Location Entry Codes

As part of CIE's continual commitment to maintaining best practice in assessment, CIE has begun to use different variants of some question papers for our most popular assessments with extremely large and widespread candidature, The question papers are closely related and the relationships between them have been thoroughly established using our assessment expertise. All versions of the paper give assessment of equal standard.

The content assessed by the examination papers and the type of questions are unchanged.

This change means that for this component there are now two variant Question Papers, Mark Schemes and Principal Examiner's Reports where previously there was only one. For any individual country, it is intended that only one variant is used. This document contains both variants which will give all Centres access to even more past examination material than is usually the case.

The diagram shows the relationship between the Question Papers, Mark Schemes and Principal Examiner's Reports.

Question Paper	**Mark Scheme**	**Principal Examiner's Report**
Introduction	Introduction	Introduction
First variant Question Paper	First variant Mark Scheme	First variant Principal Examiner's Report
Second variant Question Paper	Second variant Mark Scheme	Second variant Principal Examiner's Report

Who can I contact for further information on these changes?
Please direct any questions about this to CIE's Customer Services team at: international@cie.org.uk

PHYSICS

Paper 0625/11
Multiple Choice

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

General comments

5018 candidates sat this paper, scoring a mean of 25.904 with a standard deviation of 7.285. The mean score was lower than last year, and the standard deviation higher. Only item **17** had a facility of 90% or higher. Items **1, 2, 3, 10, 11, 13, 16, 18, 30, 32, 33, 34, 38** and **40** had a facility of 60% or lower.

Comments on individual questions

(Percentages in brackets after an item number show the proportion of candidates choosing the correct response)

All distractors worked well in item **1** (52%), indicating that it would be well worth practising similar examples in teaching. In item **2** (59%) 26% chose D, failing to halve the product of speed and time. More than one in four candidates opted for C in item **3** (53%), choosing the average of the highest and lowest speeds rather than dividing the total distance by the time taken. Item **4** (66%) was better answered, as was item **5** (78%), although option A proved quite popular in item **4**. With a facility of 88%, the density item **6** caused few problems, and this was also true of item **7** (87%) on force and item **8** (86%), also on force. A significant number of candidates believed that nuclear power stations did not use boiling water (item **9** (65%)). Item **10** (61%) was on power, and almost a third of candidates chose A, possibly visualising the amount of difficulty involved rather than using the times given in the question.

The first really problematic item was item **11** (27%), in which the majority of candidates believed that the wider tube would have a lower mercury level and opted for C. It needs to be stressed that the level depends solely on the pressure and the type of liquid, and not on the width of the tube. Those who failed to answer item **12** (76%) generally failed to realise that the oil, being less dense than water, would produce a lower pressure in C than in A. Item **13** (46%) dealt with change of state, and 49% of candidates apparently thought that evaporation caused the temperature of the remaining liquid to increase rather than decrease. In item **14** (74%), the most common mistake was the belief that increasing volume causes density to increase as well. Although well answered by most, in item **15** (65%) distractor C proved popular. The concept of thermal capacity was not well understood by most candidates, leading to a low success rate in item **16** (45%). Much better answered was item **17** (91%), but item **18** (42%) was another challenging item, in which by far the most popular distractor was B, suggesting confusion between the random process of diffusion and the upward movement of the smoke as a result of convection. In item **19** (65%), 16% chose D, remembering the reduction in wavelength but not the change in direction, and 18% chose B, showing even more confusion. A similar facility was shown in item **20** (63%). It is worth noting that in item **21** (70%), several candidates believed that dispersion only started as the light left the prism. Lenses were quite well understood in item **22** (69%), and the item on diffraction, item **23** (80%) was better answered still,

Item **24** (80%) and item **25** (78%) were well answered, but in item **25** distractor B was popular, and it would be worth reinforcing the idea of induced poles always causing attraction. The magnetism item **26** (82%) and radioactivity item **27** (74%) worked as intended. Those failing to chose A in item **28** (63%) appeared unfamiliar with the current/voltage characteristic for an ohmic resistor. Item **29** (78%) was better answered, but in item **30** (57%) the popularity of option A suggests that it would be useful to reinforce that fact that adding resistors in parallel reduces total resistance. Option C was the most popular distractor in item **31** (72%) Almost two fifths of candidates chose option B in item **32** (36%), failing to realise that both components would be connected in the same position. Further problems were found with item **33** (34%) in which very many candidates opted for C rather than choosing the lowest fuse rating which could carry the maximum current drawn by the lamp. Item **34** (41%) was also poorly answered, suggesting a lack of familiarity with the shape and direction of the magnetic field around a wire, but transformer calculations were familiar to most in item **35** (86%). The recall item **36** (75%) worked well, but the cathode-ray tube item **37** (63%) showed a lack of understanding by several candidates, and item **38** (50%), on α emission, caused even more difficulty. Half-life was covered by item **39** (71%) and showed a fair number of candidates to be unclear on this topic. The final item **40** (49%) suggested confusion over the nature of and the term ‘nucleon’ as opposed to ‘neutron’.

