PHYSICS

Paper 0625/01
Multiple Choice

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

General comments

A total of 13811 candidates sat the paper in this session, achieving a mean score of 29.247, and a standard deviation 6.438.

Several items were found particularly easy (facility of 90% or higher), namely: **1, 6, 9, 13, 14, 25, 26, 32** and **35.** A similar number had a relatively low facility of 60% or lower: **8, 10, 15, 17, 23, 27, 28, 34, 37** and **38**.

Comments on individual questions

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

Item **1** (97%) proved a simple starter, with scales which were not difficult to measure. In item **2** (82%), it was option **C** which proved the most popular distractor, being simply the highest point on the graph. Candidates also answered the speed item **3** (84%) well, and the gravity item **4** (84%), with no real indication of any particular misconceptions. Item **5** (80%) combined balancing a beam with the concept of density, and those who failed to answer this correctly usually **preferred A**, being unable to link similar mass with different volume to imply different density. The simple direct density calculation in item **6** (93%), however, was less problematic. This year there was a second density calculation item **7** (77%), and option **D** attracted 13% of candidates, who failed to subtract the mass of the empty measuring cylinder. The straight recall item **8** (50%) showed widespread unfamiliarity with the conditions required for equilibrium, but the candidates coped well with the diagrams in the other stability item **9** (93%).

Item **10** (49%) concerned energy changes, and a popular belief was that the greatest kinetic energy would be at the maximum height. Possibly candidates were not prepared to accept that position 3 could be the correct answer for both columns. All distractors worked well in item **11** (65%), but option **A** (zero pressure) was the most popular choice in item **12** (73%). Items **13** (90%) and **14** (90%) were both well answered, but this was not the case for item **15** (55%), in which many either failed to read that the temperature was constant, or didn't understand that this meant no change in the average speed of the molecules. In the thermometer item **16** (81%), most mistaken candidates thought that the lower fixed point was the temperature in a freezer. In item **17** (54%) it was often not noticed that there were *two* stable temperatures in the list, corresponding to melting and then boiling. Perhaps not surprisingly, it was distractor **B** which proved most popular in item **18** (84%), and in item **19** (72%), **D** was the most common error, being the distractor with the greatest distance from flame to ice.

Options **C** and **D** were the incorrect favourites in the straightforward refraction item **20** (61%), and it would be well worth stressing in teaching that the frequency of waves does not change when they are refracted. With 88% facility, item **21** was not a problem for many, but nearly one in five chose **B** in item **22** (67%), not appreciating the meaning of *internal* reflection. The link between infra-red radiation and temperature rise, even with the added clue of the proximity of P to the red end of the spectrum, reduced the facility of item **23** to 56%. Item **24** (64%) was simpler than many candidates believed – here it was option **B** which was most popular. Little difficulty was experienced with the simple items **25** (94%) and **26** (93%), but the recall item **27** produced a very low facility of only 43% - here again perhaps it was thought that each column must contain a different answer, and candidates should be warned against making this assumption. Although describing a standard method of demagnetisation, all distractors were effective in item **28** (59%). With facilities of 78% and 76% respectively, the effectively straight recall items **29** and **30** worked well.

In the circuit item **31** (69%) 15% chose **A**, but the action of a fuse was well-known as 90% correctly answered item **32**. Series and parallel circuits were well understood in general, as item **33** showed a facility of 83%, but electromagnetic induction was less familiar, with only 54% correctly answering item **34**. The commonly-used style of item **35** (90%) on transformers proved accessible to most, but item **36** (81%) on thermionic emission was more taxing. Potential dividers would appear not to be well understood, as item **37** had a facility of only 45%; although **A** was not popular, both **B** and **D** were frequently chosen. Item **38** (30%) had the lowest facility on the paper, with over half the candidates believing β-particles to be emitted from the outer orbits rather than the nucleus – this distinction should be emphasised. The item on half-life, item **39** (62%) showed approximately one in five choosing option **A**, but item **40** (89%) caused few problems.

PHYSICS

Paper 0625/02
Core Theory

General comments

There were a good number of candidates who made worthy attempts at this paper, and it was pleasing to mark the scripts of candidates who had been well-prepared. A higher proportion than has been the case in recent years were able to score good marks, and there were encouragingly few very poor candidates. Most candidates managed to score at least some marks on most questions.

