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PHYSICS

Paper 0625/01
Multiple Choice

Question Number	*Key*	*Question Number*	*Key*
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4	**D**	24	**B**
5	**B**	25	**B**
6	**B**	26	**C**
7	**A**	27	**A**
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17	**C**	37	**B**
18	**A**	38	**A**
19	**D**	39	**C**
20	**C**	40	**C**

General comments

Candidates achieved a mean score of 29.497. This was again very similar to last year, and very close to the target facility of 75%. At 6.786 the standard deviation was higher than in 2004.

Only **Questions 15** and **18** had a facility of 90% or better, although several others were close to this. **Questions 10**, **12**, **27**, **29**and **32** caused the greatest problems (facility less than 60%).

Comments on specific questions

Question 1

The simple question was answered correctly by 89% of candidates, although 9% opted for **D**, perhaps thinking of measuring the volume of adhesive as well as the area of the room.

Question 2

In this question distractor **A** was popular, possibly showing a perceived link between density and acceleration (the short distance implied by mention of the bench made air resistance negligible).

Question 3

This caused almost a third to opt for **D**, failing to halve the distance.

Question 4

Few problems were caused by this question.

Question 5

This was well answered, although over one in ten chose **A**, ignoring the visual clue in the diagram.

Question 6

D was popular, with candidates failing to subtract the cylinder's mass.

Question 7

This led a fair proportion to choose **C**, possibly looking for the force needed to balance the two shown.

Question 8

Over a third believed **B** correct, failing to consider the original spring length.

Question 9

Although straightforward, the generator was the most popular distractor, indicating that the question was misread.

Question 10

This was the worst answered question, with 60% choosing **A** and 17% **B** – nuclear fission as an energy source is not well understood by most candidates.

Question 11

This more common item question was well answered.

Question 12

This question was less clearly understood, with **A** and **C** being almost equally popular.

Questions 13, 14 and 15

Little difficulty was found with these questions.

Question 16

Almost one in four candidates believed **C** to be correct, associating boiling with rising temperature.

Questions 17 and 18

These presented few difficulties.

Question 19

This caused one in five to choose either **A** or **B**.

Questions 20 and 21

These were two recall questions, **Question 20** had a high facility of 86%, and **Question 21** was 81%.

Question 22

Although this was very straightforward, option **C** was quite popular.

Question 23

This was less well answered, one in four chose the image distance as the focal length.

Question 24

There was also confusion for 25% of candidates in this question, as they opted for either **A** or **C**.

Question 25

A similar proportion to **Question 24** made the classic mistake of overlooking the return time of the sound in this question.

Question 26

Magnetic materials were better known, with steel being the popular distractor, understandably.

Question 27

Conversely, this caused much more difficulty, with all distractors working well.

Question 28

Although the format of this question is not commonly used, the subject material was very simple, and it would be expected to have had a higher facility.

Question 29

This was challenging, **C** being almost as popular as the key.

Question 30

This was found much easier.

Question 31

This deductive question showed nearly a fifth of candidates falling back on 'the current is the same everywhere' and choosing **C**.

Question 32

The potential divider was not well understood, leading over half to opt for **A**.

Questions 33, 34 and 35

These were tackled more confidently.

Question 36

C was chosen by most who were incorrect, failing to appreciate that, although identical, the coils had opposite ends facing each other so would attract.

Question 37

Knowledge of operation of a cathode-ray tube deserted nearly one in four in this question.

Question 38

Nearly a fifth chose γ-rays.

Question 39

This half-life question showed **A** and **D** to be equally popular.

Question 40

78% correctly identified the symbol as being a nuclide.

Paper 0625/02

Paper 2 (Core)

General comments

While large numbers of candidates were able to provide adequate answers to all questions, outstanding answers were comparatively rare.

Examiners also reported a need for greater care in presentation.

To end the 'General comments' on a more positive note, **Question 5**, a style of question which candidates often find difficult, and **Question 6** which could be regarded as an unfamiliar application were both well done.

Comments on specific questions

Question 1

(a) Some candidates were confused between water poured out and water left in the cylinder, presumably because they did not read the question carefully.

(b)(i) Most could answer this correctly, although there was the expected sprinkling of 15.1 and 15.2 answers. Incorrect units were not penalised here.

(ii) Quite a few candidates found the substitution into the equation, and the subsequent calculation, difficult. Many used 80 for the volume, instead of 100. Substitution of an incorrect value from **(b)(i)** was not penalised further, as long as there were no further mistakes. More serious, though, was the fact that large numbers of candidates failed even to attempt to put in units, in addition to those who thought area was measured in cm^3 or cm. This was penalised here.