PHYSICS

Paper 0625/12
Multiple Choice

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

General comments

9784 candidates sat this paper, scoring a mean of 27.881 and a standard deviation of 7.578. The mean score was lower than last year, and the standard deviation higher. Items **7, 18** and **33** had a facility of 90% or higher. Items **1, 3, 12, 14, 16, 17, 31, 32, 35, 39** and **40** had a facility of 60% or lower.

Comments on individual questions

(Percentages in brackets after an item number show the proportion of candidates choosing the correct response)

Almost a third of candidates opted for C in item **1** (56%), choosing the average of the highest and lowest speeds rather than dividing the total distance by the time taken. In item **2** (70%) 18% chose D, failing to halve the product of speed and time. All distractors worked well in item **3** (53%), indicating that it would be well worth practising similar examples in teaching. Item **4** (79%) was better answered, as was item **5** (70%), although option A proved quite popular in this latter item. With a facility of 86%, the forces item **6** caused few problems, and this was also true of item **7** (90%) on density and item **8** (88%), also on force. Item **9** (61%)

was on power, and more than a quarter of candidates chose A, possibly visualising the amount of difficulty involved rather than using the times given in the question.

A significant number of candidates believed that nuclear power stations did not use boiling water (item **10** (67%)). Those who failed to answer item **11** (80%) generally failed to realise that the oil, being less dense than water, would produce a lower pressure in C than in A. The first really problematic item was item **12** (35%), in which over half of candidates believed that the wider tube would have a lower mercury level and opted for C. It needs to be stressed that the level depends solely on the pressure and the type of liquid, and not on the width of the tube. Although well answered by most, in item **13** (73%) distractor C proved popular. Item **14** (51%) dealt with change of state, and 43% of candidates apparently thought that evaporation caused the temperature of the remaining liquid to increase rather than decrease. In item **15** (76%), the most common mistake was the belief that increasing volume causes density to increase as well. Another challenging item was item **16** (40%) in which by far the most popular distractor was B, suggesting confusion between the random process of diffusion and the upward movement of the smoke as a result of convection. The concept of thermal capacity was not well understood by a fair proportion of candidates, leading to a relatively poor success rate in item **17** (58%). Much better answered were items **18** (90%) and **19** (85%), but it is worth noting that in item **20** (80%), several candidates believed that dispersion only started as the light left the prism.

Lenses were generally well understood in item **21** (77%). In item **22** (72%), 16% chose D, remembering the reduction in wavelength but not the change in direction. A similar facility was shown in item **23** (70%), but item **24** (83%) and item **25** (85%) were found easier. The magnetism and circuit items **26** (79%) and **27** (**77%**) worked as intended. In item **26** distractor B was popular, and it would be worth reinforcing the idea of induced poles always causing attraction. Similarly in item **28** (70%) the popularity of option A suggests that it would be useful to reinforce that fact that adding resistors in parallel reduces total resistance. Those failing to chose A in item **29** (67%) appeared unfamiliar with the current/voltage characteristic for an ohmic resistor. Item **30** (84%) was much better answered, unlike item **31** (44%) in which over a third chose option B, failing to realise that both components would be connected in the same position. Further problems were found with item **32** (40%) in which very many candidates opted for C rather than choosing the lowest fuse rating which could carry the maximum current drawn by the lamp. Transformer calculations were familiar to most in item **33** (90%) and the recall item **34** (79%) was generally well answered. More problems were found in item **35** (49%) which suggested lack of familiarity with the shape and direction of the magnetic field around a wire. Items **36** (80%), **37** (72%) and **38** (76%) were better answered, but the final two items **39** (51%) and **40** (56%) indicated confusion over the nature of α emission and the term ‘nucleon’ as opposed to ‘neutron’.

PHYSICS

Paper 0625/02
Core Theory

General comments

Many candidates made excellent attempts at this paper. Although there were a restricted number of outstanding candidates, there were also relatively few very poor scripts. This suggests careful preparation by candidates for whom the subject does not come easily. This is to be commended.

It is not considered that any of the questions was particularly difficult, but there were a number which were poorly answered, and comment will be made about these later. However, it was pleasing that most candidates were able to make some attempt at all parts of all questions, and that most candidates left few, if any, sections unanswered. In this particular paper, there was relatively little extended numerical work. Any problems with numerical questions seemed to be related to poor understanding of the underlying Physics, rather than lack of facility with numbers.

