PHYSICS

Paper 0625/01

Multiple Choice

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

General comments

At 31.05, the mean mark for the paper was slightly lower than in June 2001. The standard deviation was slightly higher, at 6.30.

Items 12, **14**, **16**, **31** and **33** were found the easiest, with a facility greater than 90%. **Items 7**, **18**, **32** and **36** were the most difficult – the facility for each of these was less than 60%.

Comments on specific questions

Fewer than one in ten candidates failed to answer **Item 1** correctly, with option **C** being the most popular of the distractors, indicating the need to look carefully at scale divisions. **Item 2** was also well answered (78% correct), but option **C** attracted 13%, showing the importance of reading the whole question carefully. Few problems were caused by **Items 3** and **4**; these areas appear to be well understood. In **Item 5**, 87% of responses were correct, but 10% opted for **C** – candidates knew the units were different, but there was some confusion. At 78% correct, **Item 6** confused several candidates, with **A** being the most popular distractor in this case (13%).

The first poorly answered item was **7**, with only just over half of responses correct. Option **D** was very popular, again showing the need to read the question carefully. Although 80% correctly answered **Item 8**, **C** attracted 13%, who would seem to be unaware of the need to measure total extension, from the unstretched length. **Items 9** and **10** were well answered, as was **Item 11**, although in this item 10% opted for **C** – these candidates should have checked the height of **C**, which is clearly above the starting point.

Item 12 presented few with any problems, but more difficulty was experienced with **Item 13** in which 11% incorrectly chose each of **B** and **D**, suggesting that manometers are a topic which would benefit from some extra attention. **Items 14**, **15** and **16** all had high facilities, with no widely-held misconceptions. In **Item 17**, 12% opted for **C**, apparently misunderstanding the meaning of melting point. **Item 18** posed considerable difficulty, with only 37% correct responses. Many more than this chose **B**, showing that the effect of a conductor in carrying away the heat to prevent the paper charring was not understood; it is accepted this can be quite a difficult concept until it has been explained. In **Item 19**, two-thirds were correct, but **C** was chosen by over a quarter – these candidates failed to consider convection within the boiler itself. Although three out of four could answer **Item 20**, one in five were distracted by **A**, implying lack of knowledge of examples of transverse waves.

Items 21, **22** and **23** were well answered, but one in three chose option **C** in **Item 24**, probably confusing frequency with amplitude. In **Item 25**, option **B** was the most popular distractor (12%), with these candidates making the classic mistake of forgetting the time for the sound to return to the girl. Option **A** was the popular one in **Item 26** (13%), the direction of the field lines being unknown. In **Item 27**, 16% incorrectly chose **B**, confusing the properties and uses of hard and soft magnetic materials. **Item 28** was answered well, but nearly a quarter opted for **D** in **Item 29** (61% of all responses were correct), either showing uncertainty of the effect of diameter on resistance, or carelessness over reading the diameters from the table. In **Item 30** (75% facility), nearly one in five chose **D**, confusing series and parallel circuits. The simple **Item 31** was found easy.

Problems were caused by **Item 32**, with only 56% correct, and 27% choosing **A**, again showing lack of clarity of understanding of series and parallel connections. In contrast, **Item 33** was well answered (92% correct). Only 61% succeeded in **Item 34**, with all distractors attracting candidates, **C** being the most popular at 17%; power transmission would seem to be a profitable topic for attention. The 87% success rate in **Item 35** showed that transformers were better understood.

Item 36 was very poorly answered, with only 31% correct responses. All the distractors were chosen, but particularly **B** (37%) and **C** (21%): LDR's and potential dividers clearly need much attention. **Item 37** (61% correct) showed **A** and **C** to be popular (18% and 14%), indicating lack of understanding of time bases. Option **A** in **Item 38** attracted 14%, showing confusion between alpha-particles and beta-particles. The final items, **39** and **40**, caused few problems.

Paper 0625/02
Paper 2 (Core)

General comments

Candidates for this paper generally seemed to be well prepared. Of course, some candidates were more able than others, but there were few dreadful scripts and a good number of excellent ones. Although there were one or two questions which revealed poor understanding by some candidates, there were no questions which consistently proved difficult. This was especially pleasing since one or two questions contained situations which would have been novel to most candidates, thus requiring the candidates to apply their knowledge in a new situation.