Where the candidate knew the underlying physics, any accompanying mathematics was usually clearly indicated, although there were still some candidates who risked losing marks by failing to show their working.

The biggest general criticism of many candidates was the general casualness with which they presented their work. Poor handwriting and lack of neatness are not penalised on this paper, but there were times when it was impossible to read what was written. Likewise, poor spelling is not penalised, **if** it is clear what the candidate is trying to say. However, poor spelling does lead to ambiguities which are impossible to resolve, e.g. is "nucleos" to be interpreted as "nucleus" or "nucleon"? There are times in all sciences when it is necessary to be exact.

Comments on specific questions

Question 1

(a) Most could measure the length of the rod within the acceptable tolerance, but general inaccuracy in the positioning of **C** lost many candidates the mark in **(ii)**. Many showed **C** outside the rod.

(b) This was surprisingly carelessly done by many candidates. Some drew a line across the rod, without any indication about where on this line **M** was to be positioned. Very few **M**s were clearly on the axis of the rod, and many were outside the rod altogether.

Question 2

(a) Nearly all candidates chose an appropriate scale for the time axis, and most could plot the graph correctly. The most common mistake was to end the horizontal portion at 40 s instead of 50 s.

(b) A good proportion could calculate the average speed, but very few followed the instruction to give the answer to the nearest m/s, thus losing a mark. Quite a few failed to show the working, which was fine if the answer was correct, but gave the marker no possibility of awarding marks if the answer was wrong.

(20 m/s)

Question 3

(a) This was correctly answered by most, although occasionally only one force was offered for the anticlockwise moment.

(b) Most could spot that distance *c* should be decreased, but few could give anything like a meaningful explanation. It really required an answer in terms of moments, but most wrote about forces balancing, or stated that changing *c* would change the force.

(c) This was a slightly different approach from the usual balance questions, but many coped with it well. The most popular acceptable answer was 29.5 g.

Question 4

(a) The responses to this were disappointing. Most gave PE as the answer to **(i)**, but very few gave chemical energy for **(ii)**. It would seem that many think that there is a difference between "gravitational energy", "potential energy", "positional energy", etc., since different versions of PE appeared in both **(i)** and **(ii)** on the same scripts.

(b) Most identified the electrician and gave a valid reason.

(c) A significant minority scored this mark, the most common omission being "time".

Question 5

(a)-(e) The whole of this question was generally answered well. A big problem here was interpreting candidates' misspellings, as commented earlier.

Question 6

(a) Some candidates confused **(a)**, **(b)** and **(c)** by not reading the question, with the result that unnecessary (and often incorrect) lines were drawn on Fig. 6.1. Many copied the ray from Fig. 6.2 on to Fig. 6.1, instead of drawing the required third ray, the one through the pole of the lens. Careless drawing cost some candidates the mark, both here and in **(b)**. It is always expected that rays should pass at least within 1 mm of the expected principal focus, etc., and that refraction is either shown at the centre line of the lens or at <u>both</u> surfaces. Those who showed refraction at only the front or back surface of the lens, lost a mark. There was a minority who did not use a straight edge to draw the rays.

(b) With the same criticisms as above, most made a reasonable attempt at locating the image. However, most thought that the image was a point at the intersection of the drawn rays, and failed to draw in the whole image. Some of those who made an attempt at drawing in the image between their intersection and the optic axis, still lost a mark because they were inaccurate about their drawing and the line did not quite make it both ways.

(c) Very few knew where to put the screen. A few showed it near, but not near enough, to the image, but most had no idea. It would seem that candidates do not make the link between the ray diagram and the reality of lenses, lamps and screens.

Question 7

(a) This was generally correctly answered.

(b) Most realised that the matter was liquid and even had some idea about **(ii)** and **(iii)**, but many expressed their ideas so badly that marks could not be awarded.

(c) It is clear that very few realise that a substance melts and freezes at the same temperature. A very common answer was -660°C (minus 660°C).