On occasions in the past, comment has been made about the lack of care over the presentation of answers, on the part of at least some candidates. Candidates are not penalised for poor writing, but marks cannot be awarded if an answer simply cannot be read unambiguously.

Comments on specific questions

Question 1

(a) Very few failed to read the clocks correctly and to do the necessary subtraction correctly.

(b) Apart from a few who divided by 60 and a few who tried to find the number of vehicles per hour, this was well done. Many failed to show their working, including some who got the wrong answer, but may well have scored 1 or 2 marks if they had done so.

Question 2

Candidates generally scored well on this question. As might be predicted, it was the definitions of mass and weight that caused most problems – density was usually correctly answered.

Question 3

(a) Most obtained the correct answer, but there were some who added the two forces, or even divided them.

(b) Again, this was mostly correctly answered. Interestingly, a small minority ticked several boxes. If they had stopped to think, they should have realised that there could only be one correct answer, and to tick more than one answer **must** involve getting the answer wrong.

(c) & (d) This was very poorly answered. Almost every imaginable possibility was offered, occasionally the correct one.

Question 4

(a) Most could read the difference in heights correctly, but very few could get further.

(b) Hardly any repeated the answer from **(a)** here. It was impossible to guess where most of the answers came from.

(c) Rarely answered correctly. A frequent incorrect response was obtained by subtracting **(a)** or **(b)** from 750.

(d) The vast majority had the left level going up and the right level going down, which scored 1 mark. Unfortunately, most of these had a 20 mm change in each case, instead of the required 10 mm.

Question 5

(a) This was badly answered by virtually all candidates. The reasons for the various features of the thermometer simply were not known.

(b) This part was usually answered correctly.

(c) The question was deliberately set in terms of the ice and steam points, in order to steer candidates away from the mistaken linking of -10°C and 110°C with the upper and lower fixed points. For large numbers of candidates, the ploy failed, as -10°C and 110°C appeared with disappointing regularity as answers.

Question 6

(a) & (b) It was pleasing to see how often these questions were correctly answered. It is suspected that many of those who answered incorrectly were hampered by poor language skills. There were those, however, who mixed up the relationships between loudness, amplitude, frequency and wavelength. Only a few felt the need to introduce the concept of pitch.

(c) Most found this beyond their capability.

(d) To compensate for the poor performance on **(c)**, **part (d)** was usually well done, with most candidates scoring at least 2/3.

Question 7

(a) It is hard to believe how many candidates did not know the correct direction for the normal, nor the correct identity of the angle of incidence. If this had been a mirror in a laboratory, it is wondered if there would have been as many incorrect responses. Large numbers could not even quote the usual *angle i = angle r* equation, and only a small number could identify the windows which would or would not be hit by the beam In some cases, incorrect answers to **(iii)** and **(iv)** were due to incompetent/careless drawing of the reflected rays.

(b) Now, this part **was** a laboratory-type set-up, and it was correctly answered by a good majority of candidates. Imperfect drawing skills were not penalised if it was clear what the candidate intended, although the standard of drawing, in many cases, was really very good.

Question 8

All parts of this question were generally well answered, with the exception of **part (d)**, which was deliberately intended to test the better candidates, many of whom did indeed answer correctly.

Question 9

(a) & (b) This should have been any easy few marks for all but the weakest candidates. In reality, a disturbing number could not identify the e.m.f. and the current. Many interchanged them, others put the current as 50 A instead of 50 mA. When it came to calculating the resistance, very few scored all 3 marks, because they worked out I/V or they failed to convert to A before dividing or they incorrectly converted to A or they missed the unit off the answer. It will be noticed that no units were supplied on the answer lines for **(a)** and **(b)**. This is intended to signal to the candidates that they are expected to supply them. No more than a couple of marks are awarded for units on 0625/02 papers, and there was a 1 mark unit penalty on this question.

(c) & (d) These two parts taxed all but the best candidates, although most candidates did manage to pick up the odd mark or two. It was worrying, however, that so few had any idea of the serious consequences of closing the switch in Fig. 9.2. Putting a switch in parallel with a component is a very real mistake which might be made.

Question 10

(a) A good number realised that XY would now go up, but quite a few thought that the reversal of the current would make no difference.

(b) Most candidates scored good marks on the drawing of the graph. The most common sources of lost marks were not, generally, incorrect plotting. As always, there were those who used inappropriate scales (those involving multiples of 3, 7 etc.), those who simply put the quoted values of *F* at regular intervals on the vertical axis and those who interchanged the scales. The plotting marks lost were usually for using extremely large blobs for plotting points. It is true that small dots can be lost against the lines on the graph, so small dots should perhaps be avoided, but it is better to use dots surrounded by **small** circles or crosses with the intersection of the cross accurately at the place intended. Either way, a maximum plotting error of ± ½ small square is allowed on this paper.