It is worth pointing out that, because of the international nature of the candidates, no penalty was applied for poor spelling or grammar, as long as the meaning intended by the candidate was clear. The Markers on this paper were all well experienced in interpreting what candidates have written. There was no evidence that candidates had too little time, which should have meant that they could take trouble over the presentation of their work. However, large numbers of candidates did not appear to care whether the Marker could read his/her writing, and there were a few cases where marks could not be awarded because handwriting simply could not be deciphered. A similar comment could be made about the standard of graph drawing in **Question 11** and ray drawing in **Question 12**. Large numbers of candidates did not produce accurate enough work, and were accordingly penalised. Some could not even be bothered to use a straight edge to draw the straight line on the graph, or the rays on the ray diagram (notice the instruction in the stem to **Question 12 (b)**.

Comments on specific questions

Question 1

Most candidates scored both the marks for this question, but even so it is clear that large numbers of candidates still have only a vague understanding of the relationship between mass and weight.

Question 2

(a) Most candidates recognised that **(i)** was a valid response. Not as many realised that **(ii)** was also correct.

(b)(i) Few candidates had difficulty taking the reading from the graph.

(ii) Only a tiny handful had any idea what would happen to the thread below 0°C. The most common misconceptions seemed to be that either the liquid would stop contracting below 0°C, or that it would freeze.

Answers: **(b)(i)** 70±1ºC.

Question 3

(a) Most got the number of puffs correct, and a good number could perform a correct multiplication to get 1000 Hz. Some struggled to use $v = f\lambda$, with inventive ways to justify their substitutions.

(b) The idea of reflection/echo was well recognised, but there was rather more uncertainty about the frequency and amplitude of the reflected sound.

Answers: **(a)(i)** 25.

Question 4

All parts of this question were answered correctly by the majority of candidates.

Answers: **(b)(i)** 15, **(ii)** 31.

Question 5

(a) There are a variety of ways of magnetising a steel rod, some more effective than others. Any method which could work was given credit. Common mistakes were stroking the steel rod on a magnet (rather than the other way about), not making it clear that the solenoid current should be d.c., or even specifically stating a.c., and believing that the bar should have a current passed through it. There were even a few who confused magnetising with charging, and rubbed the bar with a cloth, with the misconception carried over to **(b)**, where no "error carried forward" was given for attempts at picking up pieces of paper.

(b) The layout of this part of the answer seemed to help the candidates, and there were some good answers. Answers involving the use of other magnets or compasses were the most likely to lose marks, because in these two cases only repulsion is a test of magnetisation. Answers of the sort "The magnet attracts or repels" were not awarded the mark, because attraction is not a test in this case.

(c) This was, no doubt, a novel situation for most candidates, but many made an intelligent attempt at an answer. Anything which suggested that magnet **B** would not rest on magnet **A** was given credit, except "Magnet **B** is shot out of the tube". Most recognised that repulsion of like poles was the explanation.

Question 6

This was probably the poorest-answered question on the paper, revealing large numbers of candidates who had scant understanding of the cathode ray tube.

(a) Most, but by no means all candidates, knew where the battery should be connected, but a large proportion of these either could not draw a correct battery symbol or did not actually draw the lines connecting it to the two terminals. The majority knew that electrons were released during thermionic emission, but a sizeable majority insisted that the particles were β-particles.

(b) Hardly any could answer any part of this section correctly. Some joined every conceivable terminal to the + and – terminals and to each other, presumably in the hope that something might be deemed correct.

(c) It was surprising to find how few knew that terminals **S** and **T** were to be connected to the battery.

Question 7

This question was generally well-answered, with very few failing to score 3 marks on **(a)**, and a majority giving a valid reason for the use of high voltages. Very pleasing.

Question 8

Most candidates had some understanding of the hazards involved with the use of radioactive materials, but many were very dramatic, along the lines of developing cancer at the slightest exposure, being burned by the material, and explosions. No doubt many Centres have few opportunities of actually demonstrating investigations with radioactive materials, but it would be worth Teachers explaining the reasons for the various precautions and, whilst maintaining a healthy respect for such materials, instil a reasonable sense of reality about the precautions. In this respect, the main reason for storing radioactive materials in a locked drawer or cabinet is to prevent unauthorised use, rather than as a form of shielding the emissions. Also, a very common misconception is that the emissions are themselves radioactive and can contaminate other things, making them radioactive.