Question 2

Some candidates were confused by the use of 24-hour clock times, but appropriate allowance was made for this.

(a) Very few showed the working, but most could do the subtraction which led to the correct answer.

(b) A lot answered correctly, and the range 1500 – 1800 was accepted.

(c) There were many who gave the answer as 3 hours, which was presumably the time at greatest speed.

(d) Answers to both parts of this were expected to be in terms of areas under the graph. Unfortunately, hardly any seemed to know about distances being found from the area under the graph, so these marks were rarely scored.

Question 3

Answers to this question often showed poor understanding.

(a) Very few answers gave any certainty that the candidate understood there would be rotation.

(b) Generally poor understanding, in particular of the direction of the force. Many candidates failed to put any arrow at all on the diagram, thus ensuring that they lost 3 marks.

Question 4

The hydroelectric system has been the subject of many questions in previous years, on both Papers 1 and 2. This is very basic Physics, but large numbers of candidates seemed to be guessing. Even part **(d)**, the answer to which was more or less given in the stem of the question, was frequently incorrectly answered. A point of advice to candidates on this sort of question – each part refers to "what sort" or "what form" i.e. singular. This indicates that only one answer is acceptable, so candidates who try to "hedge their bets" by putting, for instance, "kinetic and light" are certain to have one of them wrong and thus lose the mark. It is not usually wise to put lots of alternatives.

Question 5

(a) Most could state correctly what had happened to the pressure. There was more difficulty over explaining the answer, but many candidates made very good attempts. The concepts of molecules moving faster/having more energy, and of more frequent collisions, were well known. Less commonly stated was that it is collisions with walls which matter here. Rarely scored was the point for some understanding that molecules bouncing back off walls is related to a force.

(b) Most could identify evaporation, most knew about heat causing increased energy of motion and molecules escaping. Few were convincing about which molecules escaped.

Question 6

(a) There were lots of correct answers to this part, although very few calculations were shown.

(b)(c) Graph plotting was very casual. Points were often plotted with large blobs or crosses, and the smooth curve was often far from smooth. It is expected that points are plotted within ½ a small square, and careless plotting coupled with a large blob often loses candidates plotting points. There were candidates who did not seem to understand that points can be plotted at places between the printed graph lines. Thus, for instance, 210 was plotted at 220. With a large blob or cross, this would lose the plotting mark.

(c) Very few seemed to understand why we draw smooth curves. Most tried to answer in terms of "it is more accurate" or "it looks better". The reason has to relate to the quantity being plotted, in this case the fact that resistance and temperature change smoothly during the day, not discontinuously, therefore a smooth curve is more appropriate.

(d) It was very pleasing to see how many intelligent answers there were to this part. The most common incorrect answer was to go for a time when the resistance was greatest. Answers in terms of the position of the Sun were unacceptable.

Question 7

(a) Again, candidates showed a poor knowledge of the electromagnetic spectrum, a topic for many questions over the years. Some candidates left the boxes completely blank.

(b) A fair bit of guessing here, but the majority knew that sound was the odd one out.

Question 8

Reflection at a plane surface has been the subject of so many questions, one would expect that most candidates would score full marks. This was far from the case. Only a minority showed rays being reflected at right angles at each of the mirrors, and of these, many would have lost marks if markers had been instructed to penalise inaccurate drawing. Despite the instruction to "*carefully* continue.....", some candidates did not even bother to use a straight edge to draw the lines. More disturbing though, was the fact that so many showed Ray **2** being reflected along the normal and Ray **1** either parallel to it or in a direction to intercept it. Ray optics often seem to cause candidates problems.

Question 9

(a) Calculations on echoes are common in IGCSE Physics. Part **(a)** is basic, and yet only a small proportion calculated correctly. As might be expected, forgetting the "there and back" was the most common error, but also quite common was speed = time/distance.

(b) As would be expected in the light of **(a)**, answers to **(b)** tended to be fairly random, but credit was given wherever possible.

Question 10

A good proportion of candidates could identify **(a)** as conductors and **(b)** as insulators, and give suitable examples, but there was a surprisingly large minority who mixed them up. Very few realised that all that was required in **(a)(iii)** was to connect to a battery (or equivalent), and there was great confusion about which type of material could be charged by friction. There was probably a majority who thought the answer was the conductor. Why?