(c) Very few could identify a device that utilised the force on a current-carrying conductor. Common incorrect attempts included generator, dynamo, electronic balance and pan balance.

Question 11

(a) – (d) These were frequently all correct, although “up” and “down” were sometimes put in separate boxes. Those who did not bother to read the instructions properly treated the diagram as a standard labelled diagram of a cathode ray tube, thus usually scoring the mark for cathode but nothing else. There was some uncertainty shown on some scripts about where the battery should be connected.

(e) & (f) Most could answer both parts correctly, with incorrect answers to **(e)** including α and β particles, and all the alternatives in **(f)** occurring on different scripts.

Question 12

This question revealed the poor understanding that candidates have of the characteristics of these radiations. About the only characteristic that was known by most was that beta is negative and gamma has no charge. According to most, gamma has no nature! Answers to the line about penetrating ability were usually so vaguely worded that they were worth no marks.

Location Entry Codes

UNIVERSITY *of* CAMBRIDGE
International Examinations

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PHYSICS

Paper 0625/31

Extended Theory

General comments

The work of the vast majority of candidates was a credit to the teaching they had received. The impression created by their efforts was they had done their utmost to produce answers which maximised their ability. There were few signs of giving up in more difficult questions and blank spaces in the question paper were comparatively rare across the ability range.

The performance of the ablest candidates was impressive. They were able to express themselves with great clarity in descriptions and explanations, and for them the calculations proved to be straightforward. The candidates rather less able than these showed variable levels of weakness, more predominantly in verbal answers than in numerical ones. At this level also the tendency to omit the units of numerical answers became more evident, but the calculations themselves were largely accurate.

The weakest candidates tended to misinterpret the requirements of the questions, introducing irrelevant material in their answers. They were more likely to make errors in calculations and to give numerical answers with wrong units or sometimes omitting them altogether. Unit errors are penalised to the extent of one per question.

Many calculations require the use of a formula and an early mark in a calculation is to write down the formula or to write it with numbers substituted. If the numbers substituted are the wrong ones the mark is lost. To avoid this possibility, candidates should be encouraged to write down the formula before they attempt substitution. Numerical answers, unless they are accurate to one significant figure, require a minimum of two significant figures.

Comments on specific questions

Question 1

For a good answer, candidates had to respond to the words ‘find accurately’ in the Question. 2 marks could be gained if a candidate wrote about timing at least 10 cycles of the piston’s movement or counting the number of cycles in at least 20 seconds, and dividing the time measured by the number of cycles. 1 mark was available for starting the timing at a recognisable point in the cycle, e.g. the bottom of the piston’s movement. The final mark could be gained by suggesting repetition of the measurements or other sensible precaution, e.g. checking the zero of the timer.

A number of candidates lost a mark for dividing the number of cycles by the time.

Question 2

(a) Few candidates had success with this part. The simple answer required was ‘Water’ and ‘Liquids expand more than solids’. Various ideas were expressed involving the anomalous expansion of water, the contraction of ice when it melts, the differing atomic separations in water and ice, etc., all considered irrelevant in this particular question.

(b) Most candidates interpreted the data correctly and gained at least 2 of the 3 marks. The relative expansions had to be referred to and the fact that aluminium reinforcement could damage the concrete pillars expressed in a suitable way.

Question 3

(a) (i) Most candidates could refer to the straight line nature of the graph or to its constant gradient.

(ii) Whether or not they quoted the acceleration formula, most of the candidates used the indicated graph coordinates and arrived at the correct answer. Some however omitted the unit, or gave the unit as m/s or m/s^{-2}.

(0.75 m/s^2)

(b) (i) A majority stated 'reduces the acceleration' in one way or another. Others had the wrong idea with some of these stating 'reduces the speed'.

(ii) The correct answer: (friction force) = the component of the weight down the slope was very seldom seen. The simple words 'weight' or 'gravity' were often used in isolation, but were not sufficient by themselves. Other incorrect answers included 'air resistance balances speed' or simply 'acceleration'.

(iii)1 The graph needed to start at the origin, have a decreasing gradient and become horizontal. However, frequently, the graph started with a straight line from the origin. Only a few graphs were entirely wrong.

2 A correctly curved part marked A and a correct horizontal part marked B each gained a mark. Clearly, some candidates could not access these marks if they had not drawn a suitable graph.

Question 4

(a) (i) Many candidates gained maximum marks for accurate constructions, either of a parallelogram or, much less frequently, of a triangle. Many of those who failed to gain full marks gained some credit for accurately representing the two forces and the angle between them.

(ii) This was more problematical. Although, many used the scale of their construction to find the force correctly, others wrote down the length of the construction line and not the corresponding force. Even fewer candidates could write down the angle made by the resultant with the direction of the road.

