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**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

International General Certificate of Secondary Education

# MARK SCHEME for the June 2004 question papers

## 0625 PHYSICS

| | |
|---|---|
| **0625/01** | **Paper 1 (Multiple Choice), maximum mark 40** |
| **0625/02** | **Paper 2 (Core), maximum mark 80** |
| **0625/03** | **Paper 3 (Extended), maximum mark 80** |
| **0625/05** | **Paper 5 (Practical), maximum mark 40** |
| **0625/06** | **Paper 6 (Alternative to Practical), maximum mark 40** |

These mark schemes are published as an aid to teachers and students, to indicate the requirements of the examination. They show the basis on which Examiners were initially instructed to award marks. They do not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the June 2004 question papers for most IGCSE and GCE Advanced Level syllabuses.

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**Grade thresholds** taken for Syllabus 0625 (Physics) in the June 2004 examination.

| | maximum mark available | minimum mark required for grade: | | | |
|---|---|---|---|---|---|
| | | A | C | E | F |
| Component 1 | 40 | 36 | 28 | 22 | 18 |
| Component 2 | 80 | - | 56 | 44 | 35 |
| Component 3 | 80 | 50 | 28 | 19 | 14 |
| Component 5 | 40 | 32 | 26 | 21 | 18 |
| Component 6 | 40 | 32 | 25 | 21 | 18 |

The threshold (minimum mark) for B is set halfway between those for Grades A and C.
The threshold (minimum mark) for D is set halfway between those for Grades C and E.
The threshold (minimum mark) for G is set as many marks below the F threshold as the E threshold is above it.
Grade A* does not exist at the level of an individual component.

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MARK SCHEME

**MAXIMUM MARK: 40**

SYLLABUS/COMPONENT: 0625/01

**PHYSICS**
Paper 1 (Multiple Choice)

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

**TOTAL 40**

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# MARK SCHEME

## MAXIMUM MARK: 80

SYLLABUS/COMPONENT: 0625/02

PHYSICS

Paper 2 (Core)

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## NOTES ABOUT MARK SCHEME SYMBOLS

B marks — are independent marks, which do not depend on any other marks. For a B mark to be scored, the point to which it refers must actually be seen in the candidate's answer.

M marks — are method marks upon which accuracy marks (A marks) later depend. For an M mark to be scored, the point to which it refers **must** be seen in the candidate's answer. If a candidate fails to score a particular M mark, then none of the dependent A marks can be scored.

C marks — are compensatory method marks which can be scored even if the points to which they refer are not written down by the candidate, provided subsequent working gives evidence that they have known it, e.g. if an equation carries a C mark and the candidate does not write down the actual equation but does correct working which shows he knew the equation, then the C mark is scored.

A marks — are accuracy or answer marks which either depend on an M mark, or allow a C mark to be scored.

c.a.o. — means "correct answer only".

e.c.f. — means 'error carried forward'. This indicates that if a candidate has made an earlier mistake and has carried his incorrect value forward to subsequent stages of working, he may be given marks indicated by e.c.f. provided his subsequent working is correct, bearing in mind his earlier mistake. This prevents a candidate being penalised more than once for a particular mistake, but **only** applies to marks annotated "e.c.f".

e.e.o.o. — means "each error or omission".

Brackets ( ) — around words or units in the mark scheme are intended to indicate wording used to clarify the mark scheme, but the marks do not depend on seeing the words or units in brackets, e.g. 10 (J) means that the mark is scored for 10, regardless of the unit given.

<u>Underlining</u> — indicates that this **must** be seen in the answer offered, or something very similar.

Un.pen. — means "unit penalty". An otherwise correct answer will have one mark deducted if the unit is wrong or missing. This **only** applies where specifically stated in the mark scheme. Elsewhere, incorrect or missing units are condoned.

OR/or — indicates alternative answers, any one of which is satisfactory for scoring the marks.

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| QUESTION | | SCHEME | TARGET GRADE | MARK |
|---|---|---|---|---|
| 1 | (a) | 10 | F | B1 |
| | (b) | division by 5 OR division by 6 | F | C1 |
| | | 2.0 OR 2 c.a.o | C | A1 |
| | (c) | 10 × his(b) OR 11 × his(b) | F | C1 |
| | | 20 c.a.o | C | A1<br>5 |
| 2 | (a) | straight vertical arrow upwards to/from rail | F | B1 |
| | | arrow to R of centre of rail | F | C1 |
| | | arrow at R.H. end of rail (within 2× width of resting block) | F | A1 |
| | (b) | moment ticked | F | B1 |
| | (c) | reduce weight/mass OR shorten rail, lighter rail, thinner rail, open sideways, suitable long handle, suitable 2 pulley system | F | B1<br>5 |
| 3 | (a) | PQ or 0-50s or the horizontal part<br>NOT just P or just Q | F | B1 |
| | (b) | changing speed (however indicated) NO e.c.f from (a). ACCEPT "acceleration"<br>but NOT "increasing speed" | F | B1 |
| | (c) | distance = area indicated in words or figures anywhere in (c) | F | B1 |
| | | **(i)** 20 × 50 | F | C1 |
| | | 1000 | F | A1 |
| | | **(ii)** ½ × 20 × 50 OR ½ × his(i) | C | C1 |
| | | 500 | C | A1 |
| | | **(iii)** his(i) + (ii) correctly evaluated | F | B1 |
| | | **(iv)** his(iii)/100 OR total distance/total time stated | F | C1 |
| | | correct evaluation | F | A1<br>10 |