Question 8

(a) The whole of this part was badly done. Virtually none could name the ice and steam points. Somewhat more made an attempt to involve ice and boiling water, with varying degrees of correctness, but few even mentioned steam. This is clearly a topic about which many candidates are confused, and on which teachers could well spend more teaching time.

(b) It was pleasing to see how many candidates answered this part correctly. The mark scheme was reasonably tolerant over terminology, but many candidates recognised the reason for the different temperatures.

Question 9

(a) Very few knew the circuit symbol for a fuse, even the out-of-date symbols.

(b) Many answered this completely correctly.

(c) There were many unclear answers, but most managed to give at least one correct outcome.

Question 10

(a) Most could find the combined resistance, with only a minority using the parallel resistors formula. Unfortunately, there were some basic arithmetical errors.

(60 Ω)

(b) A majority showed the voltmeter position correctly. Common wrong answers included drawing a voltmeter in series, a voltmeter in parallel with each of the resistors, and a voltmeter in parallel to a length of wire.

(c) Attempts at this were a bit disappointing. It was a straightforward calculation, and an error in **(a)** was not penalised again in **(c)**. A large minority actually quoted $I = R/V$, and others could not rearrange the equation, and so calculated 60/1.5 or 60 x 1.5. In this answer there was a mark available for the unit, (indicated by the unit not being printed on the answer line), and many lost this mark. Conversely, some, whose calculation was wrong, scored the mark for the unit, this being the only correct thing in the answer.

As a general rule on this paper, missing or incorrect units are not penalised, and units are printed on answer lines. However, candidates are still expected to be aware of correct units, and if they are not given, they must provide them themselves.

A large proportion did not realise that the p.d. across the cell was the same as that across XY.

(0.025 A, 1.5 V)

(d) Most seemed to be guessing at the answers here, and very few ticked "decreases" twice. Hardly any answered **(iii)** correctly, with most answering 30 Ω.

(60 Ω)

Question 11

(a) This was very poorly answered. This was not the standard electromagnetic induction set-up, but virtually none realised that the e.m.f. induced in AB would be cancelled by that in CB. Most tried to blame either the magnet poles for not both being the same or for being too far apart, or the experimenter for not moving the wires or not moving them fast enough. Electromagnetic induction is a difficult thing for candidates at this level to grasp, but it is an important part of the syllabus and teachers are well advised to take time over teaching it.

(b) Not many scored this mark, the most common correct answers being transformer and generator. Amongst incorrect answers, motors, scrap yard magnets, school bells and compasses were most popular.

Question 12

(a) Many realised that the half-life would be 30 min or less and many suggested a figure within the mark scheme range. A significant number answered 60 min, this being half the total time in the table.

(b) There were lots of correct answers to both parts, but also lots of seemingly illogical choices. Apart from obviously incorrect choices in **(ii)**, a fair number identified radon, but did not specify which isotope. Some of the reasons given were too ambiguous to be credited.

Location Entry Codes

UNIVERSITY of CAMBRIDGE
International Examinations

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 0625/31

Extended Theory

General comments

There were many competent candidates who attempted this paper, and it was pleasing to mark the scripts of many able candidates who have been well-prepared.

There appeared to be fewer candidates this time whose performance was so poor that it was clear that they should have been entered for paper 2. However, such candidates do still exist and teachers are urged, out of fairness to their candidates, to resist the pressures to enter candidates for inappropriate papers. However, it was encouraging to see a higher proportion of competent candidates.

Most candidates managed to score at least some marks on most questions and there were no questions which proved unreasonably hard for all candidates.

Mathematical work was usually clearly indicated, although there are still some candidates who risk losing marks by failing to show their working. As always, an incorrect answer, once penalised, did not incur further penalty if that incorrect answer was used in a later calculation, provided no further mistake was made. There were many examples of candidates whose success with calculations ensured that they achieved a good mark overall. The correct use of units was expected throughout the paper, and incorrect and missing units in final answers were penalised. It was pleasing to see that most candidates used units well. Answers were acceptable to any number of significant figures ≥ 2, except where 1 sf was appropriate. If a candidate did correct to a certain number of significant figures, then it had to be correct.

There were a number of part questions in this paper where the candidate was asked to describe or explain something. Most candidates were not good at doing this, but it is a skill at which candidates tackling the extended syllabus option should be competent. It is appreciated that most candidates do not have English as their first language, but teachers could well give thought to how they can improve their candidates' ability with this skill.