Once again, aspects of electrostatics seem to cause candidates to get confused.

Question 11

(a) It was interesting that most candidates answered this correctly, whereas in Paper 1, when questions about currents in different parts of a series circuit are asked, they frequently perform poorly. Candidates often seem to think the current decreases around a circuit.

(b) This was usually answered correctly.

(c) Most candidates correctly added the values, and an incorrect value carried into **(c)** from **(b)** was not penalised further. Very few showed the calculation, and in such cases, if the answer was not clearly 2 + answer to **(b)**, there was no way the marker could award the mark for working.

(d) Very few answered this correctly. It is accepted that core candidates are not expected to be able to do the calculation for parallel resistances, but they are expected to know that the combined resistance is "smaller than the smallest". They should also realise that the resistance cannot be zero, so the answer must be 1Ω. This leads to the current necessarily being more than 0.3A.

(e) Candidates who were prepared to apply their knowledge, usually answered **(e)** correctly.

Question 12

(a) A number of candidates answered this well, but most candidates only had a partial knowledge of the make-up of the atom. It was common for the mass and location of the neutron, and the charge and location of the electron, to be known, but the charge on the neutron more frequently was unknown and even a sensible idea of the mass of the electron was rare.

(b) Candidates were really very uncertain about the details of an α-particle. Most candidates failed to identify both the particles in **(i)**, although many knew one of them. The mass was generally an unknown quantity and, whilst some knew its charge was positive, very few could state that it was +2 on the scale in the table.

Paper 0625/03

Paper 3 (Extended)

General comments

The general standard of candidates' work was good and compared favourably with previous years. However, as always, there were significant numbers of candidates who scored very few marks, indicating that they were well below the standard expected for a paper aimed at C grade and above.

The proportion of really good candidates who scored more than 70 out of 80 appeared higher than last year. Only **Question 11** seemed to pose difficulty for the most able candidates, although there appeared to be no evidence of lack of time playing a part.

Questions involving accounts of experimental work continued to be very poor. This has been highlighted in many past reports, but there appears to be no general improvement. All but a small minority seem incapable of visualising themselves actually doing the practical work, step by step, and writing down the readings to be taken in a logical order. Many do not seem to understand that readings must be tied to the device which is taking the readings, for example, the current reading shown by the ammeter.

Questions involving graphs and calculation continue to be well done by the majority, with many full mark answers seen. Few wrong units were again a strong feature of the examination work.

Explanations of physical phenomena continued the improving trend, with more candidates making mark-worthy points clearly and succinctly.

Comments on specific questions

Question 1

(a) This type of question is usually well answered and this proved to be no exception. However, candidates must be careful not to say slow down or decelerate when they actually mean that the acceleration is decreasing.

(b) Errors seen included gravity force and weight, as though they were two different things; weight acting upwards and a variety of air resistance forces acting in all directions.

(c) Even when the forces shown in **(b)** were wrong, many candidates scored the first mark for an understanding that the two forces must be equal and opposite in direction. However, very few expressed the idea that zero net force resulted in zero acceleration.

(d)(i) Most candidates correctly used speed x time or the area under the graph, but many solutions were spoilt by mis-reads from the graph.

(ii) Many fully correct answers, but also many did not appreciate that average speed x time was necessary here.

Answers: **(d)(i)** 4800 m, **(ii)** 150 m.

Question 2

(a) Far too many tried to measure the time for one swing or worse the time from P to Q, in spite of the swing time being given as approximately 0.5 s and the question asking for an accurate measurement. Only a small minority realised that the time from P to Q was half of the periodic time and divided accordingly.

(b)(i) Wrong answers included upthrust and air resistance.

(ii) The majority of candidates realised that this was the centripetal force and gave the correct direction, but quite a number said there was no reaction and others said "towards the centre" which could have been the point R and was therefore not allowed.

(c) At least half of the entry scored both marks for a correct numerical answer and a correct unit. The most common error was to multiply 0.2 by 0.05, omitting the 10. Various wrong units were seen, the most common being newtons.

Answer: **(c)** 0.1 J.

Question 3

(a) The vast majority scored this mark, but many put the stress on magnitude rather than direction.

(b) Mostly correct answers, but a number put in an extra x10 and others wrote a correct equation but then added the numbers instead of multiplying.

(c) Again mostly correct answers, but there were those who used P = F x A instead of F/A.

Answers: **(b)** 6.0 N; **(c)** 2400 Pa.

