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FOREWORD

This booklet contains reports written by Examiners on the work of candidates in certain papers. **Its contents are primarily for the information of the subject teachers concerned**.

PHYSICS

GCE Ordinary Level

Paper 5054/01
Multiple Choice

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

General comments

The number of candidates for this session was 8599. The mean score was 24 out of 40 (60%) and the standard deviation was 18%.

In general the candidates were well prepared and performed well across the whole syllabus, but the worrying exception was the poor response to **Question 28** on electrical safety.

Comments on specific questions

Questions 4 and 5

In each case the statistics suggest that there was some guesswork between three of the four options.

Question 7

Few candidates were tempted by response **D**, but the remaining incorrect answers were equally divided between **B** and **C**.

Question 10

Many candidates did not remember that area does not affect pressure in this case.

Question 11

40% chose option **A**, but these were the less successful candidates looking for a shape they recognised.

Question 14

Here **C** also proved a popular answer with almost half as many selecting this as chose the key **A**.

Question 15

It is surprising that only just over 50% of the candidates got this "recall" question correct. The remainder seemed to be guessing from the remaining possibilities.

Question 17

Under 50% were able to deduce the correct answer. Again those who could not seemed to be guessing, with a slight preference for response **C**.

Question 21

Yet again the statistics would seem to suggest widespread "guessing" with only a slight preference shown for the key **D**. It seems 27% of the candidates felt a permanent magnet would attract both ends of a compass needle.

Question 25

Response **C**, which is the reverse of the correct answer, was also very popular.

Question 26

A large number chose **A**, including some of the better candidates.

Question 28

Almost 60%, including the better candidates, chose option **A**.

Question 29

Many candidates tried to calculate the total energy from 12 x 2 x 5 (**B**) and neglected to convert the 5 minutes to 300 seconds.

Question 31

Many candidates forgot the difference between conventional current and electron flow.

Question 33

Here a number of candidates did not realise that the current would be reversed as the magnet left the coil.

Question 34

One third of the candidates did not double the voltage as well as the frequency.

Question 37

A large number opted for **C**.

Paper 5054/02

Paper 2 Theory

General comments

This was a paper which tested not only whether candidates had a grasp of the topics covered within the syllabus, but whether they were also able to apply that knowledge to unusual questions. There appeared to be a greater number of candidates than in the recent past who were not adequately prepared for the examination and these candidates had, at times, merely a superficial knowledge of a few of the formulae involved. A reasonable amount of recall material was present in ***Section A***, where candidates who had covered all of the syllabus were able to display their knowledge.

In ***Section B***, **Question 9** was the most popular question and the performance on this question was generally the best in the section. Weaker candidates tended to score more highly on the numerical rather than the descriptive answers throughout the paper. Candidates should realise that is always helpful to give an algebraic form of the formula at the start of a numerical answer. They should not start with the numbers directly or merely insert their answer at the appropriate position. There was little, if any, indication that candidates were limited by time in answering the paper even though there was more reading to be undertaken with the comprehension passage in **Question 10**.

Comments on specific questions

Section A

Question 1

(a) The speed-time graph continues with a steeper line flattening into a horizontal line ending at t_2, with, possibly, a drop to zero speed at t_2. Relatively few of the drawn graphs contained a curve and an initial straight line was accepted, as long as it was steeper than the graph on the question paper. Many candidates also showed the spacecraft apparently hitting the planet before t_2.

(b) Most candidates produced fair answers to these numerical questions. A few candidates calculated the weight of the spacecraft on Earth rather than using the gravitational field strength given in the question. It was encouraging to find some answers where the resultant force was correctly calculated and the formula $F = ma$ used. Some candidates attempted to calculate acceleration as a change in velocity per unit time and were unsuccessful.

Answers: **(b)(i)** 195N, **(ii)** 305N, **(iii)** 4.7 m/s^2.

Question 2

(a) A good proportion of candidates realised that **C** was the correct answer and many gave a convincing reason in terms of the perpendicular, or in this case horizontal, distance between the line of action of the 200N force and the pivot. Some candidates suggested that **A** was the correct answer and suggested incorrectly that the largest vertical distance produced the largest moment.

(b) Candidates usually appeared to try to equate moments, but it would be helpful if answers did not start with a numerical attempt but instead with a statement that clockwise and anti-clockwise moments are equal. Weaker candidates tended to use 46cm rather than 80cm for the distance of *F* because of the unusual position of the fulcrum at the end of the diagram.

