CONTENTS

PHYSICS

Paper 0625/01
Multiple Choice

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

General comments

This Paper produced a mean score of 31.365, similar to that for last year. The standard deviation was 6.121.

The most difficult items (facility 60% or lower) were items **17**, **24**, **26** and, in particular, item **39**. A facility of 90% or higher was produced by items **3**, **6**, **13**, **14**, **16**, **29**, **30** and **40**.

Comments on specific questions

87% of candidates chose correctly in the straightforward item **1**, although some failed to read the question carefully and chose option **B**. Item **2** (facility 77%) caused more difficulty, with 15% opting for **C**. Checking for zero errors is good practice and worth stressing to candidates. Few problems were encountered in item **3** (90%), but in item **4**, although more than six out of ten answers were correct, one third failed to look at units and consequently chose **A**, despite this being a very low speed for a car. Items **5** and **6** were well answered (84% and 94% respectively). With a facility of 73%, item **7** also showed a good spread of responses, although none of the distractors provided sufficient apparatus alone. In item **8** (85%), **C** attracted most incorrect choices, with these candidates failing to understand that extension must start at zero. The familiar-looking option **A** was chosen by 29% in item **9** (67% correct), although stability considerations lead to **B**. Item **10** (83%) showed that just over one in ten believed waves to be the energy source.

Although 69% were correct in item **11**, all the distractors were effective, suggesting lack of clarity over the concepts of work and power. The recall item **12** (72%) caused confusion only with a barometer. Items **13** and **14** presented little difficulty, but item **15** (86%) demonstrated that several candidates believed that air at room temperature consists of stationary molecules. Thermometer fixed points were well understood (item **16** – 95%), but less than half of responses were correct in item **17**, with **D** being a very popular choice – the concept of thermal capacity is not at all clear for many. **C** was chosen by one in ten in the generally well-answered item **18** (84%), and 12% opted for **A** in item **19** (82%). In item **20** (82%), **A** and **C** were chosen by 6% and 9% respectively.

Fewer than two thirds of candidates correctly identified 200m as a wavelength in item **21**, with almost a quarter apparently believing frequency to be measured in metres. In another recall item, **22** (71%), all distractors were effective, perhaps showing that differences between types of electromagnetic radiation were better remembered than similarities. **A** and **D** were popular choices in item **23** (73%), not all candidates knowing that rays through the centre of the lens will be undeviated. Confusion over the nature of longitudinal waves (or failure to recall sound waves as longitudinal) in item **24** (59%) lead many to opt for **D** or, to a lesser extent, **A**. Item **25** (86%) was well answered, but item **26** (60%) was not read carefully by the 34% choosing **C**. Almost a quarter opted for **D** in item **27** (71%), failing to realise that XY cannot be a magnet itself, so cannot be repelled. The familiar graph in item **28** (87%) did not present much difficulty, and nor did items **29** (90%), **30** (93%) and **31** (86%).

In item **32** (77%), the parallel fuse in **A** attracted one in five, and 15% chose **D** in item **33** (82%). Nearly a third of candidates believed that **B** was correct in item **34** (65%), missing the link between any relative movement and an induced e.m.f. The transformer item **35** (89%) was well answered. In item **36** (81%), option **A** was the most popular distractor, suggesting that candidates believed cathode rays to be positively charged. 86% of responses were correct in item **37**, and 89% in item **38**. The reverse calculation required in item **39** meant that only just over one third of candidates could cope – more than four out of ten chose **C**, probably multiplying the original mass by the number of half lives. With 90% facility, item **40** caused few problems.

Paper 0625/02

Paper 2 (Core)

General comments

In general, candidates coped well with most of this Paper. A number of questions showed up gaps in the knowledge of some candidates, but there were no questions which were beyond the capability of at least some of the candidates. Answers were usually clearly presented, and mathematical parts clearly set out, except for those few candidates who insist on doing all the working on a calculator, with nothing written down, which usually means that when a mistake is made, no marks at all are scored. There are still some candidates who cannot interpret the calculator display when it gives an answer involving powers of 10. A handful of candidates wrote so carelessly that Examiners found it impossible at times to decipher what had been written. Examiners are instructed to be as generous as possible when interpreting what candidates have written, but if an answer cannot be read, then no marks can be allocated.

Comments on specific questions

Question1

This was surprisingly poorly done, with only a minority of candidates obtaining a correct answer. A value of 4m was common, as was 1m. A good number could give an acceptable answer to **(b)**, with the vast majority of these choosing “slightly greater” with a reason. Some reasons were poorly expressed and could not be interpreted.

