PHYSICS

Paper 0625/11
Multiple Choice

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

General comments

3153 candidates sat the paper this year, producing a mean score of 26.255 and a standard deviation of 7.056.

Only items **4** and **13** were found to be very easy, with a facility of 90% or higher, whereas several showed a facility of 60% or lower, namely items **2**, **8**, **9**, **11**, **17**, **18**, **20**, **22**, **23**, **25**, **26**, **28**, **29**, **34** and, in particular, item **37**, which had a facility below 25%**.**

Comments on individual questions

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

The timing item **1** (72%) worked well – distractor A was the most popular mistake, being very close to the correct value. In item **2** (29%) it was clear that many candidates were quite confused about free-fall acceleration; a large proportion believed that acceleration would be in an upwards direction and would decrease, apparently confusing acceleration with speed - this is an area which clearly needs to d carefully in teaching. Speed/time graphs were better understood in item **3** (64%) although just ov failed to halve the (20 x 10) value. The straightforward item **4** (91%) caused few problems. Item **5** (evaporation worked as intended, and item **6** (89%) showed that density calculations could be tackled Although 66% were correct in item **7**, 28% believed that passengers standing upstairs would lower the ce of mass of the bus. The popularity of option C in item **8** (41%) on forces again highlighted confusion between speed and acceleration, as shown in item **2**. The difference between the action of a microphone and that of a loudspeaker was not always well known, leading many to opt for C in item **9** (52%), but the simple power item **10** (87%) was well tackled.

Item **11** (49%) on the manometer caused more problems, with options A and C both proving popular. The next items **12** (83%) on water pressure and **13** (90%) on Brownian motion showed a good level of knowledge. The more taxing item **14** (66%) showed some weakness with kinetic theory, and in item **15** (72%) more than one in five believed room temperature to be a fixed point. Item **16** (84%) was well answered, but item **17** (53%) showed that convection was not generally understood clearly, as was also the case to some extent for thermal radiation in item **18** (57%). Candidates showed a good knowledge of the meaning of wavelength in item **19** (83%), although particle movement in a sound wave was clearly unknown to many in item **20** (38%), with the majority opting for D.

All three distractors worked well in item **21** (69%), but understandably it was mainly option D which was the mistaken choice in item **22** (60%) on lens ray diagrams; a ruler placed on the diagram made the choice clear. Straight recall of the approximate frequency range of human hearing was needed in item **23** (53%), and it was not well known. The second sound item **24** (75%) worked very well. Recall was also weak in item **25** (45%) on magnetism, although somewhat better in item **26** (60%). The resistance equation was better remembered for item **27** (83%), but item **28** (55%) showed that almost one in three candidates thought that a longer and *thicker* wire must have a higher resistance – the link between thickness and resistance is not well known. A significant number of candidates was unaware that the current at all points in a series circuit is the same in item **29** (58%), but the correct circuit in item **30** (81%) was usually identified, as was the identity of the unknown component in item **31** (83%).

62% of candidates chose the correct fuse in item **32**, but 22% opted for the unsafe value of 13A, perhaps believing the highest value to be safest. The other electrical safety item **33** (83%) was well answered, but only a small proportion correctly identified the relay in item **34** (38%). Although 67% were correct in item **35**, this was a very common type of transformer item, and one in three candidates was wrong; almost a quarter chose A, in which the numbers at first glance looked similar to the voltages - candidates should be reminded to look at the ratios rather than the actual values. The most common mistake in **36** (65%) was B, showing either lack of knowledge of the charge of cathode rays, or confusion over the law of electric charges. Item **37** (19%) was by far the worst answered in the paper; it is important that candidates know that a cathode ray tube requires a large d.c. accelerating voltage – a particular value is not relevant. The half life item **38** (75%) worked very well, as did item **39** (76%) on the absorption of ionising radiation, and item **40** (78%) on nuclear structure; this section of the syllabus has clearly been taught and learned well.

PHYSICS

Paper 0625/12

Multiple Choice

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

General comments

2459 candidates sat the paper this year, producing a mean score of 28.980 and a standard deviation of 7.182.