Answers: **(a)** C; **(b)** 51N.

Question 3

(a) A few candidates gave general descriptions of the properties of images seen through lense object distance varied but the correct answers upright, virtual and magnified were often seen.

(b) Most candidates earned at least one mark for a correct ray through the lens. For the image to be upright and magnified the object must be within the focal length of the lens. Some candidates constructed a magnified image but their image was real and on the opposite side of the lens to the object. There was no need for the candidates to construct a diagram that exactly matched the magnification of the image shown in the diagram. Where the question asks that the image and focal length are marked, candidates should be careful to mark or label the required quantities as it ensures they are given full credit for their answers.

Question 4

(a) There were a number of convincing statements that described the motion of the point as a wave passes. This could be done in terms of the longitudinal vibration, the separation of the air molecules or in terms of a rise and fall in pressure. Credit was given for any sensible suggestion. Poor answers suggested that the pitch might change or just that a sound would be heard.

(b)(i) A fair number of candidates were able to define frequency correctly. Standard definitions give frequency as the number of complete waves that pass a point in unit time, but not in 'a given time' which was sometimes seen as an answer. Many alternatives to a complete wave were accepted, such as number of oscillations, cycles or peaks.

(ii) The formula $v = f\lambda$ was known by many candidates. The final answer was three complete wavelengths. Some candidates suggested 1 ½, 2 or 4 wavelengths.

Answer: **(b)(ii)** 0.48m.

Question 5

(a) The simple ideas of the movement of molecules and, in particular, the collision of molecules on the walls of the container were well expressed in some answers. However a large number of candidates were not able to explain the simple idea of how molecules create a pressure on the walls of a container.

(b) The molecules of air inside the container slow down, resulting in fewer collisions per second on the walls and a lower pressure inside. The higher pressure outside the container then results in the bottle becoming crushed. Most good candidates started the question in the correct manner but few of them explained how the molecules produced a lower pressure or were clear how the higher pressure outside produces the crushing effect. Some candidates gave long accounts of the melting of the ice, which was not required, or suggested that there were was a higher pressure inside the bottle.

Question 6

(a) The answers to this question were often disappointing. The spatial arrangement of the compass may have confused some candidates who did not realise that the circular field around the wire will make the compass point to the West or the left. Candidates who suggested that it points to the East only lost one mark in the whole of the question for reversing this direction. Many candidates suggested that the compass points to the North, or only deflects momentarily or even spins round.

(b) There were two acceptable approaches to this question. The first suggested that there would be little or no movement because the compass was unable to respond so quickly. The more popular second approach was that the needle would vibrate from West to East because of the changing magnetic field of the current in the wire. It was unfortunate that some candidates gave different directions of vibration in **(b)** than they gave in **(a)**. Others suggested that the compass would become demagnetised by the a.c. current, which is unlikely to be true with sensible values of the current and with the fixed size and position of the current.

Question 7

(a) A downwards direction of the force due to the left-hand rule was correct but it appears that candidates did not recognise that this question referred to the force on a current-carrying wire.

(b) It was intended that candidates realise that the current is in the same direction in the coil and so the force is in the same direction as in **(a)**. This means that the coil cannot continue to rotate as it will eventually become vertical. It was often difficult to understand candidates' answers where clockwise or anti-clockwise rotations were described, as it is not clear in the diagram which direction, for example will be clockwise. Some candidates realised that rotation could not continue because there was no split-ring commutator in place to reverse the current.

(c) A small proportion of the answers showed knowledge of the action of the usual connections to a d.c. motor and were able to apply this knowledge to the unusual situation of the question. The most successful approach was to suggest that the insulated portion on the wire prevents a current but the coil continues to rotate until a current and force can act again. A few candidates gave succinct accounts that showed that they could think through an unusual situation using general principles. Weaker candidates suggested, incorrectly, that current only flows in the top part of each wire or were confused with electromagnetic induction.

Question 8

(a) It was intended that candidates would suggest that a larger potential difference is produced by increasing the number of turns in the secondary or reducing the number of turns in the primary coil. Increasing the thickness of the core, placing the primary and secondary coils closer or even laminating the core were also accepted. A proportion of candidates suggested changes that would decrease the output potential difference. A significant number of candidates merely stated that more turns were needed without explaining which coil they were referring to.