Comments on specific questions

Question 1

(a) (i) Most candidates could take appropriate values from the graph and obtain an answer within the mark scheme range.

(9.3 – 9.5 m/s)

(ii) Many candidates correctly found the area under the graph or used an appropriate equation. Some, however, simply used speed × time.

(42 – 44 m)

(iii) Most could read the terminal velocity correctly.

(15 m/s)

(b) Many candidates failed to read this question carefully enough, and assumed it was simply an explanation of terminal velocity that was required. In fact, what was asked for was an explanation of why one ball reached terminal velocity whilst the other did not. This caused many candidates to lose marks.

(c) All that was required here was a simple *mg* calculation, which most could do, although some used the value of *a* from **(a)(i)**. Quite a few also forgot to convert the grams into kilograms before multiplying.

(0.5 N)

Question 2

(a) Very few could identify fusion as the process of energy release in the Sun. Common answers were conduction, convection, radiation, fission and combustion.

(b) There were 6 separate scoring points here, any 3 of which would have earned the candidate marks. Most only managed 1 mark. The descriptions offered were both muddled and vague.

(c) There were some good answers to this part, but most candidates could not offer any reasonable form of statement about efficiency. Many had the right idea about output/input but failed to mention power or energy. Others thought it was something to do with the size of the output or with how big the losses were.

Question 3

(a) This was mostly well attempted. A common mistake was to omit g from the calculation.

(12 600 J)

(b) Unfortunately, it was only the better candidates who could equate the PE from **(a)** with the KE in order to find the speed. Candidates who tried to use equations of motion usually failed to get an answer.

(16.7 m/s)

(c) Most candidates indicated some idea of energy losses.

Question 4

(a) In common with other descriptive answers, this was generally poorly done. All that was required was some statement that the decrease in volume led to an increase in pressure. Most candidates had difficulty in saying anything like this, even completely reversing the reasoning. The question did not require a molecular explanation, but many ventured into this area and got themselves thoroughly confused.

(b) This part was actually much better done, with many candidates scoring full marks. A few lost the final mark because they had not spotted that it was the **reduction** in volume which was required. Some wrong attempts tried to involve P = F/A.

(20 cm^3)

(c) This part was intended to test the better candidates, but in fact many candidates were able to score at least one of the marks.

Question 5

(a) Some answers to this part were very difficult to interpret. It was possible, though, in many answers to find the statements the mark scheme required, amongst all the irrelevant information, and many candidates scored some or all of the marks.

(b) Most were able to score full marks here.

(c) Most candidates were able to find one relevant property of alcohol, although there were some interesting irrelevant ones.

Question 6

(a) Careless drawing cost some candidates the marks. It is always expected that rays should pass at least within 1 mm of the expected principal focus, etc., and that refraction is either shown at the centre line of the lens or at both surfaces. Those who showed refraction at only the front or back surface of the lens, lost a mark. There was a minority who did not use a straight edge to draw the rays. Most made a reasonable attempt at locating the image. However, a large proportion appeared to think that the image is a point at the intersection of their rays, and failed to draw in the whole image. Some of those who made an attempt at drawing in the image between their intersection and the optic axis, still lost a mark because they were inaccurate about their drawing and the line did not quite make it both ways.

(b) Those who drew good ray diagrams were usually able to correctly describe them. It was much more difficult if the candidate had drawn an incorrect diagram. In this instance the description required was of the correct image, with no reward being given for statements about a nonsense image.

Question 7

(a) A large proportion of candidates found great difficulty drawing the waves in the two diagrams, and as before many spurned the use of a ruler with which to draw them. Even those who scored full marks often drew rays which were not consistent with the waves. Candidates often spend a lot of class time drawing ray diagrams – perhaps it would be beneficial to spend a similar time on wave diagrams, which are, after all, what is really happening.

(b) The calculations were often very well done, apart from those where the "sine" part was forgotten and ratios of angles were used.

(2×10^8 m/s, 38.8°)

Question 8

(a) The most common error was to place the two 60 W lamps in series rather than parallel. Other candidates drew circuits with an inbuilt short-circuit or which would short if the switch were closed.