Question 9

Candidates for this paper usually score well on electric circuit questions. This question spoiled the pattern, probably because it tested understanding about currents in series and parallel circuits. Many candidates scored all 6 marks, but many did not.

(a) Most knew the total resistance, but far fewer realised that all 3 ammeters would read the same current.

(b) Fewer could choose the correct resistance. It was not necessary to calculate the resistance, merely to realise that it must be “smaller than the smallest” resistor i.e. smaller than 20Ω, so that the only possible answer was 10Ω. Although better candidates could correctly decide on the currents in the 2 ammeters, there seemed to be a lot of guessing.

Answers: **(a)(i)** 40Ω, **(ii)** 0.2A, 0.2A.

Question 10

(a)(i) Most candidates showed understanding of the pressure formula and involved the ratios of weights and number of wheels, however few could combine these in such a way as to obtain the correct answer. Many scored 2 marks, but a far smaller number gained all 3 marks.

(ii) A good number of candidates made an intelligent attempt at applying the concept of pressure to this situation. Some seemed more concerned with skidding than with sinking, and some answers were too vague to be worth marks, but the majority of answers were worth at least 1 mark.

(b)(i) Answers were frequently vague and ill-expressed. Atmospheric pressure was often mentioned, although without clearly stating that it was the same at both surfaces. Some thought that the levels were the same “so that accurate readings can be taken”.

(ii) A fairly easy mark for most candidates.

(iii) Very few realised that the difference between the 2 levels must be measured. Most thought that it would be the distance moved by one of the levels

Question 11

(a)(b)(c) The majority correctly calculated the figures required and identified the length of the unstretched spring. As previously commented, the quality of the graphs frequently left a lot to be desired. Far too many candidates plotted points as large blobs; the point 0,0 was often not plotted, although clearly on the table; the "best straight line" often was not straight but was diverted to take in the rogue point; and sometimes the line was drawn freehand, without the use of a straight edge. Such faults will always be penalised. In **(iii)**, most candidates identified the incorrect reading, but many of these simply quoted the reading off the graph for the correct value i.e. the extension, instead of converting this to the length of the spring. Some credit was given for the extension, but obviously not full marks as this was not what the question asked for.

(d) It was pleasing to see the high proportion who could answer this correctly, even to the stage of thinking logically about what the friction force would be.

Answers: **(a)** 40mm; **(c)(iii) 1.** 60mm **2.** 56(±1)mm; **(d)(i)** 28mm, **(ii)** 3.5(±0.1)N, **(iii)** as **(ii)**

Question 12

(a) Only the careless candidates failed to score the first 2 marks on the section, but large numbers did not know what is meant by focal length.

(b) Again as previously commented, the quality of diagrams was not good enough. The instruction clearly says "you are required to draw an *accurate* ray diagram…". This should have flagged up that candidates were required to take care how they drew their lines, which in many cases they did not. For instance, Markers were instructed to penalise lines which passed more than ½mm from the point through which they were supposed to pass. This is not considered unreasonable in an *accurate* diagram. Apart from this, constructions were reasonable, except with the weaker candidates. In parts **(iv)** and **(v)**, candidates often found difficulty in saying what they wanted to say if they did not know the appropriate Physics term. Markers gave the usual credit where the meaning could be inferred, but this was a good example where knowledge of standard Physics language can lead to unambiguous answers.

Paper 0625/03

Paper 3

General comments

The candidates found the paper more difficult than those of the previous two years, and this was reflected in generally lower marks. Undoubtedly some found rather more difficult parts of questions than usual, but there were also many marks that should have been easily scored.

The standard of calculations was only moderate. Powers of 10 seemed to cause considerable problems. Units were wrong or missing in many cases, even when they were quoted in the question.

Accounts of experimental work were very poor, in particular in question number 10.

There was some evidence that candidates found the paper too long or they worked too slowly. A significant number of candidates made no attempt at **Questions 9** and **10**.

The number of weak and very weak candidates showed an unwelcome increase.