(b) The formula $P = VI$ was known by the best candidates, although a significant minority of answers quoted transformer equations directly in **(i)**.

Answers: **(c)(i)** 1.5A, **(ii)** 0.15A.

Section B

Question 9

(a)(i) This section differentiated well between candidates. The difference between boiling and evaporation was usually given in terms of the fixed temperature for boiling but variable temperature for evaporation, although some strong candidates realised that evaporation occurs at the surface and boiling within the bulk of the liquid.

(ii) Few candidates gained full marks in this section, even though there were five possible ways to earn the three marks available. Good answers mentioned the breaking of bonds between molecules, that the fastest molecules will escape or that the molecules become further apart in the gaseous state.

(b)(i) Most candidates realised that a convection current was responsible for cooling the whole of the compartment. The better answers explained that the cold air, being denser, sinks. Some candidates gave an account of latent heat and the role of the ice in the cooling. This was not necessary as the question made clear that thermal energy passes into the ice box.

(ii) The major role of the black colour is to increase the loss of heat by radiation from the fins. Most candidates recognised the greater rate of flow of heat to the outside but a large number of candidates suggested that this was only due to increased absorption of radiation from the fluid inside the pipes. Candidates who stated both roles were generally successful in scoring full marks. They were unsuccessful if they merely repeated statements such as 'black absorbs heat best', without applying any knowledge to the actual situation. A number of candidates simply referred to the emission of heat. A full answer should have referred to the emission of radiation or infra-red.

(c) The formulae for latent heat and power were generally known. Statements such as 'there is no change in the temperature of the plastic tray' were all that were needed to answer **(ii)**. A common error was a failure to take into account the sixteen sections in the ice tray, leading to an answer of 6600J. Candidates only lost one mark for this error.

Answers: **(c)(i)** 105 600J, **(iii)** 3520s.

Question 10

(a)(i) Many good candidates failed to answer the question. Instead of explaining why the repe necessary, they explained what the repeater did, and often merely repeated phrases fro comprehension passage given in the question, or gave vague statements about efficiency. It w only necessary to explain that the light signal has been reduced in strength as it passes along the fibre, although strong candidates often suggested that the light level would be too low to receive effectively.

(ii) The answers were disappointing and it appears that few candidates even realised that it is possible to have many more telephone conversations on a cable made from optical fibre rather than copper. Other possibilities, such as less interference, less noise, less reduction in amplitude with distance, the need for fewer repeaters or even that more signals could be sent per second, were rarely seen.

(b)(i) The marks for this section were structured so that candidates who showed any ability to describe an experiment involving refraction could earn some marks. Sadly, few candidates were able to give sources of light or a sensible piece of glass that would be able to demonstrate refraction, let alone total internal reflection. The most straightforward apparatus involves a semicircular or even rectangular glass block which is slowly rotated in the ray from a ray box until the refracted ray emerging from the glass block disappears.

(ii) Successful candidates usually gave a series of text-book diagrams and explanations showing a ray of light incident at different angles on the glass-cladding interface, although statements such as ‘the speed of light is smaller in the glass than in the cladding, the glass is more optically dense and as a ray of light passes from the denser to the less dense medium at an angle greater than the critical angle total internal reflection will occur’ were, on occasion, seen.

(c) There were pit-falls for the unwary in this numerical question and often candidates appeared to give up in the later sections. Marks are awarded even if there are errors in earlier sections and candidates should be encouraged to continue. The formulae for potential difference and power were often quoted but using the correct data proved difficult for many candidates. The largest source of error was to introduce a %, either 10% or 90%, into the answers. In **(iii)**, new calculations were common instead of the simple addition of the answers in **(i)** and **(ii)**. In **(iv)**, very large answers were common where candidates gave the answer for all 7500km of the cable instead of for one km. Where candidates had made clear the formula or method that they used they rarely lost more than one mark for such errors.

Answers: **(c)(i)** 4000V, **(ii)** 8200V, **(iii)** 0.448W.