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| | | | | | |
|---|---|---|---|---|---|
| **4** | **(a)** | (horizontal) force<br>allow F | | F | B1 |
| | | distance (travelled from A to B)<br>condone "perpendicular"<br>allow D OR d OR S | | F | B1 |
| | **(b)** | goes faster OR less time | | F | B1 |
| | | accelerates | | C | B1 |
| | **(c)** | **(i)** | 2nd person (however expressed) | F | B1 |
| | | **(ii)** | more work/energy OR bigger force OR pulls harder | F | B1 |
| | | | smaller time OR greater speed<br>("more work/second" gets B1, B1) | C | B1<br>7 |
| **5** | **(a)** | drops OR decreases OR cools down | | F | B1 |
| | **(b)** | idea of loss of molecules (from surface) OR molecules evaporate | | F | M1 |
| | | more energetic/faster molecules<br>(SPECIAL CASE remaining molecules slower B1) | | C | A1 |
| | **(c)** | any sensible example where cooling is noticeable<br>e.g. (feeling cold) after swimming, sweating, refrigerators | | C | B1<br>4 |
| **6** | **(a)** | (increased) internal energy OR (increased) KE of molecules OR (increased) thermal/heat (energy) | | C | B1 |
| | **(b)** | any mention of thermal capacity | | C | C1 |
| | | smaller thermal capacity | | C | A1<br>3 |
| **7** | **(a)** | light wave fastest<br>)<br>water wave slowest | | 2F | B1+B1 |
| | **(b)** | longitudinal | | F | B1 |
| | | transverse | | C | B1 |
| | | transverse | | F | B1 |
| | **(c)** | light wave ticked | use ✓+× = 0 if extras | F | B1<br>6 |

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| | | | | | |
|---|---|---|---|---|---|
| **8** | | A | magnet OR magnetised | F | B1 |
| | | B | magnet OR magnetised | F | B1 |
| | | C | iron OR unmagnetised | C | B1 |
| | | D | aluminium | C | B1 |
| | | | | | 4 |
| **9** | **(a)** | | points plotted correctly (± ½ small square) | 3F | B3 (-1 eeoo) |
| | **(b)** | | smooth curve through points by eye, not too thick | F | B1 |
| | **(c)** | | correct construction lines shown (allow dot on curve at correct place) | C | B1 |
| | | | correct value from his graph, based on 800-400 (± ½ square) | F | B1 |
| | **(d)** | **(i)** | smaller | F | B1 |
| | | **(ii)** | the same OR no change | C | B1 |
| | | | | | 8 |
| **10** | **(a)** | **(i)** | less turns on secondary<br>ACCEPT "because Np=4800 and Ns=200"<br>ACCEPT "sycoil < pycoil"<br>NOT "secondary < primary" | F | B1 |
| | | **(ii)** | $V_2/V_1 = N_2/N_1$ in any form | F | C1 |
| | | | correct substitution | F | C1 |
| | | | 10 | F | A1 |
| | | **(iii)** | 1. decreases | F | B1 |
| | | | 2. runs slower OR will not work e.c.f. from **(iii)1**. | F | B1 |
| | **(b)** | | ignore stage 1<br>from stage 2 onwards…… | | |
| | | | B )<br>E ) (3 marks for any 3)<br>A ) (2 marks for any 2)<br>D ) (1 mark for any 1) | 3C | B3<br>9 |