Question 2

In part **(a)**, some candidates missed the significance of “soft rubber”, and did not spot that the ball would stretch. Such candidates usually said that the ball would be stationary, but this was not awarded marks. In part **(b)**, most calculated the force of each block, but the incorrect answer “down” was common for the direction. Most attempts for reducing the sinking pot were good, with increasing the area of the blocks being the obvious one.

Question 3

This question was competently answered by most, barring the usual arithmetical errors. Here 10.5 was a common incorrect answer for **(b)(i)**. In **(b)(iii)**, some candidates used D = MxV. Quite a few could not interpret their calculator displays, and many lost marks because they simply ignored the calculator's attempt at showing powers of 10. This seems to be a silly way for candidates who know their Physics to lose marks. Lots tried to change the units for mass and/or volume, and got themselves in a tangle. The mark for the correct density unit was given if what was written was appropriate to the units the candidate was trying to use.

Question 4

There were lots of excellent answers to this question. Clearly this is a topic which is being well taught in most Centres. Most candidates knew about the involvement of molecular collisions in the creation of pressure. However very large numbers thought that collisions of molecules with each other were at least as significant as collisions with the walls. Clarification is needed here.

Question 5

Most candidates found this question difficult. Very few drew a horizontal line at "0", to indicate that the temperature stayed constant at the ice point. A reasonable number spotted that in **(b)**, the water had reached boiling. A few gave the alternative response that heat being lost = heat being supplied. Most answers were very vague, with many candidates being confused between melting and boiling.

Question 6

There were many pleasing answers to **(a)** in this question, with many candidates scoring all 3 marks. Lines were usually, though not always, drawn carefully. It was easy to spot which candidates had not studied reflection and ray diagrams adequately. The sentence in **(b)** was not always completed appropriately. The idea that the ray is parallel to the original ray was wanted, but a lot put phrases like "is equal to" or "the same as". Such answers were not considered adequate for the mark.

Question 7

This question was usually well done. As graph questions go, all candidates should have found it easy. Some threw marks away by careless plotting or over-large "blobs" and thick lines. Most knew that light travels faster than sound (although a significant minority thought it was the other way round), but very few indicated that light is very much faster, and that is the reason we get such a gap between the flash and the bang. The question quite clearly says in **(c)(ii)** "Use your graph......". Most did indeed find the required value from the graph, albeit not always very accurately. However, some insisted on calculating the value, with no reference to the graph. This approach did not score the marks, because the question was testing graph reading skills.

Question 8

Candidates were very uncertain about time delay circuits, and there were very few good answers. It is worth noting that when a question asks for "one use of.....", vague answers such as "In a television set" will not usually score marks. More detail than this is usually needed, and this is certainly the case here.

Question 9

A good number of candidates realised that the wires would be bent, most of these showing curves in opposite directions for the two parts. Very rarely were the curves smooth from A to B, although this was not penalised too harshly. Hardly any could explain satisfactorily why the wires behaved in this way. An acceptable answer had to involve the mention of a force. No penalty was imposed if the candidate showed the curving in the wrong direction.

Question 10

Very few Centres had candidates who had a sound grasp of the workings of a cathode ray oscilloscope. Indeed, some answers were dismal, suggesting that this is part of the syllabus which had been glossed over. Clearly, it aids understanding if candidates have had hands-on experience of CROs, and it is understood that not all Centres may have the equipment to permit this. However, this is part of the core syllabus, and candidates are expected to be able to deal with such questions. Quite a lot of candidates only scored the marks on **(a)(ii)** and **(b)(i)**, which might be inferred by a candidate prepared to think. Interestingly, a lot of candidates knew something about the inside workings of CROs, and made reasonable attempts at **(a)(i)** and **(iv)** even though they knew nothing about how to use the device.

Question 11

This question probably came as something of a relief to many candidates. It was generally very well done. Some candidates could not redraw Fig. 11.1 correctly, but such candidates were in the minority. Calculations were usually well done and adequately explained. A few treated the resistors in Fig. 11.2 as being in parallel, and consequently lost the marks in **(b)(i)**, but no further penalties were applied if subsequent working, with their incorrect resistance, was correctly done. It was disappointing to see, once again, that the majority of candidates do not realise that the current is the same all round a series circuit. Part **(b)(iii)** said quite clearly "On Fig. 11.2, show..........." In spite of this, many candidates insisted on redrawing the diagram at the bottom of the page, often introducing errors of their own. Such redrawn diagrams were not penalised, but candidates are unwise to waste time on such unnecessary activity.