Question 11

(a) This question first asked for an account of an experiment to measure the half-life of a radioactive source. Help was given in the question as to a possible format for the answer and many successful candidates used this suggested format for the answer. Not all points had to be correctly dealt with to earn full credit. Background radiation could be taken into account by taking measurements without the source and then subtracting the reading from subsequent readings. It was intended that the computer be used to take a record of the counts for any period between 10s and 15 minutes as the basic measurement, the ‘count’ being repeated in any reasonable time period between 1 minute and 30 minutes. Many candidates merely recorded the ‘count’ every hour but this will not lead to an accurate record of the activity of the source as a function of time. Some candidates suggested a suitable time for the whole experiment, any time period between 2 and 10 hours. In describing how the half-life is determined from the readings it was pleasing to find candidates that understood the concept of half-life.

The most successful candidates suggested a suitable graph which was used to find the time for the activity to halve, and some even went on to determine several values for the half-life and calculate an average. Weaker candidates merely used the computer to find the time for the count to halve. The poorest answers rejected the use of the detector completely and suggested that the mass of the source be measured at different time intervals. There will be little, if any, loss in mass and candidates should be aware that the definition of half-life in terms of a mass loss is not acceptable.

(b)(i) The answers to this section were straightforward with the use of tongs or a lead abs the source at a distance from the experimenter or to absorb any radiation emitted. candidate who merely refers to 'protective clothing' must give more detail as to how the protects the experimenter.

(ii) Only a few candidates scored one or two marks from the three available for this section. It was sometimes recognised that alpha particles cause more ionisation than gamma particles - but it was rare to find a statement that the particles cause cell death, cancer or any specific harm to the body. In suggesting why alpha particles are more dangerous when emitted inside the body, explanations that gamma particles are able to leave the body were usually successful, whereas it was rarely stated that the alpha particles were absorbed within the body and often there was a wrong statement or implication that alpha particles cannot escape and thus keep moving around the body to cause damage. The better candidates recognised that the particles were absorbed within the body and thus were unable to leave.

(c)(i) Very few candidates earned all four marks for this section. The question merely requires the candidate to convert the counts from 380 per hour to 6.3 per second and then read the answer from the graph.

(ii) The readings given in the question are small compared to usual values for the background radiation. This point was missed by many candidates but credit was given for any understanding that the background has increased the readings obtained and they were not all from the sample of wood.

Answer: **(c)(i)** 2000 years.

Paper 5054/03

Practical

<u>General comments</u>

The performance on ***Section A*** was not quite as good as in November 2002 mainly because candidates did not take the precautions that the Examiners expected them to take. The points listed below are the marking points that the Examiners expected the better candidates to score. In practice these points were scored by too few candidates.

Question 1 (c) measurement of two heights to determine the height through which the car had descended.

Question 2 (b) x measured from the centre of the 100 g mass.

(d) w and t found from repeat measurements and l recorded to the nearest mm.

Question 3 (c) W found by converting M_T to kg and then multiplying by the gravitational field strength.

(d)(e) correct calculations of μ.

In contrast, performance on **Question 4** was considerably better than in November 2002. It was particularly pleasing to see high marks scored for such techniques as drawing a correct diagram of the circuit, producing a correctly labelled table of results and producing a reasonable graph of the data that had been obtained.

The result was that the overall performance of candidates was very similar to previous years.

Comments on specific questions

Section A

Question 1

(a) The majority of candidates obtained a correct value for *t.* A small number of candidates lost this mark for one of the following three reasons;

- Repeat values of *t* were not recorded,
- The stopwatch was misread i.e. 2.56 seconds was read as 0.0256 seconds,
- Times were recorded to the nearest second.

(b) Virtually all candidates obtained a correct value for *v.*

(c) Examiners did not see the detail they expected when the diagram of the measurement of the vertical height through which the car descends was drawn. Since there were two marks on the runway, Examiners expected two heights to be measured and their values subtracted. A very small number of candidates gained this mark.

(d) The mass was generally correctly recorded but no marks were awarded for this at this stage.

(e) The two main mistakes in the calculation of the energies were;

- The value of *h* was not converted to metres when the potential energy was calculated,
- The value of *v* was not squared when the kinetic energy was calculated.

(f) Most candidates obtained a potential energy value that was greater than the kinetic energy value. Only the best candidates went on to say that this was because energy was lost doing work against friction as the car descended the ramp.

Question 2

(a) The majority of candidates recorded the position of the centre of mass to the nearest mm and obtained a sensible value. Candidates who lost this mark will generally have quoted a value to the nearest cm e.g. 50cm.