Items **2**, **5**, **11** and **15** were found to be very easy, with a facility of 90% or higher, whereas several showed a facility of 60% or lower, namely items **4**, **7**, **10**, **12**, **17**, **22**, **27**, **33** and, in particular, item **36**, which had a facility below 25%**.**

Comments on individual questions

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

The speed/time graph item **1** (77%) worked well although several candidates failed to halve the (20 x 10) value, and the straightforward item **2** (92%) caused few problems. Item **3** (77%), on stopwatches, worked well – distractor A was the most popular mistake, being very close to the correct value. In item **4** (38%) it was clear that many candidates were quite confused about free-fall acceleration; a large propo that acceleration would be in an upwards direction and would decrease, apparently confusing a with speed - this is an area which clearly needs to be explained carefully in teaching. Item **5** (91%) that density calculations could be tackled well, and the evaporation item **6** (74%) worked as intended. popularity of option C in item **7** (48%) on forces again highlighted confusion between speed acceleration, as shown in item **4**. Although 69% were correct in item **8**, 25% believed that passengers standing upstairs would lower the centre of mass of the bus. The simple power item **9** (88%) was well tackled, but the difference between the action of a microphone and that of a loudspeaker was not always well known, leading many to opt for C in item **10** (60%).

Although item **11** (90%) on water pressure showed a good level of knowledge, item **12** (58%) on the manometer caused more problems, with options A and C both proving popular.

In item **13** (79%) several candidates believed room temperature to be a fixed point, but item **14** (86%) was well answered. Brownian motion was a strength for most, as shown in item **15** (93%). The more taxing item **16** (71%) showed some weakness with kinetic theory, and item **17** (58%) showed that thermal radiation was not generally understood clearly. This was also the case to some extent for convection in item **18** (66%).

The sound item **20** (76%) worked very well, and in item **21** (89%), candidates showed a good knowledge of the meaning of wavelength. Particle movement in a sound wave was clearly unknown to several however in item **22** (54%), with many opting for D. Understandably it was mainly option D which was the mistaken choice in item **23** (70%) on lens ray diagrams; a ruler placed on the diagram made the choice clear. Refraction was well known for item **24** (79%), as was the resistance equation for item **25** (87%). Item **26** (67%) showed that more than one in five candidates thought that a longer and *thicker* wire must have a higher resistance, failing to appreciate the link between thickness and resistance. Recall was weak in item **27** (56%) on magnetism, although noticeably better in item **28** (74%).

The correct circuit in item **29** (87%) was usually identified, although a significant number of candidates was unaware that the current at all points in a series circuit is the same in item **30** (67%).

74% of candidates chose the correct fuse in item **31**, but 14% opted for the unsafe value of 13A, perhaps believing the highest value to be safest. The identity of the unknown component in item **32** (87%) caused few problems, but this was not the case in item **33** in which only 50% of candidates correctly identified the relay. One in five opted for B or C in the electrical safety item **34** (77%) and the most common mistake in **35** (75%) was B, showing either lack of knowledge of the charge of cathode rays, or confusion over the law of electric charges. Item **36** (23%) was by far the worst answered in the paper; It is important that candidates know that a cathode ray tube requires a large d.c. accelerating voltage – a particular value is not relevant. Although 77% were correct in the transformer item **37**, 16% chose A, in which the numbers at first glance looked similar to the voltages - candidates should be reminded to look at the ratios rather than the actual values. Nuclear structure was well known for item **38** (83%), and the half life item **39** (76%) worked as intended – the most common error was to believe that half life is half the time taken for the substance to decay completely (B). Item **40** (83%) showed a good level of knowledge of the absorption of ionising radiation.

PHYSICS

Paper 0625/02

Core Theory

General comments

Many candidates made very intelligent attempts at this paper. Not many scripts could be called outstanding, but a good number showed a mature grasp of the syllabus. Such candidates are to be commended for their careful preparation.

All candidates were able to make at least some attempt at all questions, with very few leaving sections unanswered. Numerical work was usually competently executed, with working usually shown. However, there are still some candidates who continue simply to put a numerical answer on the answer line, without showing any working, and it would be good if teachers could impress on their candidates how this affects the marks that can be awarded if the answer is wrong. Most of the problems with numerical questions seemed to be related to poor understanding of the underlying Physics, rather than lack of facility with numbers.

Comment needs to be made about the lack of care over the presentation of answers, on the part of at least some candidates; similarly with poor handwriting. Candidates are not penalised for poor writing, but marks cannot be awarded if an answer simply cannot be read unambiguously. There were a number of candidates this time, whose writing in places was totally unreadable. Are such candidates really so determined to prevent the marker awarding them any marks?

Comments on specific questions

Question 1

In general, this was well done. Only a handful of candidates were unable to take the readings off the measuring cylinder and make the necessary calculations.