Question 12

This question was frequently very well done, with many candidates scoring full marks. Occasionally "time" was quoted as the other quantity in **(b)**. In the last part, many candidates were unsure about other ways in which the energy in the climber's body was used. KE was allowed as an acceptable answer, except where the climb was treated as a sort of free fall in reverse i.e. KE decreases as the climber gets higher. It would be helpful to candidates if Teachers could discuss the involvement of KE in such situations – what happens to the KE when the climber stops, for instance.

Paper 0625/03
Paper 3 (Extended)

General comments

The Paper appeared to discriminate very well, with the least able candidates scoring very few marks and the most able achieving unusually high marks. The proportion of able and very able candidates seemed higher than in previous years.

Taken over the whole entry, **Questions 5** and **6** were very badly answered, particularly **Question 6**. Average and below average candidates who had performed well on **Questions 1** to **4** inclusive, often scored only one or two marks on **Questions 5** and **6** together. All the other questions gave a normal distribution of marks.

Where the question had a practical bias, as in **Questions 7 (c)** and **11 (a)**, candidates generally failed to write logically or completely, as a result the marks scored often failed to reflect the knowledge and understanding that the candidates showed in other parts of the Paper.

The high standard of calculation skills shown in recent years was not quite maintained, with more wrong answers and more wrong or missing units. Again, this year candidates who failed to show their working and obtained wrong answers lost all credit for the calculation, whereas those who did show correct working followed by wrong answers gained some credit.

The recall of factual information was excellent and where explanation was required a distinct improvement was noted.

Comments on specific questions

Question 1

(a) Both parts were well answered. The action of gravity on all masses producing a force called weight was well known.

(b)(i) Very few chose the wrong spring. In spite of the clear wording of the question by no means all candidates gave values from the graph to support their answer.

(ii) As expected there were many wrong answers. Popular wrong values were at extensions of 30 mm and 37 mm (the end of the line).

(iii) Most candidates gave correct answers around 6 mm, but it was hard to see the origin of some of the incorrect values.

Answer: **(b)(iii)** 6 mm.

Question 2

(a) Those who used deceleration = speed change/time almost always scored full marks. As expected the most common errors were to divide 2.5 or 1.0 by 12.

(b) Surprisingly there were less correct answers than for part **(a)**. Often complex formulae were employed with disastrous results. A number referred to a non-existent graph in an attempt to use the area under it. Those who used average speed x time generally scored full marks.

Answers: **(a)** 0.13 m/s^2; **(b)** 21 m.

Question 3

(a) The answers sharply divided between those who were able to construct a parallelogram or triangle of forces and those who had no idea and generally simply added the two forces together or reproduced the diagram given in the question. However, about half of the entry successfully demonstrated the high level of skill required and scored full marks. It was sad to see some able mathematicians who ignored the instruction in the question and proceeded to calculate an answer with a consequent loss of marks.

(b) A high proportion of fully correct answers to both parts were seen. The most common mistake was to multiply work by time instead of dividing when calculating power. A number confused the units of work and power, commonly writing joules for both.

Answers: **(a)** 1780 N; **(b)** 4500 J, 1800 W.

Question 4

(a) The confusion between particles and molecules was less common than with previous questions on this topic. However there were considerable numbers of candidates who thought that the dust particles were “lighter than the heavy air molecules”. Many answers were spoilt by extending this wrong concept to “fast moving dust particles colliding with air molecules”. However, there were many excellent answers seen.

(b) Large numbers of fully correct answers were seen, generally well set out and with all the working shown. The most common error was the use of 2 x 25/80 instead of 2 x 80/25.

Answer: **(b)** 6.4 x 10^5 Pa.

Question 5

(a) A poor level of correct response to both parts. In **(i)** even good candidates gave copper as the answer. In **(ii)** a wide variety of wrong or unacceptable suggestions included thermocouple, meter and readout. Any named meter was accepted provided it was capable of detecting an e.m.f. of millivolts or less or a current of milliamps or less.

(b) Whilst some good answers were seen the vast majority had no idea. Only simple explanations were required in terms of the difference in junction temperatures producing an e.m.f. which was measured by a millivoltmeter which in turn could be calibrated to read in °C.

(c) Most candidates stated a dull black surface. A good conductor of heat was a popular wrong answer.

Question 6

(a) The standard of answers to this part was extremely poor. Widespread confusion between wavefronts and rays made it difficult to give any credit. Common errors were to measure the angles between the wavefronts and the glass as the angles of incidence and refraction and to draw the incident ray along one of the wavefronts.