(5500-5700 N; 28-32°)

(b) Most candidates know what is meant by a vector and could give an example.

Question 5

(a) (i) A large majority of candidates could state and use the kinetic energy formula and arrived at the correct value and unit. The minority who failed to do so usually forgot to square the speed in the calculation.

(5400000 J or 540 kJ)

(ii) Here again there were very many correct answers with correct units. For those who did not get the answer completely correct, partial credit was often gained for finding 10% of the answer **(a)(i)** and using $P = E/t$.

(54000 W or J/s or 54 kW or kJ/s)

(b) (i) Correct answers were very common.

(3750 kg)

(ii) This caused more difficulty and correct answers were less frequent. However, many candidates managed to access part marks.

(0.125 or 1/8 or 12.5%)

Question 6

(a) (i) The correct formula is well known and was correctly used to find the pressure with the correct unit. The comparatively few who gained the wrong numerical value were likely to have made errors in the use of their calculators.

(1.4×10^6 Pa or N/m^2)

(ii) Most candidates wrote down the correct value. A few answers of 168 N were given as well the value of the pressure previously calculated.

(84 N)

(iii) A full answer required candidates to write that the same force acting over the smaller area (of the thumb) gives a bigger pressure. The same force was very infrequently mentioned so a mark was often lost.

(b) (i) Many candidates got this part correct. Those who did not get a completely correct answer often gained partial credit for stating the formula $P = hdg$ in symbols, words or with correct numerical values.

(30000 Pa or N/m^2)

(ii) The second pool with twice the area persuaded many that the pressure at the same depth would be halved or, less frequently, doubled. Only the more alert realised that the new area was a distraction and correctly repeated their answer to **(i).**

Question 7

(a) (i) 'Molecules with high energy / high speed' gained a mark. The second mark could be gained for 'Molecules escape from / leave the liquid surface' or 'Molecules overcome attractive forces / break bonds'. These statements could be made in various acceptable ways but the second mark was not awarded for 'Molecules evaporate' which was the process requiring explanation.

(ii) Many candidates stated that 'the puddle has a larger surface area', but fewer could state that 'more molecules escape / evaporate (in the same time).

(iii) Some candidates simply repeated an increase in surface area, which was not acceptable.

(b) (i) This proved to be a difficult question in which only a minority of candidates were successful in whole or in part. Many unsuccessful answers suggested that the objective was to prevent heat gain by normal heat transfer processes, rather than extending thinking on evaporation to this context.

Question 8

(a) Most candidates answered this part successfully in terms of the difference in the angles of incidence and reflection at the medium A / air boundary. A few candidates even correctly specified that A was more dense on the basis that ray 3 undergoes total internal reflection because that only happens in the denser medium.

(b) The required answer was that the higher speed was in air because air is less dense (than A). Candidates found various equivalent ways to make this comparison. Unsuccessful answers were mostly an extension of misunderstandings in **part (a).**

(c) This was reasonably well attempted.

(42-45°)

(d) In general, candidates seemed to be familiar with this effect.

(e) Correct values for the angle were rarely given. An angle of incidence was required rather than an angle of refraction and this caused some confusion. Perhaps candidates have less experience of this type of calculation.

(58.71 or 58.72 or 58.7 or 59°)

(f) There was a good deal of success with this calculation. The answer was required to at least 2 significant figures, and many gave more than this.

(2.0×10^8 m/s)

Question 9

(a) Many candidates had little idea of what was expected in this question. Many gave graphs with positive and negative values; others gave only positive graphs which were not separated into separate humps.

(b) (i) The only answer acceptable was A. Guesses were apparent on many scripts.

(ii) Candidates, in general, found this question regarding diodes within circuits difficult.

Question 10

(a) (i) The correct answer of zero (with or without a unit) was the norm.

(0 (V))

(i) Candidates seem to be unfamiliar with the idea that the p.d. across a switch or a gap in a circuit is the same as the p.d. of the supply. Very few were successful.

(12 V)

(b) These calculations were found to be straightforward and a large majority gained full marks.

(0.5 A and 4 V)

(c) The correct final answer was often seen. Sometimes, the wrong resistance value was calculated from the correct formula and then used to find the current. A small minority of candidates calculated the separate currents of the two resistors and added them together.

(2.25 A)

Question 11

(a) Ideas about the differing deflections of the radiations in magnetic fields seem to be well known.

(b) Candidates had to convey the idea that the electric field was in the plane of the paper (perpendicular to the magnetic field) as well as towards the bottom of the page. A minority gained both marks, with many stating only one of these requirements.