Question 2

The whole of this question was disappointingly answered. For most, the only forms of energy they seemed to know about were kinetic and potential, and these were allocated almost at random to **(a)**, **(b)** and **(c)**. Some, who obviously did not know about strain energy, quoted both “gravitational” and “potential”, as if they were different. Very few knew the two quantities needed in **(d)**. A small number of candidates, who knew the formula for work, still did not score the mark because they failed to relate it to the situation in the question. Only 1 mark was available, and for this to be scored the force had to be specified as “weight”.

Question 3

It was anticipated that many would find this question difficult, mainly because so many candidates appear to be unable or unwilling to stop, think, and apply their knowledge to an unusual situation. This was indeed the case here, but it was encouraging to notice how many did, in fact, manage to answer correctly. The answers to **(a)** were designed to lead candidates towards the correct responses to **(b)**. That some candidates were not thinking about what they were writing, was illustrated by the large numbers who stated in **(a)** that the speed of the bicycle was constant, but then on the graph for **(b)**, clearly showed a speed that was increasing. It is appreciated that candidates who attempt this paper are not those who find the subject easy, but some advice about slowing down enough to think about what is being written, would be well-made. Although many missed the significance of the distance-time graph, a good proportion realised that the cyclist has ended up back at her starting point.

The "Read the question carefully" warning is well applied in this question, because **(a)(i)** ... "Answer the following questions **for the time interval AB.**" Many candidates answered in terms of ... journey ABCD. Consequently parts of their answers were wrong and therefore cancelled out any cr... might have got earlier in the answer.

Question 4

(a) It was interesting that a large proportion thought that the object would *topple* "to the left". Most of the rest realise that the object would move to the left, although literally only a handful realised that it would *accelerate* to the left. The vast majority showed an arrow to the right, and only a few of these failed to annotate it with the correct value of the force. The Centre of mass was almost always correctly labelled.

(b) Almost all combinations of the two sets of 3 answers were seen, fortunately with the correct combination in the majority. It was interesting to note that quite a large number thought that adding the cars to the upper deck would make the transporter and its load **more** stable.

Question 5

(a) This topic did not appear to have inspired confidence in many candidates. Many seemed very uncertain about what was happening to the substance. Few got full marks to **(i)**, even though a simple description in terms of temperature would have sufficed. Virtually none realised that energy was being lost in all three sections of the cooling process, but a good proportion knew that the final state would be solid.

(b) This part was marked generously, and with this generosity, many candidates were awarded both marks. On this occasion, it appears that most candidates *were* trying to think sensibly!

Question 6

Candidates frequently find difficult such questions about the behaviour of gases and molecules. This was no exception. No particular incorrect understanding was apparent, simply that large numbers were making guesses, intelligent or otherwise. In the light of this comment, it was pleasing to see how many still managed to score 2 or 3 marks for part **(a)**.

Question 7

As always, ray optics caused problems! Why is it that candidates always struggle with this topic? There was some concern, when the question was set, that the angling of the card and the mirror in the diagram would cause confusion. There is no evidence that this was so.

(a) By no means could all candidates identify the focal length.

(b) Even fewer could label the principal focus correctly. Common incorrect positions for *F* were on the plane mirror, on the lens itself and on the bulb of the torch.

(c) Very few could pair **inverted** and **real**. In fact, very few realised that the image was real, even though it was clearly shown focused on a card. Most insisted that it was virtual.

(d) Surprisingly, there were a few who thought the object and image were different sizes, but the vast majority answered correctly.

(e) Most answers were along the lines of "The image moves to the left/right". The question actually asked about the image <u>on the card</u>, which does not move.

Question 8

If it were not for the difficulty that many had in expressing themselves unambiguously, this would have been well answered. Most spotted the significance of the mountainside and the creation of an echo.

(a) Many scored both marks, but a significant minority lost a mark because they made no reference to the first sound heard. The mountainside was only responsible for the second sound.

(b) Most realised that the first sound was the louder (even if it had not been mentioned in a few thought the echo would be louder because it came from a bigger place. Not ma convincingly explained why the second sound was quieter (and thereby the first was lou answer in terms of distance travelled was not satisfactory without some sort of refere absorption or dispersion.

(c) Most candidates could calculate the time from the speed and the distance, but many lost marks because they chose the wrong distances to use, in particular in part **(ii)**.

Question 9

A large number could cope well with this topic, but it was a little disappointing that there were still many who could not.

(a) A few candidates mixed up series and parallel, but this was generally well-known.

(b) (i) and (ii) were managed well, but by no means as many could answer **(iii)** correctly, either by using the values of I and R, or from a consideration of potential dividers. Part **(ii)** required the candidate to provide the unit for the current, and most did so correctly. Some leniency was allowed over the actual way the symbol for amps was shown, because of different practices in different countries. However, it is worth noting that the preferred convention is that a unit derived from the name of a person (e.g. ampere, newton) is abbreviated with a capital letter; others use lower case letters. A good proportion knew that a voltmeter should be used in **(iv)**, and most of these could connect it appropriately.