(b) Very few candidates scored more than one mark for stating the formula and attempting to substitute in it. A significant number divided the angles instead of the sines of the angles, something which has been rarely seen in the past.

Question 7

(a) At least half of the entry gave the correct value and the correct unit.

(b) It was very surprising to note that a large number of candidates thought that sound travelled faster than light.

(c) The general level of answer seen was poor, though the better candidates usually scored full marks. Large numbers suggested timing the light separately over a few metres with a stopwatch. A large number used reflection methods, which were not in the spirit of the question. However these were reluctantly allowed provided they were properly described.

Question 8

(a) All parts were correctly answered by the majority of candidates. Most errors occurred in **(i)**, often followed by full mark attempts at **(ii)** and **(iii)** by applying the carry-forward of errors. Both transposition errors and unit errors were common. In **(iii)** a common error was to confuse energy and power.

(b) This difficult topic was well understood by the good candidates. However, the concept of e.m.f. as a measurement of energy transfer per unit of charge appeared too difficult for many.

Answer: **(a)** 2 A, 3 Ω, 540 J.

Question 9

(a) Both calculations were well done with many full mark answers. Units were seldom a problem.

(b) In **(i)** it was good to see the majority giving clear answers in terms of no energy or power loss. Common errors included answers of no voltage and no current. In **(ii)** some good candidates lost marks because they only addressed the factor relating to the turns ratio and stated nothing about the process of induction. However there were many excellent answers giving more detail than was required for full marks.

Answers: **(a)** 48 W, 120 V.

Question 10

(a) Most candidates drew a circular field line through *P*, with a minority wrongly drawing a clockwise arrow. Arrows through *Q* tended to be in all directions with a significant number pointing up the page.

(b) The vast majority found this part easy, the most common mistake was in **(i)** where some stated that the needle deflected more.

(c) The answers divided sharply between those who understood and gave fully correct answers and those who did not understand and merely guessed, usually getting all three parts wrong.

Question 11

(a) The general standard of the answers was poor. In spite of the experiment being broken down into three parts in an attempt to help the candidates, the information given was randomly scattered into the three parts by many of them. The Examiners gave credit for correct responses wherever they occurred, that considerably helped many candidates. Many accounts were muddled with often no mention of a detector or even a test. Far too many seemed to think that a discussion of the various penetration powers of the three types of radiation was an answer to the question. The best candidates did give superb, clear, full mark responses but they were in a minority.

(b) Only a minority gained all three marks. Most gained the mark for a curved path, either stated or drawn. Large numbers stated that the particles were attracted to either the N pole or the S pole of the magnet.

Paper 0625/04
Coursework

General comments

The candidates at the majority of Centres were given many opportunities to demonstrate their practical skills using a varied range of tasks from different areas of the syllabus. Clearly a large amount of good work has been completed by Teachers and candidates. A large number 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 Moderators' Reports were noted. The assessment criteria were successfully applied and the marks awarded to candidates were not adjusted.

The following two points are still relevant to 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 of 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. Most candidates dealt well with the range of practical skills tested. Each question differentiated in its own way, but it was noticeable that the question that caused most difficulty was **Question 4**, the optics question. It appeared that some candidates had no personal experience of carrying out this kind of practical work.

Comments on specific questions

Question 1

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

(d) The graphs were generally accurately plotted but a suitable temperature scale allowing good differentiation between the lines was rarely chosen. Some candidates lost marks since their lines were too thick or poorly judged best fit curves.

(e) Most candidates correctly stated which thermometer heated up more quickly, but few responded correctly to the question since they did not justify their conclusion by reference to the graph. Rather they attempted a theoretical answer. They should be advised that theoretical answers are not required in the practical examination. The better candidates compared the steepness of the curves.

Question 2

(a)–(e) Most candidates correctly took the readings and followed up with correct calculations. Some candidates lost marks by failing to include the unit or to show that they could read the metre rule to better than the nearest cm. Good clear diagrams showed that many candidates understood how to use the blocks to enable them to measure the diameter accurately. Errors in the calculation were rarely seen.

(f) Many candidates did not take readings but performed a calculation using $2\pi r$. Others used too little string; there was sufficient to wrap around the beaker several times in order to improve accuracy of the final result.

(g)(h) The calculations were usually correct but some candidates lost marks by missing the unit for A and/or giving the answer to more than 3 sf.