Question 4

(a) Many marks were lost by not specifying exactly what was to be measured. Temperature, mass and time on their own were not accepted.

(b) One mark was often lost for stating only energy instead of power x time.

(c)(i) About half of the entry correctly gave heat loss to the air or surroundings. Just heat loss was not considered enough.

(ii) Some misunderstood the question and quoted additional pieces of equipment such as a stopwatch. Others managed to get **(i)** wrong but still came up with the correct answer of lagging the iron block.

Question 5

(a) Many poor answers, often amounting to no more than air molecules hit particles, but taking many lines of writing. To score more than 1 mark the nature of the hits needed spelling out more clearly for example "from all directions" or "unbalanced hits". With 4 marks available, it should have been clear to candidates that detail was required.

(b)(i) Poor answers such as "the molecules on the surface" and "the molecules pointing upwards" were common. Clear statements that the molecules with the most energy would leave first were in a minority.

(ii) Energy to break bonds or separate molecules were the required answers with a good proportion scoring this mark. However, very few developed this to state that moving/breaking intermolecular forces needed work to be done, hence energy is needed.

Question 6

(a) Most candidates scored this mark, but answers were generally unclear with angle of incidence zero rarely given.

(b) Mainly correct answers but those who gave wrong answers covered every possible combination of increase, decrease and remain constant. Some answers were spoilt by stating that there were changes rather than specifying increase or decrease.

(c) Mostly correct but a number showed the refraction nearer the normal. In spite of being asked to label the rays a significant number did not.

(d) A high proportion of fully correct answers. This was very creditable given that this was an unusual example where the ray passed from glass to air. Some poorer candidates divided the angles instead of the sines of the angles.

Answer: **(d)** 48°.

Question 7

(a)(i)(ii) In both parts the majority gave the correct answer. The expected wrong answer by reversing the answers to the parts was frequently seen.

(b) Most candidates did well in dealing with powers of 10, and in transposing the formula. Quite a number gave a wrong unit.

(c) The majority understood that the value required was the same as that for the speed of light.

Answer: **(b)** 3×10^{20} Hz.

Question 8

(a) The quality of the circuit diagrams was poor and labels were either inadequate or missing. All the usual faults were seen in large numbers such as voltmeters in series and ammeters in parallel, whilst some had extra connections which rendered the circuit useless. Some circuits had no fixed resistance shown which made it impossible to give credit.

(b) Clear correct answers were hard to find. Many thought that changing the setting of the variable resistor changed only the current in the resistor whilst the potential difference across the resistor remained constant.

(c)(i) The majority quoted and used Ohm's Law, but some did not calculate the required resistance.

(ii) The majority correctly used charge = current x time. As expected a number gave the wrong unit.

(iii) The majority correctly used the formula for power, but large numbers used the wrong current. Wrong or missing units were not uncommon.

Answers: **(c)(i)** 9.0 Ω, **(ii)** 60 C, **(iii)** 0.75 W.

Question 9

(a)(i) Well answered, clearly rectification was well understood.

(ii) The most common errors were to show full wave rectification or a constant d.c. potential.

(b)(i) Less than half the candidates could draw the correct symbol. The most common error was to show two inputs.

(ii) Very well answered by the majority. As in **(i)** most mistakes arose by trying to consider two inputs.

Question 10

(a) Mostly correct answers although some strange working led to wrong answers in a few cases.

(b)(i) Some good diagrams but the general standard was poor. Lack of labels did not help.

(ii) All but a few were poor. The minority that were on the right track often spoiled their answers by not making it clear exactly what they were measuring and where the components were placed.

Refinements such as placing the detector at a fixed distance from the source, with and without the aluminium were rarely seen. Very few measured the background count. A logical progression of readings from background count to count without the aluminium to count with the aluminium was all that the mark scheme demanded.

Question 11

(a) Many strange and wrong ideas were expressed. There seemed to be a lot of confusion with induction. More candidates were successful in terms of the field around the wire interacting with the field due to the magnet than those who used Fleming's rule as the basis of their explanations.

(b) Some correct answers, usually by the more able candidates. All the usual wrong possibilities were explored.

(c) A large number of candidates seem to think that the answer to all energy change questions is potential to kinetic and so large numbers gave this partly incorrect answer here.

(d)(i) Very few drew any resemblance to a split ring and brushes. Slip rings were very common.

(ii) Hardly any convincing explanations of commutation. Even the best candidates rarely scored more than 1 out of 2.

