority who realised that the *k.e.* gained = *p.e.* lost.

The level of understanding shown here was very creditable.

(c) Most answers vaguely stated "to heat and sound" without any reference to the particular situation. A large number had conversion to potential energy and others a gradual or abrupt loss of kinetic energy to nothing in particular.

It was pleasing to see some thoughtful answers from those who realised that some of the kinetic energy was retained in the stone as it sank in the water.

Answers: **(a)** 750 N; **(b)** 11 250 J.

Question 3

(a)(i) The majority of candidates correctly stated this law, but extension increases as load increases was not good enough.

(ii) This was generally correct even when Hooke's law was not correctly stated.

(b)(i) The minority of candidates who did not get this fully correct usually scored one mark for a correctly quoted formula.

(ii) About half the candidates gave fully correct answers, the biggest source of error being the misuse or omission of the 24. Units were often wrong.

Answers: **(b)(i)** 84 J, **(ii)** 34 W.

Question 4

(a) Too many answers were spoilt by not clearly comparing what was happening at the two temperatures stated in the question. General comments about evaporation were not sufficient here. Answers often did not refer to the energies of the molecules as the question demanded. A common wrong statement was that there was no evaporation at the lower temperature.

(b) This calculation was poorly done. In many cases there was confusion with specific heat capacity, candidates commonly using 100°C. Other common mistakes were neglecting the heat loss, adding it instead of subtracting it and using 600 J as the total energy required to evaporate 15 g of water. Incorrect units were very common even when the working was correct.

Answer: **(b)** 2260 J/g.

Question 5

(a)(i) A variety of possible answers were accepted but even then there were more wrong suggestions than correct ones. A number confused the topic with radioactivity and suggested a Geiger counter.

(ii) Candidates who did not read the question carefully gave answers that were in effect repeating information given in the question.

(iii) Large numbers of candidates thought the silver surface was the best emitter, many others wrote about absorption, again not reading the question properly.

(iv) It was surprising how few stated infra-red radiation.

(b) This part of the question was very badly attempted. Electrical circuits were very common answers. Where convection currents were attempted, many were unconvincing. Common errors were no apparent heat source shown, currents going the wrong way on part or all of the convection current, rising currents from one edge only of a heat source and only up currents.

Question 6

(a)(i) The two common errors seen were refraction away from the normal on entering the block and the ray out of the block not parallel to the ray going into the block.

(ii) Almost every angle possible was marked with *i* and *r* by some of the candidates. As expected the most common errors were to mark the complement angles and to mark the angle of emergence as the angle of refraction.

(b)(i) The correct formula was given by the majority of candidates, but as expected sin *i*/sin *r* was seen in large numbers.

(ii) The majority worked out the answer as 1.5, but some added various powers of 10 and gave the answer a unit. Unsupported answers of 1.5 did not score the mark.

(c) Generally well done with the powers of 10 correct. The majority of errors arose from dividing frequency by speed.

Answers: **(b)(ii)** 1.5; **(c)** 5×10^{-7} m.

Question 7

(a) Generally correct, but in a number of cases the instruction to label *three* compressions and *three* rarefactions was ignored.

(b) Most candidates scored the marks, either in terms of the separation of the air particles or in terms of the air pressure differences.

(c) Considering that this is a core topic the answers were extremely poor. The concept of air particles vibrating in the direction of wave travel was not often known and so few scored any marks.

(d) Mostly correct answers. Common mistakes were to write 340/50 instead of 50/340 and/or forget to multiply by2.

Answer: **(d)** 0.29 s.

Question 8

(a) It was surprising how many wrong answers were seen. All the powers in the diagram were quoted and many only added in one 60 W.

(b)(i) Answers were poor, vague and confused, when all that was required was an indication that each and every appliance was connected across the same power supply.

(ii) The majority of candidates scored the marks for independent switching and continued operation of the other appliances when one ceased to work.

(c)(i) Generally well done, but many used the wrong power or gave a wrong unit.

(ii) Many wrong answers because a wrong power or a wrong formula, for example, energy = power/time were used. The unit was often given as watts instead of joules.

(iii) This part was well answered, being often correct when parts **(i)** and **(ii)** were not. Again some wrong powers were used but not nearly so many as in the previous parts. Wrong or missing units were rare.

Answers: **(a)** 1.52 kW; **(c)(i)** 0.83 A, **(ii)** 1.3 x 107 J, **(iii)** 960 Ω.

Question 9

(a) Very poor arrangements shown by many candidates. Batteries or power supplies were all too common. The magnet was shown connected as part of the circuit in some cases. Transformers were a common completely wrong answer since they did not use the apparatus given in the question.

(b) This was marked independently of **(a)** so most scored the mark, although there were many doubtful phrases such as place the magnet in the solenoid.

(c) Many answers were spoilt by vagueness, particularly not making it clear that the magnetic field lines of the magnet must cut the coil.

(d)(i)(ii) Both parts were well answered, but too many did not read the question carefully enough and changed the apparatus in **(ii)**.

Question 10

(a) Very few candidates were able to give a convincing answer, especially to digital. Some had the idea of 0 and 1 but had no idea that this meant that the readings went up in steps of 0.01 rather than continuously.

(b)(i) Many wrong components named, commonly diodes.

(ii) About half could give the correct symbol, whilst too many failed to label the inputs and output as the question asked.