(b) The most common error in this part was the determination of the distance x. This was the distance from the centre of mass of the 100 g mass to the knife edge. Most candidates did not obtain this mark because their values of $x + y$ added up to the value of the position of the centre of mass of the rule. This indicated that *x* had been measured to the end of the rule rather than the centre of the 100 g mass. This was a mark that Examiners expected the best candidates to achieve but in reality few achieved.

(c) Because the error in the value of *x* was carried forward, the majority of candidates obtained the mark for the correct value of the mass of the rule.

(d) Despite the fact that the question referred to the average width and thickness, very few candidates measured the width and thickness at several different places. The length of the metre rule was often not quoted to the nearest mm. The result of these two points was that this mark was often not awarded.

(e)(i) The volume of the metre rule was usually calculated correctly. The candidates who obtained an incorrect value were often those who attempted to convert to m^3. Candidates should be advised that Examiners are happy for them to work in cm^3 in the examination unless instructed otherwise.

(ii) In the majority of cases density values were correct and lay in the correct range. Only those candidates who had large errors in *x*, *w*, *t* or l did not obtain a correct value for the density.

Question 3

(a) Most candidates obtained a correct value of *F* from repeated readings.

(b) Most candidates recorded correct values for M_B and M_T although no mark was awarded for this this stage.

(c) A large number of candidates did not convert the mass to kg and so obtained an incorrect value for *W*.

(d)(e) There was a total of 3 marks for these two parts. The first mark was awarded for the use of two further mass values giving sensible results for *F* and correct calculations of *W* in each case. Most candidates obtained this mark since previous errors in the value of *W* were carried forward. The next mark was awarded for correct μ, this included correct calculations, no units and answers in the range 0.15 to 0.54. This mark was only awarded to the best candidates. The final mark was for any sensible comments on the results and this included comment on either μ or the frictional force. Thus any of the following comments would have gained the mark.

- The frictional force increase as the mass increases,
- The value of μ is approximately constant – provided that this was evident from the results obtained,
- The value of μ increases as the mass increases – provided this was evident from the results obtained.

Good candidates could therefore obtain this last mark.

Section B

Question 4

(a) It was pleasing to see that in the majority of cases the symbols used in the circuit diagram were correct. There were two difficulties with the diagrams. It was not always clear that the length of the resistance wire used in the circuit could be varied i.e. the crocodile clips were not drawn and connections were only made to the ends of the wire. In some circuits the length of wire was being used as a potential divider rather than a variable resistor i.e. the circuit was connected to the ends of the wire but the voltmeter was connected between one end and a point on the wire.

(b) Current and voltage values were generally correct. A very small number of candidates obtained a current value which was 10x the correct value i.e. 3.2 A rather than 0.32 A.

(c) All candidates calculated the power correctly.

(d) It was pleasing to see that the majority of tables had units in the headings. The expected results were that as the length of the wire was increased the power dissipated rose sharply to a maximum at a length of about 50cm and then fell gradually until the maximum length of wire had been reached. Because of the gradual fall, those candidates who did not use a length above 80cm may not have detected the maximum point in the curve. Examiners therefore gave a mark to those candidates who used a length of 90cm or greater. Only the better candidates scored this mark. The majority of candidates achieved marks for a length of 20cm or less and the production of data that gave a maximum power value.

(e) The majority of candidates labelled the axes of their graph correctly. Examiners expected the data obtained in the experiment to be spread over as much of the grid as possible. This generally meant that the power axis should not start at the origin and quite a number of candidates lost the mark for correct graph scale. Candidates were allowed to start the graph at the origin if the candidate had produced the line so that it passes through this point i.e. the candidate had realised that zero power was dissipated when the length of the wire was zero. On the graph some candidates drew a line that rose to a steady value, if this line was a reasonable fit to the data then the line mark was awarded.

(f) A second line mark was awarded at this stage provided the candidate had drawn a which showed a maximum point. Examiners were relatively generous about the fit of th that most candidates obtained the 2 marks for a curve with maximum point and correct va Those candidates who had not obtained a maximum point did not score here.

(g) Since Examiners allowed candidates to carry forward their l_M value to this section virtually a candidates obtained the mark in this part.

Paper 5054/04

Alternative to Practical

General comments

This paper is designed to test the candidates' attainment in Practical Physics. The best preparation is a well-designed course of Physics experiments. The course should include; performing experiments, making observations, recording experimental results and the analysis of the results, especially by using a graph.