Overall the candidates' performance was disappointing, with fewer excellent scripts seen.

<u>Comments on specific questions</u>

Question 1

(a) Too many failed to answer the question by not listing the readings that were necessary. Instead equations were given and quantities that could not be measured directly were quoted, such as work and energy. Less than half of the candidates realised that the vertical height was needed and many measured both the horizontal distance and vertical height and added them together. Very few wrote anything about accuracy and how to improve it, particularly with regard to the time of the run.

(b) Mostly fully correct answers with only a few giving the equations in symbol form, which the question excluded.

(c)(i) Most candidates correctly wrote potential energy, whilst a few gave kinetic energy and a few only gave heat.

(ii) The common correct answer was heat, with only a few realising that kinetic energy was needed for the motion to occur. As expected friction was a common wrong answer, though work against friction was accepted

Question 2

(a) Well answered by most candidates, but far too many saw the graph as a height-time graph and so had difficulty throughout the question.

(b) Candidates found this difficult, but most candidates scored one mark for recognising that this was at the time when the bounce occurred. A wide variety of correct comments were accepted for the second mark.

(c) A few wholly correct answers were seen. Others scored the mark in **(i)** but not in **(ii)**. A common answer to both parts was 9.5 m/s.

(d) Almost every candidate scored one mark for the definition of scalar and vector, but only a very few went on to link this idea with the situation in **(c)**.

(e) A great many correct answers based on distance = area under the graph. However a number of candidates used the time at point *C* rather than *D* and this was allowed for full marks. Those who used the time at *B* rather than *D* lost the second mark.

(f) This was mostly correctly calculated from the graph, but again some used the time at *B* or *C* instead of *D*. Those candidates who gave a bare answer scored no marks as they could have been quoting the acceleration of freefall without answering the question.

Answers: **(c)(i)** 1.5 m/s, **(ii)** 17.5 m/s; **(e)** 3.0 m to 3.4 m; **(f)** 10 m/s^2.

Question 3

(a) Because candidates found **(a)** and **(c)** very similar it was decided to mark them as one section. In **(a)** it was disappointing that few candidates were aware that for molecules to escape, the liquid needed potential energy to do work against the intermolecular forces and that below the boiling point only a few molecules had the required energy.

(b) Correctly answered by the vast majority.

(c) Marked with **(a)**.

Question 4

(a) There were more wrong answers than usual for this type of calculation. However most candidates understood that volume could be replaced by length when the cross-sectional area was constant. The most common mistake was to quote *P*/*V* as a constant rather than *P* x *V*.

(b)(i) This was very poorly answered. Far too many candidates put the mark for 0°C at the bottom of the cylinder and a mark for 100°C at the top of the cylinder just below the piston, which gained no credit. A number of rather better attempts were spoilt by giving no indication of a method for ensuring fixed point conditions for calibration. The good candidates gave excellent answers by using melting ice and steam over boiling water and so for them this represented three easy marks.

(ii) Most scored one mark for immersing the part of the cylinder containing the air in the water. A common error was to replace the air in the cylinder by water. Only a few realised that this device needed to be left for a while before reading the scale.

Question 5

(a)(i) About 70% could correctly state the standard definition. A common error was to state that the angle of incidence was equal to the angle of refraction.

(ii) Those candidates that attempted to draw a ray reflecting from the right-hand end of the mirror usually got the correct solution. However many drew their reflected ray from the centre of the mirror which had no value. Poorer candidates showed little understanding, drawing a multitude of rays in more or less random directions and shading in many incorrect places.

(b) Some candidates moved their mirror backwards and so made no progress. Only about one candidate in five scored any marks in this part. Those who understood the question often used trial and error which was perfectly acceptable. A few able candidates measured the distance from *P* to the end of the counter, divided this distance by two and then constructed a normal to the mirror line produced at this point.

(c) Very well answered. Only a tiny minority stated either real or inverted or both.

Answer: **(b)** 1.4 m to 1.8 m.

Question 6

(a) As expected a significant number of candidates could not transpose the formula correctly. The number not being able to deal with powers of 10 was higher than expected.

(b)(i) A large number of candidates confused this situation with echoes and divided the correct answer by 2, thereby losing a mark.