PHYSICS

Paper 0625/32

Extended Theory

General comments

The work of the vast majority of candidates was a credit to the teaching they had received. The impression created by their efforts was they had done their utmost to produce answers which maximised their ability. There were few signs of giving up in more difficult questions and blank spaces in the question paper were comparatively rare across the ability range.

The performance of the ablest candidates was impressive. They were able to express themselves with great clarity in descriptions and explanations, and for them the calculations proved to be straightforward. The candidates rather less able than these showed variable levels of weakness, more predominantly in verbal answers than in numerical ones. At this level also the tendency to omit the units of numerical answers became more evident, but the calculations themselves were largely accurate.

The weaker candidates tended to misinterpret the requirements of the questions, introducing irrelevant material in their answers. They were more likely to make errors in calculations and to give numerical answers with wrong units or sometimes omitting them altogether. Unit errors are penalised to the extent of one per question.

Many calculations require the use of a formula and an early mark in a calculation is to write down the formula or to write it with numbers substituted. If the numbers substituted are the wrong ones the mark is lost. To avoid this possibility, candidates should be encouraged to write down the formula before they attempt substitution. Numerical answers, unless they are accurate to one significant figure, require a minimum of two significant figures.

Comments on specific questions

Question 1

(a) The words 'as accurately as possible' had to be addressed in the answer. Therefore the instrument required was a micrometer (screw gauge) or vernier callipers, not a ruler or metre rule.

(b) There were different ways of gaining marks in this part: for the suggestion of measuring the thickness of several pieces stacked together and dividing the measurement by the number of pieces; for finding the mean / average of a number of repetitions of the measurement; and for sensible details about the use of the micrometer or callipers, for example, checking the zero. Candidates who had not gained the mark in **(a)** often gained the 'measuring and dividing' mark and the 'averaging' mark.

Question 2

(a) Few candidates had success with this part. The simple answer required was 'Water' and 'Liquids expand more than solids'. Various ideas were expressed involving the anomalous expansion of water, the contraction of ice when it melts, the differing atomic separations in water and ice, etc., all considered irrelevant in this particular question.

(b) Most candidates interpreted the data correctly and gained at least 2 of the 3 marks. The relative expansions had to be referred to and the fact that aluminium reinforcement could damage the concrete pillars expressed in a suitable way.

Question 3

(a) A significant proportion of candidates gave the answer zero, wrongly thinking that zero speed (at the origin) means zero acceleration.

(10, 9.81 or 9.8 m/s^2)

(b) Here candidates were required to reach their conclusion by looking at the graph and referring to its decreasing gradient or slope. Many missed this requirement and introduced ideas about air resistance at this stage.

(c) This is where reference to air resistance or drag was needed: i.e. that it was increasing because speed was increasing. It was unclear whether candidates knew that the increase in air resistance was due to an Increase in speed or whether they simply forgot to mention it in their answer.

(d) (i) There were few wrong answers.

(ii) A statement that two equal and opposite forces were acting had to be made. This could be conveyed in one of several ways: e.g. forces in equilibrium, forces balance, no resultant force, force up = force down, weight = air resistance, opposite forces equal.

(e) 'At B' presented almost no problems.

(f) Two aspects were needed; larger parachute area and larger air resistance or air resistance bigger than weight. The first mark was frequently not gained.

Question 4

(a) (i) Many candidates gained maximum marks for accurate constructions, either of a parallelogram or, much less frequently, of a triangle. Many of those who failed to gain full marks gained some credit for accurately representing the two forces and the angle between them.

(ii) This was more problematical. Although, many used the scale of their construction to find the force correctly, others wrote down the length of the construction line and not the corresponding force. Even fewer candidates could write down the angle made by the resultant with the direction of the road.

(5500-5700 N; 28-32°)

(b) Most candidates know what is meant by a vector and could give an example.

Question 5

(a) (i) A large majority of candidates could state and use the kinetic energy formula and arrived at the correct value and unit. The minority who failed to do so usually forgot to square the speed in the calculation.

(5400000 J or 540 kJ)

(ii) Here again there were very many correct answers with correct units. For those who did not get the answer completely correct, partial credit was often gained for finding 10% of the answer **(a)(i)** and using $P = E/t$.

(54000 W or J/s or 54 kW or kJ/s)

(b) (i) Correct answers were very common.

(3750 kg)

(ii) This caused more difficulty and correct answers were less frequent. However, many candidates managed to access part marks.

(0.125 or 1/8 or 12.5%)

Question 6

(a) (i) The correct formula is well known and was correctly used to find the pressure with the correct unit. The comparatively few who gained the wrong numerical value were likely to have made errors in the use of their calculators.

(1.4×10^6 Pa or N/m^2)

(ii) Most candidates wrote down the correct value. A few answers of 168 N were given as well the value of the pressure previously calculated.