(b) There were many completely correct responses. The most frequent error was the attempt to use $I = V/R$ instead of $I = P/V$ in **(i)** and $Q = I/t$ rather than $Q = It$ in **(ii)**.

(0.5 A, 30 C)

(c) In **(i)**, answers of 45 W rather than 135 W were common, but full marks were still available in **(ii)** with the benefit of successful carrying forward of the error.

(135 W, 486 000 J)

Question 9

(a) Magnetic field patterns were usually correctly, if untidily, drawn. A few candidates answered on Fig. 9.1, instead of Fig. 9.2, as instructed. This was not penalised.

(b) Most had a good idea of what the effects on the magnetic field would be.

(c) For candidates on this paper, this question was an application of their knowledge of the behaviour of current-carrying conductors in magnetic fields. Those who were prepared to stop and think were able to answer all three parts well.

Question 10

(a) Pleasingly, most candidates were able to give the circuit symbol, although a good proportion of these were not well drawn.

(b) Candidates had great difficulty in describing the action of the NOR gate in words, frequently mixing inputs and outputs or making ambiguous statements about the different combinations of inputs. A very large proportion tried to answer in terms of an OR gate followed by a NOT gate. Electrically/logically this is equivalent, but it did not answer the question, nor did it make things easier for the candidates. It is suggested that teaching gates in this way is probably not very helpful to candidates. It was not expected that candidates would be able to produce the appropriate truth table, but this was undoubtedly the most certain way of scoring full marks, and the majority of good answers did use this method.

(c) This part was not so successfully attempted by most candidates. Apart from simply getting muddled, the most common cause of lost marks was failing to refer to the inputs to the gate, concentrating instead on the outputs of the two sensors.

Question 11

(a) This was generally correctly answered.

(b) Again, this part was generally well answered.

(c) Most candidates had knowledge of one practical use of a radioactive isotope and could give a simple outline of how it is used.

PHYSICS

Paper 0625/32

Extended Theory

General comments

There were many competent candidates who attempted this paper, and it was pleasing to mark the scripts of many able candidates who have been well prepared.

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Most candidates managed to score at least some marks on most questions and there were no questions which proved unreasonably hard for all candidates.

Mathematical work was usually clearly indicated, although there are still some candidates who risk losing marks by failing to show their working. As always, an incorrect answer, once penalised, did not incur further penalty if that incorrect answer was used in a later calculation, provided no further mistake was made. There were many examples of candidates whose success with calculations ensured that they achieved a good mark overall. The correct use of units was expected throughout the paper, and incorrect and missing units in final answers were penalised. It was pleasing to see that most candidates used units well. Answers were acceptable to any number of significant figures ≥ 2, except where 1 sf was appropriate. If a candidate did correct to a certain number of significant figures, then it had to be correct.

There were a number of part questions in this paper where the candidate was asked to describe or explain something. Most candidates were not good at doing this, but it is a skill at which candidates tackling the extended syllabus option should be competent. It is appreciated that most candidates do not have English as their first language, but teachers could well give thought to how they can improve their candidates' ability with this skill.

Comments on specific questions

Question 1

(a) Most candidates drew a correct straight line, but a few drew one from the origin to the diagonally opposite corner of the graph grid.

(b) Many candidates could calculate the distance correctly, but too many used final speed $\times$ time. (20 m)

(c) Very few drew convincing curves for this part. The most common error was in failing to show the second curve below the first curve at all times.

(d) Answers to both parts of this section were often very pleasing. A good proportion related the terminal velocity to air resistance and could explain when terminal velocity occurs.

(e) As is often the case, the relationship between mass and weight caused some to get confused.

(f) Many recognised that in equilibrium, the downward and upward forces are equal.

Question 2

(a) Very few could identify fusion as the process of energy release in the Sun. Common answers were conduction, convection, radiation, fission and combustion.

(b) There were 6 separate scoring points here, any 3 of which would have earned the candidate marks. Most only managed 1 mark. The descriptions offered were both muddled and vague.

(c) There were some good answers to this part, but most candidates could not offer any reasonable form of statement about efficiency. Many had the right idea about output/input but failed to mention power or energy. Others thought it was something to do with the size of the output or with how big the losses were.