Question 10

(a) Very few, in fact, could label the core correctly. Many clearly labelled the coils as the core, or indicated the region between the turns of a coil, which was ambiguous. Some even labelled the hole in the centre of the core. Actually, the whole idea of the core was a mystery to most – not all knew it would be made of iron, and very few could state the purpose of the core. Perhaps this is an interesting discovery thrown up by this question that teachers might like to address – their candidates have very little idea of the function of the core of a transformer.

(b) A high proportion could do this calculation. Common errors included mixing up the equation to start off with, and being unable to rearrange it correctly.

Question 11

It is to be hoped that not too many of these candidates aspire to be handymen or handywomen! Very few showed any real understanding of electrical safety precautions.

Question 12

This covered a topic which is a regular in examinations like this one. However, the approach was somewhat different from many, in that it used an understanding of half-life in order to develop the graph. It is true that some weaker candidates did not get very far with it, but it is pleasing to report that many candidates did very well. Many produced excellent graphs, from which they could take readings. Even those whose graphs were less than perfect could use them to obtain answers for **(b)** and **(c)**. As always, candidates who have made numerical or graphical errors are not penalised further if they use their incorrect values in future working that would otherwise be correct. Many scored marks on **(b)** and/or **(c)**, even though their graphs were wrong. Clearly, those candidates who could not take readings correctly from their graphs did not score marks for these incorrect values.

Part **(d)** was intended to test the better candidates in applying their knowledge in a new situation. There were some who made good attempts that were at least partially correct, and that showed intelligent thought.

PHYSICS

Paper 0625/31
Extended Theory

General comments

The vast majority of candidates deserve praise for the overall level of their performance. The impression gained in looking at scripts across the range was that candidates had done their utmost to demonstrate their ability. Their high levels of perseverance were shown by the general lack of blank spaces in their answers. Also, attention to finer points of detail meant that penalties for wrong or missing units in numerical answers rarely had to be applied. Praise is also deserved in the fact that numerical answers are now less often written with a large excess of decimal places or significant figures; although this factor does not materially add to their total marks, it demonstrates candidates' awareness of the reliability of numerical data.

As usual, some very high marks were awarded. Candidates showing this level of achievement clearly absorb factual material extremely well and are also able to apply their knowledge in unfamiliar situations. These candidates are often the most adept at conveying their thoughts with succinct and accurate phraseology. The middle range of candidates also show some strength in this, but struggle more with the application of their recalled facts, definitions and formulae. Other candidates have greater difficulty both in recall and also in their ability to write coherent answers which convey their thinking without omissions or contradiction.

Comments on specific questions

Question 1

(a) A question requiring candidates to describe the use of a mechanical method for the measurement of a small distance had not appeared for some considerable time. Perhaps many Centres and candidates were therefore surprised by the presence of this question. Many candidates could not name the instrument as a micrometer or a screw gauge.

(b) Only a very small minority of those who could name the instrument could also provide the correct reading. Many could read one of the scales only.

[2.73 mm]

(c) Many candidates could apply the technique for measuring a small quantity accurately – measure, in this case the thickness of several sheets together, and divide the result by the number measured. A further mark was only possible for those who could supply a detail of how to use the instrument.

Question 2

(a) A large majority are well aware of a displacement technique and could describe it satisfactorily. Attention to the detail of naming the vessels used was required. Marks were lost in one of the methods for suggesting use of a beaker rather than a measuring cylinder, and in the other for failing to describe or draw a displacement vessel full to overflowing before immersion of the statue, or a measuring cylinder to measure the overflow.

(b) It was unusual for any marks to be lost in this question.

Question 3

Full marks in **(a), (b)** and **(c)** was the common outcome. Graphing skills are clearly well instilled.

(d) The recognition that the law is obeyed was required. This, along with a statement of Hooke's law in one of several acceptable forms, gained a mark. However, the question was not deemed to have been answered completely without reference to the straight line or constant gradient nature of the graph.

(e) Candidates were not expected to give specific details of how the graph changed although some, to their credit, did so correctly. A simple statement that the straight line became a curve, or bent, sufficed.

(f) References to elastic or plastic limits or ways in which the spring's stretching was irrecoverable earned a mark.

Question 4

(a) A statement that the acceleration is in the direction of the force was required. Candidates giving answers like 'forward' or 'down' were presumably imagining a diagram of the object and the force.