Generally the answers were well presented, easy to follow and written in very good English. However, the Physics content of some of the answers was very disappointing. Some points are considered in the comments on specific questions.

Comments on specific questions

Question 1

(a) When ray-boxes are not available it is useful to use pins to locate rays. If the four pins are standing so that they are perpendicular and aligned, then they are on the same ray of light.

Marks were awarded to:

- An appropriate comment about "perpendicular pins" helping to ensure that the pins are aligned on a ray,
- Noting that a correctly located ray helps to ensure that the measurements of *i* and *t* can be accurately determined.

(b) The table required a minimum of two columns one labelled $i\,/^{\circ}$ the other labelled t/mm. Many of the candidates omitted units, some columns were wrongly labelled *i*, *r*, and μ. Some of the candidates thought that *t* stood for time. The Examiners were not expecting so many misunderstandings about the table.

(c)(i) The estimations were well made; most candidates gave a value for *t* between 2 and 3 mm. Other units for length were accepted provide the numerical value for *t* was consistent with the unit.

A large number of alternative responses were accepted, these included *t* or *i* too small to measure accurately, or the pencil work for the trace was too thick or the angle was measured using a small protractor etc. Answers involving the use of the word error were expected to include what was being measured, e.g. the angle *i*.

Question 2

(a)(i) A method based on $T = t/N$, where *N* was large, was accepted. A large number of the candidates proposed a determination of only one oscillation.

(ii) The position of the eye was accepted if it were located to the left or right of *l*, or under A or B, or above the letter *s*.

Reasons that implied that "the pendulum crosses line of sight with greatest speed" were accepted.

(b) There was considerable confusion between A to B along the rule and A to B along ... simple technique would be to mark the thread at A and B on the thread, and to atta... points on the rule for different value of *s*.

(c) One of three basic methods was accepted viz., (i) measuring the height of each end of the ... above the bench (making $L_1 = L_2$), or (ii) using a protractor and accepting that a clamp holding the rule was vertical or (iii) using two protractors, one of which provided a vertical from the laboratory bench top.

Question 3

(a)(i) Not many of the candidates made it clear that, when measuring a p.d, the positive side of the p.d. is connected to this terminal.

(ii) There was much confusion as to where to draw the two lines. A line from *x* and one from y often converged to the same point. Some of these points were on the side of the rectangle drawn around the meter and sometimes to a point on the scale on the face of the voltmeter. This kind of mistake was very common.

(iii) Most of the candidates realised that the current through the resistor flows from the +ve potential to the –ve, hence the point labelled *x*, was at a positive potential.

(b)(i)(ii) The accepted answers were 0.1 V and 1V, the unit was required with one value. Many candidates seemed confused and gave answers unrelated to the function of a voltmeter, for example, 2 amps.

(c) A line crossing the middle of the third division to the right of the number 2 was accepted. Most of the candidates drew an appropriate line, but there were some lines drawn in inappropriate positions, for example, exactly on the number 1and some on 1.5 position.

Question 4

(a)(i) Four marks, +/- 1000 cm^3, on the *V*-axis of the graph, were required. A frequent omission was a mark for the volume of water at t = 0 s.

(ii) Although well answered by many candidates, there were more candidates who ignored the words “change of volume”. Candidates were given some credit if they recorded the four numerical values corresponding to the four graph marks they gave in (i) above.

(b)(i) Most of the candidates gave their values for *V* within the tolerance of +/- 1000 cm^3. At t = 0 a common mistake was to give V = 140 000 cm^3 or even = 0. An e.c.f. was allowed for this mistake.

(ii) Candidates did not appear to have difficulty in obtaining the correct answer of 420 s.

Question 5

(a) Although well answered by most candidates there was a large number who were vague or careless about their answers. For example, “to get a good result” or “to get a good value for the temperature” are answers which lack clarity.

(b) A graph is an essential tool in Physics practical work. Poor graphical work is a characteristic feature of the answers to this question. Wrong axes, lack of labels, unsuitable scales, inaccurate plotting and inappropriate lines were common errors noted on the scripts.

(c)(i) The decimal place worried many candidates, 10.89°C was a common error. 29°C was also a frequent misreading of the scale.

(ii) Many candidates only gave one answer to this part question. The answer was usually confined to reading the thermometer. Errors in performing the experiment were valid responses.