(i) The estimation proved to be a problem for some candidates. A wide tolerance was allowed, but some estimated a volume of less than 250 cm^3, whilst others grossly overestimated (estimates in excess of 400 cm^3 were seen.

(j) Full marks were obtained here by candidates who correctly calculated G and gave the answer to 2 or 3 significant figures with the unit, cm^3.

Question 3

(a)–(g) The majority of candidates recorded currents, voltages and resistances correctly with values given to at least 1 dp and the units present. Full marks for the ratio were awarded if it was arithmetically correct, to 2 or 3 significant figures and was given no unit.

(h) Most candidates drew a correct circuit with the voltmeter in parallel with the motors, the ammeter in series and the variable resistor in series with one of the motors. The most common error was in the variable resistor symbol. Some candidates drew a thermistor symbol and others a non standard symbol.

Question 4

(a)–(b) This was the least well answered question for many candidates. However the majority drew the angles correctly.

(c)–(f) Fewer candidates were able to plot and draw the reflected rays with adequate accuracy and neatness. Some candidates apparently had no previous experience of this type of experiment and drew in rays in entirely the wrong directions. Subsequent marks were however awarded whenever possible where candidates had followed the instructions correctly.

Credit was given to those candidates who realised that accuracy is improved if the pins are placed far apart. A distance apart of 5 cm or more gained marks.

(g)–(i) Careful candidates gained marks for drawing the parallel lines accurately and measuring to within $\pm$ 1 mm. The best candidates expressed the ratio to 2/3 significant figures and with no unit.

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.

The overall standard of work was encouraging.

Comments on specific questions

Question 1

(a) Most candidates correctly calculated the values of e. A few gave values which were l – W. Where necessary subsequent marking allowed for this so that candidates were not over penalised for this initial error.

(b) Most candidates chose a good scale that filled the grid. Some merely wrote the readings from the table equally spaced along the axes. Others plotted the wrong values (W and l rather than e). Again, subsequent marking allowed for this so that candidates were not over penalised for this error. Some line work was poor: large plots, thick lines, 'dot-to-dot' lines and carelessly placed best fit lines.

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

Question 2

(a)–(c) Many candidates correctly measured the angle of incidence and went on to draw in the refracted ray and normal. To gain full marks the angles and the normal had to be correct to $\pm$ 1° and the lines drawn neatly. This is an example of where, in this Alternative to Practical Paper, the candidates are asked to do something of a practical nature; in this case, measuring angles and drawing lines. The Examiners expect, therefore, a high level of care and accuracy as candidates demonstrate their practical skill.

(d) Many candidates correctly marked two pins on either side of the prism. Fewer gained the mark for placing the pins a reasonable distance apart (judged by the Examiners to be at least 4 cm on this diagram).

Question 3

(a) Most candidates correctly showed a voltmeter in parallel with the lamp and identified the variable resistor.

(b) Few candidates misread the scale, but most of those who did placed the pointer at 2.4 V instead of the 2.2 V asked for.

(c) To gain full marks, candidates had to write in the correct units (most did but some apparently ignored the instruction), and then perform correct calculations giving the answers consistently to either 2 or 3 significant figures.

Question 4

(a) Most candidates measured the distance correctly (6.8 to 6.9 cm was allowed) but some failed to include the appropriate unit to match the value (cm or mm). A significant number did not realise that division by 10 was required to calculate the circumference and used irrelevant equations instead.

(b) Many candidates used the equation correctly but some lost a mark by missing the unit or giving their answer to more than 3 significant figures. Calculating *e* proved a problem for many who did not realise that 90° is one quarter of a revolution and therefore did not divide their *c* value by 4. This proved to be a question that only the better candidates could answer with confidence with relatively few going on to work out the length of the heated rod correctly by adding their value of *e* to the original length. Answers to any number of significant figures were accepted here down to the nearest mm.

(c) Better candidates made sensible suggestions here e.g. the string might stretch, the rule cannot measure the length of the string to better than 1 (or 0.5) mm, when the string is wound round the coils are not at right angles to the axis of the rod, thus each turn is slightly in excess of the circumference. Answers that effectively said that the method might have been done carelessly did not attract a mark.

Although this was a difficult question some candidates produced excellent answers, gaining full marks.

Question 5

(a) Many candidates scored full marks here.

(b) Good candidates knew what was required here and gave sensible answers (e.g. same initial temperature, same room temperature, same volume of water, same thickness of insulator, same can throughout, etc.). Others were apparently unaware of the importance in experimental work of the control of variables and could only give vague or irrelevant answers (e.g. constant pressure).