(b) The answer required was one in which the application of Newton's 1^{st} law was evident.

(c) (i) **1** In a Physics context a weight of 60 kg is not acceptable. The formula mg had to be applied. The numerical value of g was expected to be taken as 10, but 9.8 and 9.81 were accepted.

[600 N]

(i) **2** The application of Newton's 3^{rd} law was required.

[600 N]

(ii) A number of candidates, correctly using F = ma, substituted 600 for m.

[150 N]

(iii) A pleasing number realised that the accelerating lift required the addition of the two previous answers.

[750 N]

(iv) This conceptually difficult question again produced a substantial number of right answers.

[600 N]

Question 5

(a) The potential energy formula is well known and there were few wrong answers. As in **Question 4** alternative numerical values of g were accepted.

[360 J]

(b) Fewer candidates could recall a necessary expression for power, and good answers were less frequent.

[6 W]

Question 6

(a) (i) Wrong answers were rare.

(ii) The essential need for Boyle's law was recognised by a good proportion of candidates, most of whom went on to do a correct calculation.

[1.4×10^5 Pa or N/m^2]

(iii) Most candidates recalled P = F/A or F = P x A and gained credit. The majority then calculated the final force (700 N) and got no further. A very small number also calculated the initial force (525 N) and subtracted to find the added weight. Answers involving subtraction of the pressure were very seldom given.

[175 N]

(b) The succession of steps required, with consideration of different gas laws at diffe[rent stages] proved tricky for many, but few gained fewer than 2 marks.

Question 7

(a) There were many clear cases of misreading or misunderstanding of the question. Many candidates introduced one or more wires made of different materials than the ones specified. Many of those who named the allowed materials frequently did not appreciate the need to have different materials meeting at a junction.

(b) Many missed the point that the meter had to be one capable of measuring quantities of the order of mV or mA.

(c) A sizeable proportion of candidates gave 'sensitive', which is not acceptable as a particular advantage.

Question 8

On the whole this question was successfully answered. Most candidates who placed the object in the correct position went on to complete the ray diagram successfully. The few who placed the image on the wrong side of the principal focus could only gain a mark for two correct rays.

Question 9

(a) Most answers referred to a 1 ^{o}C or 1 K or unit temperature rise, but an important omission from a significant number of answers was reference to 1 kg or 1 g.

(b) A large majority could identify a disadvantage.

(c) (i) A surprising number of even the strongest candidates wrote 1.8 ^{o}C in both spaces, possibly because the boiling temperature of the water was not stated and had to be assumed. Perhaps some were confusing temperature with heat and erroneously thought 'temperature rise of cold body = temperature fall of hot body'.

[1.8 ^{o}C, 77.1 ^{o}C]

(ii) There were many successful answers.

[1512 J]

(iii) With the benefit of error carried forward from **(ii)** in many cases, correct answers were again common. Commendably, errors in the unit of specific heat capacity were quite rare.

[392 J/kg K or J/kg ^{o}C]

(iv) There were many possible choices of reasons, and most answers could be rewarded.

Question 10

(a) The omission of 'step-up' in describing the transformer was the significant error in **(i)**. Most candidates could state an advantage of using high voltage in **(ii)**, but those who gave 'prevents heat, energy or power loss' were not rewarded.

(b) The calculation was unsuccessful in many cases, the correct answer only being gained by using the formula I = P/V. Attempts to use I = V/R or $\sqrt{(P/R)}$ were unsuccessful.

[2.5 A]

(c) A good proportion of blank spaces occurred in this answer, not even quoting a power formula, suggesting that many candidates did not equate rate of loss of energy to power. However, those who had correctly answered **(b)** tended to arrive at the required answer.

[18.75 W or J/s]

(d) Perhaps some candidates were unfamiliar with the term 'voltage drop' and there we[illegible]k spaces, but more were successful with this calculation than with the one in **(c)**.

(e) As in **(d),** many made no attempt, but correct answers, sometimes with errors carried forward f[illegible] **(d)**, meant that a substantial number gained one or both marks.

[21,985 V]

Question 11

(a) The symbols for both gates are well known, and there were few errors.

(b) Whether through knowledge of the truth-tables or otherwise, candidates tend to show proficiency in dealing with questions of this type. A good majority gained all the marks.

(c) (i) The function of a relay in this situation is not well understood. Only a small minority were able to explain that the output of gate B cannot supply enough power or current for the lamp.

(ii) The correct choice from the answers to **(b)**, sometimes with error carried forward, enabled most to succeed here.