Question 3

(a) This was usually well attempted. A common mistake was to omit g from the calculation.

(12 600 J)

(b) Unfortunately it was only the better candidates who could equate the PE from **(a)** with the KE in order to find the speed. Candidates who tried to use equations of motion usually failed to get an answer.

(16.7 m/s)

(c) Most candidates indicated some idea of energy losses.

Question 4

(a) In this question, the word **equation** was printed in bold format, in order to indicate what was required. Despite this, many candidates offered a proportionality as the answer. Something like $p = k/T$ was what was required. $P = 1/T$ was not acceptable.

(b) Some made a good attempt by realising that for all of the sets of results $p \times V$ was the same. Very few then went on to say that this meant that the results obeyed the law quoted in the question **and therefore** the temperature must have been constant. However, many good tries were seen. The simple fact that V decreased as p increased, was not enough to score any marks.

(c) Many could carry out this calculation successfully, and others could have done so if they had not got into difficulties with the powers of 10. Very few scored the last mark, for finding the distance **moved** by the piston.

Question 5

(a) Some answers to this part were very difficult to interpret. It was possible, though, in many answers to find the statements the mark scheme required, amongst all the irrelevant information, and many candidates scored some or all of the marks.

(b) Most were able to score both marks here.

(c) Most were able to find one relevant property of alcohol, although there were some interesting irrelevant ones.

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(b) Many candidates could not describe clearly what happened to the image as a result of the changes described. The vast majority seemed to describe the new image, and this was given credit if correct.

Question 7

(a) A large proportion of candidates found great difficulty drawing the waves in the two diagrams, and as before many spurned the use of a ruler with which to draw them. Even those diagrams that scored full marks often had rays drawn on them which were not consistent with the waves. Candidates often spend a lot of class time drawing ray diagrams – perhaps it would be beneficial to spend a similar time on wave diagrams, which are, after all, what is really happening.

(b) The calculations were often very well done, apart from those where the "sine" part was forgotten and ratios of angles were used.

(2×10^8 m/s, 38.8°)

Question 8

(a) The most common error was to place the two 60 W lamps in series rather than parallel. Other candidates drew circuits with an inbuilt short-circuit or which would short if the switch were closed.

(b) There were many completely correct responses. The most frequent error was the attempt to use I = V/R instead of I = P/V in **(i)** and Q = I/t rather than Q = It in **(ii)**.

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(c) Most candidates had knowledge of one practical use of a radioactive isotope and could give a simple outline of how it is used.

PHYSICS

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. 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 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.

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 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 and 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 the different types of question in the examination. The responses to the optics question were better than in some previous sessions and this was pleasing to see although there are still some candidates who appear to have had little or no experience of this type of practical work.

Comments on specific questions

Question 1

(b) Many candidates were able to draw a good diagram showing a sensible approach to the judgement. Any appropriate response was credited.

(d) – (f) A pleasing number of candidates recorded correct distances for both positions of the mass and went on to calculate *W* values successfully. Those who carried out the procedure with care gained the mark for obtaining *W* values that were the same to within 10%.

(g) For the final average value candidates had to show how they worked out the average and give their value to 2 or 3 significant figures with the unit N. The most common error was to give the unit as g, kg or to give no unit.

Question 2

(a) Most candidates were able to record sensible values with the correct units. Some wrote values of p.d. or current that were clearly far too large and were therefore penalised. The calculation of resistance was a problem for only a few who inverted the equation. Some candidates lost marks because their values of current clearly showed that they had set the circuits up wrongly. A mark was lost by those who did not give their resistance values consistently to either 2 significant figures or 3 significant figures.

(b) The best candidates were able to make a correct statement in relation to their readings and to justify it by working out the relevant values and comparing them. (For most, the results did not support the theory as hinted at in **part (ii)**). Thoughtful candidates realised that the reason was that the resistances of the individual lamps are unlikely to be the same as each other. Some sensibly suggested that temperature changes in the filaments or zero errors in the meters could be a reason.

Question 3

(a) Most candidates were able to record sensible temperature values.

(b) (i) 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 often not used. A significant number of candidates lost marks since their lines were too thick or they drew poorly judged best fit curves.