(ii) Very poorly answered with only a tiny minority giving the full answer that the speed of light was so high that the time to travel this short distance was negligible. Far too many candidates stated that light had nothing to do with the time interval in spite of the wording of the stem of the question.

(c) A great many excellent diagrams seen. The most common errors were no dispersion at the first face and a reversal of the order of the colours.

Answers: **(a)** 6×10^{14} Hz; **(b)(i)** 1224 m.

Question 7

(a) Generally excellent answers. Some were spoilt by vague references to one sphere and the other, not making it clear which sphere lost electrons and which gained electrons and linking this process to the residual charge.

(b) An acceptable level of correct answers was seen, with some clearly and accurately drawn. The most common error was the reversal of some or all of the arrows.

(c)(i)(ii) Not well answered with many wrong equations quoted, equations wrongly used, inability to deal with powers of 10 and wrong or missing units.

Answers: **(c)(i)** 3.2×10^{-9} C, **(ii)** 3.2×10^{-6} A.

Question 8

(a) The majority of candidates scored full marks. Errors arose because 12 V was used instead of 15 V and some used the ratio of 15 V to 12 V instead of the ratio of 240 V to 15 V.

(b) Less than half of the candidates drew a believable d.c. output. Many showed full-wave rectification which the circuit could not have produced.

(c) Most answers amounted to a statement that the diode allowed current to flow in one direction. Only a tiny minority went on to link this with the effect on the a.c. output from the transformer.

(d) The large majority showed a battery connected correctly across T_1 and T_2.

(e)(i)(ii) Generally correct answers to both parts, but there was confusion between power and energy. Energy was stated as power/time in some cases. In spite of the time being given in seconds to help the candidates, some insisted in trying to convert 30 hours to seconds usually ending up with the value in minutes. Many used a time of 30 s and gave the answer in joules. Others calculated the energy in watt-hours but wrote kWh.

Answers: **(a)** 16:1 or 1:16; **(e)(i)** 24 W, **(ii)** 2.6×10^6 J or 0.72 kWh.

Question 9

(a) Very poorly answered. Only a minority stated that the 1 V d.c. should be connected to the Y-plates. Even fewer stated that the vertical displacement should be measured, or the Y-gain adjusted to one division on the grid. Hardly any went on to state that the 1 V value should be used to make an equal interval scale.

(b) A substantial minority connected A and F to the Y-plates in spite of the clear reference to C and D in the question.

(c) A good number of correct answers but too many were not clear as candidates refused to use the letters in the question.

Question 10

Far too many candidates made no attempt at this question, either from lack of knowledge or poor timing. It was easily the worst answered question on the paper.

(a) Far too many wrote their own question by showing a solid source, or showed the detector pointed at the side of a thick container holding the liquid. Clear, simple, labelled diagrams showing the liquid source in an open container with paper over the top and the detector above the paper were rare.

(b) Candidates were obsessed with background radiation. All too often they took this to mean the radiation from the liquid with no absorber between the source and the detector, which meant that no marks could be scored. Only a tiny minority scored full marks when all that was required was a reading without the paper, a reading with the paper inserted and the difference between the two to give a measure of the alpha radiation.

(c) Most candidates scored two marks. However there seemed to be a general belief that technicians were in the habit of eating their meals close to radioactive sources. All references to not eating and drinking in the context of this question were considered absurd and so discounted.

Paper 0625/04
Coursework

General comments

It is pleasing to see that points made from previous Moderators reports were noted. The assessment criteria were successfully applied and the marks awarded to candidates were not adjusted.

The 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 following points are still relevant to a couple of Centres;

- Three skills should not be assessed in one task. It is acceptable to assess two skills using one task, the combinations that are most frequently used are C1 and C2; C2 and C3; C3 and C4.

- It should be noted that although Moderators do not expect to see written evidence of Skill C1, they do expect to be provided with details of how candidates achieved the marks awarded.

Paper 0625/05
Practical Test

General comments

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

- graph plotting
- tabulation of readings
- manipulation of data to obtain results
- drawing conclusions
- dealing with possible sources 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 pleasing. The questions discriminated well showing candidates' strengths and weaknesses. There was no evidence of candidates running short of time to complete the test and very few candidates failed to attempt all parts of each question.