(84 N)

(iii) A full answer required candidates to write that the same force acting over the smaller area (of the thumb) gives a bigger pressure. The same force was very infrequently mentioned so a mark was often lost.

(b) (i) Many candidates got this part correct. Those who did not get a completely correct answer often gained partial credit for stating the formula $P = hdg$ in symbols, words or with correct numerical values.

(30000 Pa or N/m^2)

(ii) The second pool with twice the area persuaded many that the pressure at the same depth would be halved or, less frequently, doubled. Only the more alert realised that the new area was a distraction and correctly repeated their answer to **(i).**

Question 7

(a) (i) 'Molecules with high energy / high speed' gained a mark. The second mark could be gained for 'Molecules escape from / leave the liquid surface' or 'Molecules overcome attractive forces / break bonds'. These statements could be made in various acceptable ways but the second mark was not awarded for 'Molecules evaporate' which was the process requiring explanation.

(ii) Many candidates stated that 'the puddle has a larger surface area', but fewer could state that 'more molecules escape / evaporate (in the same time).

(iii) Some candidates simply repeated an increase in surface area, which was not acceptable.

(b) (i) This proved to be a difficult question in which only a minority of candidates were successful in whole or in part. Many unsuccessful answers suggested that the objective was to prevent heat gain by normal heat transfer processes, rather than extending thinking on evaporation to this context.

Question 8

(a) Most candidates answered this part successfully in terms of the difference in the angles of incidence and reflection at the medium A / air boundary. A few candidates even correctly specified that A was more dense on the basis that ray 3 undergoes total internal reflection because that only happens in the denser medium.

(b) The required answer was that the higher speed was in air because air is less dense (than A). Candidates found various equivalent ways to make this comparison. Unsuccessful answers were mostly an extension of misunderstandings in **part (a).**

(c) This was reasonably well attempted.

(42-45°)

(d) In general, candidates seemed to be familiar with this effect.

(e) Correct values for the angle were rarely given. An angle of incidence was required rather than an angle of refraction and this caused some confusion. Perhaps candidates have less experience of this type of calculation.

(58.71 or 58.72 or 58.7 or 59°)

(f) There was a good deal of success with this calculation. The answer was required to at least 2 significant figures, and many gave more than this.

(2.0×10^8 m/s)

Question 9

(a) Many candidates had little idea of what was expected in this question. Many gave graphs with positive and negative values; others gave only positive graphs which were not separated into separate humps.

(b) (i) The only answer acceptable was A. Guesses were apparent on many scripts.

(ii) Candidates, in general, found this question regarding diodes within circuits difficult.

Question 10

(a) (i)1 Candidates seem to be unfamiliar with the idea that the p.d. across a switch or a gap in a circuit is the same as the p.d. of the supply.

(12 V)

(i)2 The correct answer of zero (with or without a unit) was the norm.

(ii) Most candidates could state that the two lamps were off.

(b) (i) The correct value of 6 V and an incorrect one of 12 V were almost equally seen.

(6 V)

(ii) The answer required was full brightness or normal brightness. 'Bright' on its own was not accepted.

(iii) The correct final answer was calculated successfully by many candidates. In the decimal form at least two significant figures were required. The 12 V answer carried forward from **(i)** also allowed the answer 2/3 A or 0.67 A to gain all the marks.

(1/3 A or 0.33 A)

(c) (i) This was reasonably well answered. Some candidates, however, failed to find the reciprocal and gave 1.1 Ω as their answer. Candidates who worked correctly with 18 Ω rather than 1.8 Ω were given some credit.

(0.9 Ω)

(ii) With generous allowance for linguistic expression, this part posed few problems.

Question 11

(a) Ideas about the differing deflections of the radiations in magnetic fields seem to be well known.

(b) Candidates had to convey the idea that the electric field was in the plane of the paper (perpendicular to the magnetic field) as well as towards the bottom of the page. A minority gained both marks, with many stating only one of these requirements.

PHYSICS

Paper 0625/04

Coursework

General comments

It is pleasing to see that points made from previous reports were noted. Although the following points are 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.
- It is advisable that a maximum of two skill areas should be assessed on each practical exercise.

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.

PHYSICS

Paper 0625/05

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 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 and there was no evidence of candidates suffering from lack of time. Many candidates dealt well with the range of practical skills tested. Some candidates appeared to have attempted to learn responses from past papers. This was particularly noticeable in **Questions 2** and **4** where candidates did not understand the difference between taking precautions to improve accuracy and the control of variables.

Comments on specific questions

Question 1

(a) Most displayed their measurements and the calculation well and understood what was required in the diagram.

(b) The majority of candidates gave a mass within a suitable tolerance.

(c) The volume measurement was generally sensible and the calculation correct.