(ii) Most candidates offered a correct statement in relation to their readings. Fewer, however, were able to justify this by reference to the graph. The most competent candidates were able to simply comment on the relative steepness of the curves. Many candidates attempted a theoretical explanation. In a significant number of cases the explanation offered was correct physics but scored no mark because it was not the answer to the question set – the key words here were 'by reference to your graph'.

Question 4

(a) – (g) Many candidates were able to draw the diagram according to the instructions and score the marks available for accuracy and neatness. The most commonly lost mark was the one for placing P_3 and P_4 at least 5 cm apart thus showing lack of awareness that greater separation leads to a more accurate result. Some candidates displayed an almost complete lack of experience of this type of experiment and produced a diagram that bore no relation to what they could have seen.

(i) - (l) Here candidates were expected to measure distances accurately and were rewarded for so doing. The marks were available even if the observations of the pins had gone wrong and the lines were not in the expected areas.

(m) The mark for refractive index was only awarded to those candidates who had calculated it correctly and had carried out the experiment to obtain a result within the tolerance allowed. The final mark was awarded to candidates who expressed the refractive index to 2 or 3 significant figures and with no unit.

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. 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. 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. 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. For example if asked about control of variables, they wrote about precautions to improve accuracy and vice versa.

Comments on specific questions

Question 1

(a) Most candidates filled in the table correctly, although some gave incorrect (or no) units, and others incorrectly rounded their values of M.

(b) Many candidates were able to draw a good diagram showing a sensible approach to the judgement. Any appropriate response was credited.

(c) Most candidates calculated the average value successfully. Some lost a mark for failing to follow the instruction to show their working.

(d) A surprisingly large number of candidates measured t wrongly. Often the value given was in fact $(d - t)$.

Question 2

(a) Most candidates were confident with the units in the table. The calculation of resistance was a problem for only a few who inverted the equation. A mark was lost by those who did not give their resistance values consistently to either 2 significant figures or 3 significant figures.

(b) Most candidates were able to make a correct statement in relation to the readings in the table. (If the resistance values were wrong, the statement was marked accordingly.) It was pleasing to see the good number of candidates who compared the two resistances and were convincing in their explanation that the first was close enough to being half the second to justify the theory. Those who merely stated that one was half the other (when it wasn't quite that) did not score the mark. Sensible precautions were rewarded for the final mark but suggestions such as 'use the same ammeter' were not awarded a mark.

Question 3

(a) 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 often not used. A significant number of candidates lost marks because their lines were too thick or they drew poorly judged best fit curves.

(b) Most candidates offered a correct statement in relation to the readings. Fewer, however, were able to justify this by reference to the graph. The most competent candidates were able to simply comment on the relative steepness of the curves. Many candidates attempted a theoretical explanation. In a significant number of cases, the explanation offered was correct physics but it scored no mark because it was not the answer to the question set – the key words here were 'by reference to your graph'.

Question 4

(a) – (c) Many candidates were able to draw the diagram according to the instructions and score the marks available for accuracy and neatness. Some candidates displayed an almost complete lack of experience of this type of experiment and produced a diagram that bore no relation to what they would have seen had they done the experiment.

Candidates were expected to measure the distances accurately and were rewarded for so doing. The mark for refractive index was awarded to those candidates who had calculated it correctly. The final mark was awarded to candidates who expressed the refractive index to 2 or 3 significant figures and with no unit.

Question 5

(a) Candidates were rewarded for using a triangle method for finding the gradient using at least half of the line. Many candidates lost a mark because their triangle was far too small, or not shown at all. Regrettably, there was a typographical error on the numbering of the *l* axis. Full credit was given to all candidates whose triangle extended beyond *l*/m = 1.0 if their reading was a sensible reading assuming one small square represented 0.02 (or 0.01). In this way no candidate was disadvantaged. The majority of candidates knew that the purpose of taking many readings was to increase accuracy.

(b) This part proved to be more difficult for candidates. Of those who understood the concepts of variables, many could only make one sensible suggestion (length of pendulum). The best candidates were able to interpret the table as showing that within the limits of experimental accuracy the results show that the mass does not affect the time for one swing.