(iii) Many answers were too vague in their detail, or did not address the fact that the system had to respond to both dark and warm conditions where a visual signal is appropriate. Answers such as 'burglar alarm' and 'fire alarm' were frequently given, and unrewarded.

PHYSICS

Paper 0625/32

Extended Theory

General comments

The vast majority of candidates deserve praise for the overall level of their performance. The impression gained in looking at scripts across the range was that candidates had done their utmost to demonstrate their ability. Their high levels of perseverance were shown by the general lack of blank spaces in their answers. Also, attention to finer points of detail meant that penalties for wrong or missing units in numerical answers rarely had to be applied. Praise is also deserved in the fact that numerical answers are now less often written with a large excess of decimal places or significant figures; although this factor does not materially add to their total marks, it demonstrates candidates' awareness of the reliability of numerical data.

As usual, some very high marks were awarded. Candidates showing this level of achievement clearly absorb factual material extremely well and are also able to apply their knowledge in unfamiliar situations. These candidates are often the most adept at conveying their thoughts with succinct and accurate phraseology. The middle range of candidates also show strength in this, but struggle more with the application of their recalled facts, definitions and formulae. Other candidates have greater difficulty both in recall and often in their ability to write coherent answers which convey their thinking without omissions or contradiction.

Comments on specific questions

Question 1

(a) Some of the answers suggested that candidates understood amplitude in the context of a wave motion, but not of a swinging pendulum. Answers stating that the amplitude equalled half AB or half arc AB or half the angle between the extreme positions A and B, were rare. References to the distance AB were more frequent. A number of candidates, perhaps with wave motion in mind, mentioned the height of A and B. Others confused amplitude with period.

(b) A significant number, including some who had not mentioned time in their answer to (a), gave a detailed account of how to measure the period of the oscillation. Those who had the right idea about the required measurement frequently failed to mention a measuring device. Overall, this question gave a large number of candidates a disappointing start to the paper.

Question 2

(a) A large majority are well aware of a displacement technique and could describe it satisfactorily. The naming of the vessels used was required. Marks were lost in one of the methods for suggesting use of a beaker rather than a measuring cylinder, and in the other for failing to describe or draw a displacement vessel full to overflowing before immersion of the statue, or a measuring cylinder to measure the overflow.

(b) It was unusual for any marks to be lost in this question.

Question 3

Full marks in **(a), (b)** and **(c)** was the common outcome. Graphing skills are clearly well instilled.

(d) The recognition that the law is obeyed was required. This, along with a statement of Hooke's law in one of several acceptable forms, gained a mark. However, the question was not deemed to have been answered completely without reference to the straight line or constant gradient nature of the graph.

(e) Candidates were not expected to give specific details of how the graph changed alth… their credit, did so correctly. A simple statement that the straight line became a curv… sufficed.

(f) References to elastic or plastic limits or ways in which the spring's stretching was irrecovera… earned a mark.

Question 4

(a) (i) About half of the candidates marked the forces clearly in the right direction. Of the remainder, some indicated the direction as away from the Centre, some drew arrows at right angles to the radii or elsewhere, and others made no attempt.

(ii) In general this was not well answered. For A the initial path was wrong or badly shown, and for B curved or straight paths to the right or left were frequent.

(b) (i) A majority of candidates wrote down mg and / or used the correct data. The numerical value of g was expected to be taken as 10, but 9.8 and 9.81 were accepted.

[0.5 N]

(ii) The large number who added 3.6 N to the previous answer was pleasing. A smaller number of others were on the right track and gained some credit for subtracting 0.5 N from 3.6 N.

[4.1 N]

Question 5

(a) The potential energy formula is well known and there were few wrong answers. As in **Question 4**, alternative numerical values of g were accepted.

[360 J]

(b) Fewer candidates could recall a necessary expression for power, and good answers were less frequent.

[6 W]

Question 6

(a) (i) Wrong answers were rare.

(ii) The essential need for Boyle's law was recognised by a good proportion of candidates, most of who went on to do a correct calculation.

[1.4×10^5 Pa or N/m^2]

(iii) Most candidates recalled P = F/A or F = P x A and gained credit. The majority then calculated the final force (700 N) and got no further. A very small number also calculated the initial force (525 N) and subtracted to find the added weight. Answers involving subtraction of the pressure were very seldom given.

[175 N]

(b) The succession of steps required, with consideration of different gas laws at different stages, proved tricky for many, but few gained less than 2 marks.

Question 7

(a) There were many clear cases of misreading or misunderstanding of the question. Many candidates introduced one or more wires made of different materials than the ones specified. Many of those who named the allowed materials frequently did not appreciate the need to have different materials meeting at a junction.