Comments on specific questions

Question 1

Candidates were able to carry out this moments experiment well. Very few produced wrong readings of the distances and most were able to carry out the calculations correctly. A mark was awarded to candidates whose quality of work yielded two mass values within 5 g of each other.

The diagram asked for was in many cases done very well with candidates showing clearly how they placed the centre of the mass correctly on the rule. Some however missed the point and explained a centre of mass experiment involving suspending the mass.

Some marks were lost by candidates who used other than 2 or 3 sf for their final answer and those who gave wrong (or no units) – this was quite rare though.

Question 2

Here candidates were taking temperature readings and processing them. The candidates were able to follow the instructions and carry out the experiment well. To score full marks candidates had to give their temperature readings to better than one degree Celsius. A significant number of candidates lost marks comparing the temperature drops. They referred only to the two final temperatures and disregarded the different starting temperatures. The justification required candidates to quote readings to back up their answer.

Most were able to suggest suitable modifications (same starting temperature, insulation, etc.) and the method of reading the measuring cylinder was well understood by many.

Question 3

Most candidates produced a correct range of readings although many lost marks by rounding all their readings to the nearest 0.5 cm. The graph work showed accurate plotting in most cases but the quality of the line work was less good overall. Many coped well with drawing the straight line and taking a reading from it.

Question 4

Here candidates showed that they could use a simple circuit and take the necessary readings. Some candidates lost marks through confusion over units and by giving units for the ratios. Candidates were expected to realise that the two ratios (within experimental error) were the same. The diagram was done well by most candidates.

Paper 0625/06
Alternative to Practical

General comments

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

- graph plotting
- tabulation of readings
- manipulation of data to obtain results
- drawing conclusions
- dealing with possible sources or error
- control of variables
- accurate measurements
- choice of most suitable apparatus.

It is assumed that, as far as is possible, the IGCSE course will be taught so that candidates undertake regular practical work as an integral part of their study of Physics. This examination should not be seen as suggesting that the course can be fully and effectively taught without practical work.

Clearly, some of the skills involved in practical work can be practised without doing experiments – graph plotting, tabulation of readings, etc. However there are parts of this examination in which the candidates are effectively being asked to answer from their own practical experience.

The answers given by some candidates in this examination point to a lack of practical Physics experience.

The overall standard of work was pleasing

Comments on specific questions

Question 1

(a) Candidates could score the two available marks by indicating any two of the following: moving the rule closer to the blocks, moving the rule down so that the scale could be used, having the eye level correct at the top or bottom of the block.

(b) Many candidates were confused in this part and could not work out the scaling correctly.

Question 2

The majority of candidates coped well with this question.

(a) A few failed to place the ammeter in series and the voltmeter in parallel with the lamp.

(b) Most candidates placed the pointer correctly but some lost a mark because they did not understand that the range should be quoted as 0 – 0.5A.

(c) Here full marks were scored by those who calculated correctly (most), gave the answer to 2/3 sf (fewer) and gave the unit.

Question 3

(a) It was pleasing to see the large number of sensible responses here, indicating that candidates had been well prepared and were used to thinking through the control of variables.

(b) Graph work was generally well done, but too many candidates lost marks by drawing a poor line (either too thick or poorly judged in relation to the plots, or both).

(c) In was in this section that most marks were lost. Candidates need to know that the ratio should be given as a single number (e.g. 2.6) not as a fraction or in the form 2.6:1. Most realised that the ratio has no unit.

Question 4

Whilst many candidates drew their ray diagrams well (a high level of care was expected here as it is, in a sense, an actual practical exercise) others seemed to have had no experience of such work. This should not be the case as simple, inexpensive apparatus is involved.

(a) Those who had the experience drew a good diagram although marks were lost most commonly due to lines that were too thick or carelessly positioned and arrows in the wrong direction (sometimes contradicting each other).

(b) The justification had to be written by reference to the lines drawn, not a 'text book' answer about focusing on a screen.

Question 5

(a) A surprisingly large number of candidates read the scale wrongly. The importance of looking at a scale and deciding what the divisions mean must be emphasised to candidates.

(b) Most candidates made a sensible reference to increased accuracy.

(c) Most candidates answered part **(i)** correctly, but many missed the last mark because they failed to quote the answer to 2/3 sf.