(d) and **(e)** This part of the experiment required care to obtain a good result. Most candidates achieved values within the tolerance allowed for volume and mass but only those who worked with great care and precision were awarded the mark for obtaining two values of density sufficiently close to each other.

Question 2

(a) A pleasing proportion of candidates scored full marks (or close to full marks) for the readings in the table. This showed good attention to detail

(b) Most candidates correctly stated which thermometer cooled more quickly. However, too many tried to justify their answer by a theoretical approach instead of by reference to the readings as requested in the question.

(c) Some candidates wrote sensibly about variables to be controlled. Some, however, seemed to have learned answers from previous questions of this type and made suggestions that are not relevant in this case (e.g. size of beaker, volume of water, etc.). Yet others wrote about precautions to improve accuracy rather than control of variables.

Question 3

(a) – (h) Most candidates recorded the necessary readings sensibly but some missed the current unit.

(i) The graph was usually set up with sensible, labelled axes and the plotting correct. However many drew a line that was either not the best fit line or too thick (or both).

(j) Most candidates did not seem to realise that the line must be straight *and* pass through the origin to show proportionality.

(k) The value of R was often determined correctly and well shown on the graph.

Question 4

(a) – (g) Accurate measurements within tolerance were expected and often achieved. Some lost a mark by being inconsistent in the number of significant figures for the *f* values.

(h) The arithmetic was usually correct although some candidates appeared not to know how to calculate an average of two numbers. Good candidates, aware of practical procedures gave the answer to 2 or 3 significant figures.

(i) Many candidates could give at least one sensible practical precaution.

PHYSICS

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 of 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. This was particularly noticeable in **Questions 3** and **5**. Some candidates had a good overall understanding of what was required, backed by personal practical experience, and therefore scored high marks. Others, obtaining lower marks, appeared to have limited experience. The examination appeared to be accessible to the candidates and there was no mark that proved unobtainable. Many candidates had prepared for the examination (very sensibly) by working through some past papers. This examination showed that where this was done with little understanding, candidates gave answers that would have been correct in a similar question from a previous session.

Comments on specific questions

Question 1

(a) (i) - (iii) Accurate measurements were expected and mostly achieved. Good clear diagrams were often seen but some candidates lost a mark by drawing a rule that appeared to be exactly 14.5 cm long thus displaying a lack of practical awareness.

(b) (i) - (iii) Many candidates carried out the calculations correctly and the best gave their final answer with the correct unit and to two or three significant figures.

Question 2

(a) and **(b)** Only a few candidates failed to insert the correct temperature and units into the table.

(c) Most candidates saw that thermometer **A** cooled more quickly but too many tried to offer a theoretical explanation and did not follow the instruction 'Justify your answer *by reference to the readings*.'

(d) Many candidates did not read the question sufficiently carefully. The answers had to relate to this particular experiment so mention of the size of beaker, volume of water, etc. did not gain a mark. It seems that many candidates used answers that might have been appropriate to a similar set-up in a previous examination. Training in examination technique using past papers is very valuable but candidates must understand the work so that they can apply their knowledge to each new situation not merely repeat something they have learned.

Question 3

(a) Most candidates calculated the values correctly although some lost a mark due to 'rounding' errors.

(b) Graph work was often good. Scales and plots were generally well done but the line judgement lost most marks with candidates drawing a straight line that went through some points whilst ignoring others.

(c) Only the better candidates made the point that the line must be straight *and* pass through the origin.

(d) Many candidates were successful in reading the value from the graph although some were careless and placed the line at 0.800 m rather than 0.750 m.

(e) Too many candidates suggested ideas that indicated they had little practical experience of this type of experiment. For example insulating the wire or placing it in cold water.

Question 4

(a) Accurate measurements were expected and generally achieved.

(b) (i) and **(ii)** Most candidates coped with the idea of the scale drawing and converted the distances appropriately. Almost without exception the candidates clearly recorded the measurements and results in cm. Many lost a mark by being inconsistent in the number of significant figures for the *f* values.

(c) The arithmetic was usually correct although some candidates appeared not to know how to calculate an average of two numbers. Good candidates, aware of practical procedures gave the answer to 2 or 3 significant figures.

(d) Many candidates could give at least one sensible practical precaution.

Question 5

This question was missed out by a significant number of candidates. This is probably because they simply did not turn to the final page of the examination paper.

The question relied on candidates having carried out a simple moments experiment during their course. It would appear that many had no experience of this standard type of experiment and this is disappointing.

(a) Most candidates did not show that the rule would tip down to the bench when loaded on one side.

(b) There were some very good and full answers from those candidates with practical experience. Others struggled to understand what was being asked.

(c) Most candidates were able to perform this calculation but some lost the mark because they did not include the unit.