(b) Many missed the point that the meter had to be one capable of measuring a quantity of the order of mV or mA.

(c) A sizeable proportion of candidates gave 'sensitive', which is not acceptable as a particular advantage.

Question 8

On the whole this question was successfully answered. Most candidates who placed the object correct position went on to complete the ray diagram successfully. The few who placed the image on wrong side of the principal focus could only gain a mark for two correct rays.

Question 9

(a) Most answers referred to a 1 °C or 1 K or unit temperature rise, but an important omission from a significant number of answers was reference to 1 kg or 1 g.

(b) A large majority could identify a disadvantage.

(c) (i) A surprising number of even the strongest candidates wrote 1.8 °C in both spaces, possibly because the boiling temperature of the water was not stated and had to be assumed. Perhaps some were confusing temperature with heat and erroneously thought 'temperature rise of cold body = temperature fall of hot body'.

[1.8 °C, 77.1 °C]

(ii) There were many successful answers.

[1512 J]

(iii) With the benefit of error carried forward from **(ii)** in many cases, correct answers were again common. Commendably, errors in the unit of specific heat capacity were quite rare.

[392 J/kg K or J/kg °C]

(iv) There were many possible choices of reasons, and most answers could be rewarded.

Question 10

(a) The omission of 'step-up' in describing the transformer was the significant error in **(i)**. Most candidates could state an advantage of using high voltage in **(ii)**, but those who gave 'prevents heat, energy or power loss' were not rewarded.

(b) The calculation was unsuccessful in many cases, the correct answer only being gained by using the formula I = P/V. Attempts to use I = V/R or √(P/R) were unsuccessful.

[2.5 A]

(c) A good proportion of blank spaces occurred in this answer, not even quoting a power formula, suggesting that many candidates did not equate rate of loss of energy to power. However, those who had correctly answered **(b)** tended to arrive at the required answer.

[18.75 W or J/s]

(d) Perhaps some candidates were unfamiliar with the term 'voltage drop' and there were many blank spaces, but more were successful with this calculation than with the one in **(c)**.

[7.5 V]

(e) As in **(d),** many made no attempt, but correct answers, sometimes with errors carried forward from **(d)**, meant that a substantial number gained one or both marks.

[21,985 V]

Question 11

Candidates across the range of overall performance are clearly well prepared in this topic, and in **(a)**, **(b)** and **(c)** a succession of correct responses were seen.

(d) Many described the function of a variable resistor, or the effect of changing its value on the p.d. across it. Few could provide an answer in terms of its use to adjust the temperature at which the relay would trigger or the heater come on.

(e) Acceptable answers were required to refer to, or clearly imply, the automatic control of a heating device, and not just its switching on, and few answers achieved this.

PHYSICS

Paper 0625/04
Coursework

General comments

The candidates at all the Centres were given many opportunities to demonstrate their practical skills using a range of tasks from different areas of the specification. Clearly a large amount of good work has been completed by teachers and candidates. The majority of samples illustrated clear annotated marks and comments, which was helpful during the moderation process.

It is pleasing to see that points made in previous reports were noted. The following points, however, 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.
- Consistent use of units, in both results tables and on the axes of graphs, should be checked.
- It is advisable that a maximum of two skill areas should be assessed on each practical exercise.

PHYSICS

Paper 0625/05

Practical Test

General comments

The aim of the examination is to enable candidates to display their knowledge and understanding of practical physics techniques. These include:

- graph plotting
- tabulation of readings
- manipulation of data to obtain results
- drawing conclusions
- dealing with possible sources of error
- control of variables
- accurate measurements
- choice of the most effective way to use the equipment provided

The general level of competence shown by the candidates was sound although some seemed less than well prepared for the examination. However many candidates dealt well with the range of practical skills tested. Each question differentiated in its own way. 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.

Comments on specific questions

Section A

Question 1

(a) – (e) Most candidates gave sensible values for *d* although some had a higher first value than second. The *t* values were entered, but occasionally had the same number repeated for every reading. A surprising number of candidates did not divide by 20 to find *T*, preferring instead to divide *t* by *d*.

(f) Axes were almost invariably labelled but good scales were rare. Candidates needed to use a false origin so that their plots occupied at least half of the graph grid. Plotting was generally accurate and neat although best fit lines were often poor with too many candidates merely joining the dots.

(g) Most candidates chose "no" and justified the statement adequately. Some candidates conveyed the correct understanding but their explanations took a long time to reach the point. The most confident candidates were able to answer in a few words, for example by noting that the line did not pass through the origin.