Paper 0625/04

Coursework

General comments

For the fourth consecutive year there was an increase in the number of Centres moderated. 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 point is still relevant to some of the Centres:

- 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

(a) Full marks here were awarded to candidates who recorded all the temperatures showing increasing temperatures and the correct added volumes. Some candidates did not complete the column headings in the table by inserting the units for volume (cm^3) and temperature (^oC).

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

(b) Many candidates were able to make a sensible suggestion about energy being lost to the surroundings.

Question 2

(a)-(f) The majority of candidates recorded the lengths, currents and voltages correctly with length values in cm, current values in amps, voltage values in volts and resistance values in ohms. Also the current and voltage values were usually given to at least 1 dp. Full marks for *R* were awarded if the values were arithmetically correct, all to 2 or 3 significant figures, 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. Less common was a range of resistance values that showed that the candidate had not followed the instructions.

(g) Good candidates were able to make a sensible prediction that fitted their own results to within a reasonable tolerance.

Question 3

(a)-(f) Most candidates took the readings carefully and accurately and followed up with correct calculations. A significant number of candidates lost a mark for failing to include the units for *T/m*. Candidates were expected to use consistent numbers of significant figures (2 or 3) for the values of *T/m.*

(g) Confident candidates commented that *T* is not proportional to *m* and spotted that *T/m* was not constant.

(h) Candidates could earn the marks here either by describing the averaging of the *t* values or by describing the technique of taking 10 oscillations to find *T*. Some candidates lost marks because they apparently did not read the question carefully and described other precautions that could have been taken.

Question 4

(a)-(g) Many candidates seemed to understand what was required here and were able to draw clear accurate diagrams as instructed. Some lost marks because their lines were very untidy or too thick. To obtain good results in this type of experiment it is good practice to place the pins far apart. Candidates who placed their pins less than 5 cm apart lost marks.

(h)(j)(l) The values should have been the same so those candidates who carried out their experiments with care were rewarded with accuracy marks here.

(m) Only the best candidates realised the significance of the phrase 'within the limits of experimental error' and completed the sentence with wording such as 'the angle of refraction is constant'.

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.

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 recorded the temperature correctly although some made the expected errors (e.g. 20.1°C).

(b) The graph plotting was usually accurate with a suitable temperature scale but many candidates lost a mark because their line was poorly judged or too thick. Some candidates are still producing a 'dot-to-dot' line.

(c) Many candidates correctly made a suggestion about heat loss to the surroundings.

Question 2

(a) This part was designed to test candidate's awareness of common apparatus and the ability to estimate. Few candidates scored full marks here but most were able to make three of four correct estimates.

(b) Any sensible example of good experimental practice was rewarded here but many candidates seemed unaware of what was being asked. Candidates should be encouraged to think critically about the methods they use in practical physics. In this case candidates should have been able to comment on the importance of using a small current (or leaving the current switched on for the minimum time) to limit possible temperature rise.

Question 3

(a) The majority of candidates recorded the lengths correctly.

(b) Most candidates drew the pointers in accurately. A minority were too careless to gain one or both of the available marks.

(c) Full marks for *R* were awarded if the values were arithmetically correct, all to 2 or 3 significant figures, and the unit correct. 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.

(d) Good candidates were able to make a sensible prediction that fitted the results to within a reasonable tolerance.

Question 4

(a)(b) Most candidates completed correct calculations. Candidates were expected to use consistent numbers of significant figures (2 or 3) for the values of T/m.

(c) Confident candidates commented that T is not proportional to m and spotted that T/m was not constant.

(d) Candidates could earn the marks here either by describing the averaging of the t values or by describing the technique of taking 10 oscillations to find T. Some candidates lost marks because they apparently did not read the question carefully and described other precautions that could have been taken.

(e) Candidates found this was a difficult mark to gain. Good candidates, familiar with the use of springs realised that the cause was that the lower spring would become fully compressed and stop the free oscillation.

Question 5

(a)-(e) Many candidates seemed to understand what was required here and were able to draw clear accurate diagrams as instructed. Most measured the angle of incidence correctly at 30^{o}. Some lost marks because their lines were very untidy or too thick. To obtain good results in this type of experiment it is good practice to place the pins far apart. Candidates who placed their pins less than 5 cm apart lost marks.

A minority of candidates clearly had little or no experience of the type of experiment and drew lines that had little relation to the instructions.

Since this is, in a sense, a practical exercise a good standard of line drawing is expected with candidates displaying care and attention to detail.