(iii) Few fully correct answers, with many giving only the truth table.

Question 11

(a) Many good answers where convincing paths were drawn for all three particles. Weaker candidates drew wrong or random paths.

(b) Well answered but some wrote about the structure of the ∝-particles rather than the structure of the gold atoms.

(c) Most gave the correct answer.

Answer: **(c)** 4.

Paper 0625/04

Coursework

General comments

For the third consecutive year there was an increase in the number of Centres moderated, also there was continuity of the high standard of well presented moderation samples. Once again 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 specification. Clearly a large amount of good work has been completed by teachers and candidates. The majority of samples illustrated clear annotated marks and comments, which was helpful during the moderation process.

It is pleasing to see that points made from previous reports were noted. Although, the following two points are still important to mention and 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:

- 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. The majority of candidates showed evidence of preparation for all the different types of question in the examination but at the same time marks were lost due to lack of care in recording and processing readings.

Comments on specific questions

Question 1

(b)–(e) 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 (°C).

(f) The graph was generally accurately plotted but a suitable temperature scale using at least half of the available grid was seen less frequently. A significant number of candidates lost marks since their lines were too thick or they drew a poorly judged best fit curve.

(g) 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)–(i) The majority of candidates recorded the currents and voltages correctly with *I* values in amps and *V* values given to at least 1 dp in volts. Full marks for *R* were awarded if the values were arithmetically correct, all to 2 or 3 significant figures, the unit Ω and the values correct in relation to each other (within a reasonable tolerance). 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 *R* values were recorded.

(j) Drawing the correct diagram from the written instructions proved difficult for most candidates suggesting a lack of practical experience in setting up circuits.

Question 3

(a)–(f) Most candidates took the readings carefully and accurately and followed up with correct calculations. Some lost a mark for failing to include the units or thinking that the unit for *T* was s/10. A small proportion of candidates failed to use the values of *d* that were specified in the question and so lost a mark. Candidates were expected to use consistent numbers of significant figures (2 or 3 for the values of *T* and *t*).

(g) Many candidates drew a good clear diagram and scored both marks.

(h) *T* is not directly proportional to *d* in this experiment. The best candidates realised that if it were the values of *T*/*d* would be constant (within the limits of experimental error) and were able to comment suitably. Other more wordy (correct) explanations were allowed.

Question 4

(a)–(e) Many candidates seemed to understand what was required here and were able to obtain readings that indicated familiarity with this type of experiment. Some candidates appeared to have no previous experience and their readings were clearly obtained without a focused image. Lack of units for the various distances was penalised as was any unit given for *y*/*x* or *m*. Credit was given for values of *y* and *h* that were within a suitable tolerance of the expected values and for *y*/*x* and *m* being equal within the limits of experimental error.

(f) Candidates should be able to look at their *y*/*x* and *m* values and realise that they are equal within the limits of experimental error. Candidates who wrote a vague statement about the values being nearly the same did not score the mark.

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 practiced 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.

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 various readings accurately gaining one mark for each and those who included the correct unit each time scored the final mark. The gap between the electrodes was the one recorded incorrectly most often.

(b) Candidates were asked to solve a practical problem here and were required to read the question carefully and understand the practical difficulty involved. Many sensibly suggested that the gap between the electrodes would have to be measured with the electrodes out of the water but few suggested how they might ensure that the gap remained the same when the electrodes were put back into the beaker.

(c) Candidates were expected to suggest a variable such as temperature. Some failed to read the question in detail and suggested a variable already accounted for in Figs. 1.2 – 1.6.

Question 2

(a) Those candidates who correctly divided by 10 to obtain the period and gave the results consistently to 2 or 3 significant figures gained both available marks here. Many performed another calculation with the numbers given and so lost a mark. However the subsequent marks were still available.

(b) Most candidates chose a good scale that made good use of 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.

(c) Candidates who had drawn an accurate best fit line were able to obtain the correct answer for the value of T.

(d) Only the most confident candidates were able to write that T is not proportional to d because the line does not pass through the origin. (Candidates who made a sensible comment about the straight line were given some credit).

Question 3

(a) Most candidates correctly showed the positions of the ammeter and voltmeter.

(b) Most candidates correctly calculated the resistance and gave the answer to 2 or 3 significant figures with the unit Ω.

(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). Candidates who included more than one voltmeter were penalised.

Answer: **(b)** 3.3 Ω.

Question 4

(a) Many candidates correctly measured the distances and went on to calculate the actual size values. A few divided by 5 instead of multiplying. A mark was available for those candidates who included correct units for all the values. The mark for the magnification was scored by those candidates who recorded the value to 2 or 3 significant figures and with no unit.

(b) Candidates with the appropriate practical experience knew that the image would be inverted.

(c) This section was not so well answered. 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 difficulty in positioning the metre rule to take the readings and the importance of ensuring the centres of the illuminated object and lens are suitably in line.

Question 5

(a) Most candidates recorded the temperature of 22°C correctly but the expected wrong readings (20.2°C and 38°C) were also seen.

(b) The temperature rise was usually correctly calculated but the temperature fall created more problems. A mark was available to those candidates who carefully included the correct unit at each stage.

(c) Pleasingly most candidates were able to write sensibly about the loss of energy to the surroundings.

Answers: **(b)(i)** 14°C, **(ii)** 64°C.