Question 2

(a) – (d) Most candidates recorded the temperatures of the hot water correctly and completed the table accurately. Some failed to include the units. A small number recorded temperatures that were clearly wrongly read.

(e) Most candidates identified the correct position but too many did not justify their answer with reference to the readings but rather attempted a theoretical explanation or wrote about the different positions.

(f) Good candidates were able to write about two conditions that should be controlled but a significant number failed to read the question with care and wrote about precautions that might be taken to ensure accurate readings.

Question 3

(a) – (f) Most candidates were able to fill in the table correctly with sensible values. Some failed to r the ammeter reading to 2 decimal places and some used the equation provided wrongly and miscalculated *R*.

(g) Many candidates calculated the ratio correctly although some gave the inverse. A good number gave their answer sensibly to two or three significant figures and realised that there is no unit.

(h) Candidates who knew the correct symbols usually drew the circuit correctly but many did not correctly indicate where to connect the voltmeter. A surprisingly large number of candidates did not know the purpose of the resistor. Some appeared to think it acted as a fuse.

Question 4

(a) – (c) Most candidates recorded the focal length correctly with the appropriate unit.

(d) (e) Few candidates recorded more than one value of *d* in spite of being asked to determine an average value. So marks were lost due to lack of attention to the detail of the question. Most candidates recorded a sensible value for *t*, but some recorded a value that was clearly the diameter rather that the thickness.

(f) The method of measuring being asked for here has been tested in the examination on previous occasions so it is encouraging to see a higher proportion of candidates able to score the marks. However there are still some who draw an unrealistic or impractical arrangement.

(g) Confident candidates recognised that the values obtained were too different to be regarded as equal within the limits of experimental accuracy and were able to express this well. Most candidates however assumed, in spite of the evidence recorded, that the values supported the theory. (The answers were judged on the candidates' actual readings and credit was given accordingly.)

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(d) 4(b)(iii)** 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. Almost without exception candidates attempted all the questions. The examination appeared to be accessible to the candidates and there was no mark that proved unobtainable.

Comments on specific questions

Question 1

(a) (b) Most candidates measured d correctly and entered the corresponding value of x in the table. Some calculated T wrongly and more went wrong calculating T^2.

(c) The graph was generally accurately plotted with the scales labelled but a suitable T^2 scale using at least half of the available grid was often not used. Candidates needed to use a false origin. A significant number of candidates lost marks since their lines were too thick or they drew poorly judged best fit lines.

(d) The most competent candidates were able to state concisely that the line did not pass through the origin to justify their 'no' statement. Others reasoned correctly but far less concisely. Those who assumed that the answer must be 'yes' wrote justifications that contradicted the evidence.

Question 2

(a) Most candidates read the thermometer correctly.

(b) Most candidates were able to fill in the units correctly.

(c) Most candidates made a correct statement and many were able to justify it by re readings.

(d) A significant number of candidates apparently misread the question here and wrote precautions that might have been taken to improve accuracy rather than the control of variab Others suggested variables that were not relevant to this experiment.

Question 3

(a) (b) Most candidates successfully completed the column headings. Some left them blank, a few entered wrong units (e.g. W for the voltage).

(c) Many candidates calculated the correct ratio although some gave the inverse. Competent candidates expressed the answer to 2 or 3 significant figures and realised that there was no unit.

(d) Relatively few candidates gave the correct position for the voltmeter, clearly marked as required in the question. The circuit was often correct but some candidates did not know the circuit symbols. A surprisingly large number did not know the purpose of the variable resistor. A significant number thought it acted as a fuse.

Question 4

(a) Most candidates measured *f* correctly and gave an appropriate unit.

(b) Very few candidates recorded more than one reading for *d* in spite of the question asking for them to calculate an average value. Most measured *t* correctly and in general candidates gave the correct units. The practical skill being tested in part **(iii)** showed those candidates who were unfamiliar with practical work as they suggested a range of impractical ways of using the blocks. Most candidates calculated *f* correctly.

(c) Candidates should have noted that the two answers were too different to be explained by the limits of experimental accuracy and therefore that the results did not support the theory. Few candidates were sufficiently confident to say this and wrote that the theory was supported in spite of the evidence before them.

Question 5

(a) This question was difficult for candidates with little practical experience. Some resorted to more or less copying the diagram from the previous question, including the mirror which was not part of **Question 5**.

(b) Those candidates with suitable experience were able to choose two precautions that were relevant. Others were only able to make generalised comments that were not particularly relevant to this experiment.