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| | | | | | |
|---|---|---|---|---|---|
| **11** | **(a)** | **(i)** | thermistor | F | B1 |
| | | **(ii)** | variable resistor (accept rheostat) | F | B1 |
| | | **(iii)** | light-dependent resistor<br>(ACCEPT LDR) | F | B1 |
| | **(b)** | **(i)** | 1. resistance = p.d./current OR R=V/I<br>OR any correct reorganization<br>ACCEPT mixture of words and letters | F | B1 |
| | | | 2. 12/0.5 OR correct sub in his 1, if shown | F | C1 |
| | | | 24 c.a.o | F | A1 |
| | | | Ω OR ohm | C | B1 |
| | | **(ii)** | 1. decreases | F | B1 |
| | | | 2. idea of greater resistance | F | B1 |
| | | | 3. dimmer OR does not glow/work/shine<br>NOTE: NO e.c.f. in **(ii)** | C | B1<br>10 |
| **12** | **(a)** | **(i)** | beard tip to dot perpendicular to mirror (by eye) | F | B1 |
| | | | distance beard tip to mirror = dist. mirror to dot (by eye) | F | B1 |
| | | **(ii)** | reflected ray along line from eye to his dot (by eye) | C | M1 |
| | | | incident ray from beard tip to join reflected ray at mirror | C | A1 |
| | | | arrows from beard to eye | C | B1 |
| | | **(iii)** | virtual | C | B1 |
| | | **(iv)** | angle of incidence = angle of reflection OR i = r OR “they are equal” OR “sini = sinr” | F | B1 |
| | **(b)** | **(i)** | right hand | F | B1 |
| | | **(ii)** | mark shown under L.H. eye on Fig. 11.2 | F | B1<br>9 |

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MARK SCHEME

**MAXIMUM MARK: 80**

SYLLABUS/COMPONENT: 0625/03

**PHYSICS**
Paper 3 (Extended)

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| | | | | | |
|---|---|---|---|---|---|
| **1** | **(a)** | **(i)** | Acceleration / increase in speed | **M1** | |
| | | | Uniform / constant or in a straight line | **A1** | |
| | | **(ii)** | Uniform speed | **B1** | |
| | | | Velocity changes / motion in a circle / accelerates | **B1** | **4** |
| | **(b)** | | Similarity: same value / 6m/s or velocity changing | **B1** | |
| | | | Difference: opposite directions / up at E, down at C | **B1** | **2** |
| | **(c)** | **(i)** | Average speed x time / area under graph / 3 x 20 | **C1** | |
| | | | 60 m | **A1** | |
| | | **(ii)** | 6 x 52 | **C1** | |
| | | | 312m | **A1** | **4** |
| | | | | | **[10]** |
| **2** | **(a)** | | 750 N | **A1** | **1** |
| | **(b)** | | p.e. lost / converted = mgh or weight x height | **C1** | |
| | | | 750 x 15 or 75 x10 x15 = 11250 (J) | **C1** | |
| | | | p.e. lost = k.e. gained = 11250 (J) | **A1** | **3** |
| | **(c)** | | Any 3 of: heat in water / rock<br>(kinetic) energy of (moved) water / to make water move/ make waves<br>some k.e. still in (sinking) rock<br>sound energy on impact / of splash | **B3** | **3** |
| | | | (just heat and sound **C1**) | | **[7]** |
| **3** | **(a)** | **(i)** | Extension proportional to load however expressed | **B1** | |
| | | **(ii)** | Any relevant arithmetic to show direct proportion (or straight line graph <u>with values</u>) | **B1** | **2** |
| | **(b)** | **(i)** | Work done = force x distance / 400 x 0.210 | **C1** | |
| | | | 84.0 J | **A1** | |
| | | **(ii)** | (total) work/time or (24 x) 84/60 (apply e.c.f from **(i)** ) | **C1** | |
| | | | 33.6 W | **A1** | **4** |
| | | | | | **[6]** |
| **4** | **(a)** | | Water molecules at higher temps. have higher (av) k.e. / energy | **B1** | |
| | | | Higher energy molecules (have greater chance to) escape the surface | **B1** | |
| | | | Higher energy molecules have energy to break liquid “bonds” or separate liquid molecules or more evaporation at 85°C (lowers level) | **B1** | **3** |
| | **(b)** | | Heat for evaporation = 34 500 – 600 = (33 900) | **C1** | |
| | | | Sp. latent heat of evaporation = heat/mass evap. or 33 900 / 15 | **C1** | |
| | | | 2260 J/g (method and working correct, but no heat loss used, 2/3) | **A1** | |
| | | | (600 added or 34 500 used can score **2 max**) | | **3** |

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| | | | | | |
|---|---|---|---|---|---|
| **5** | **(a)** | **(i)** | Thermopile / thermocouple / (blackened) thermometer / infra red detector or use ammeter / voltmeter in supply circuit | **B1** | |
| | | **(ii)** | One of: same distance of plate to detector or use two identical detectors or same time (after switching on) | **B1** | |
| | | **(iii)** | Dull black better radiator / radiates more than silver / or emits more heat / radiation | **B1** | |
| | | **(iv)** | Infra red (i.r.) | **A1** | **4** |
| | **(b)** | | any correct example e.g. heating water or chimney | **M1** | |
| | | | current clear and complete | **A1** | |
| | | | direction shown correctly by arrows | **A1** | **3** |
| | | | | | **[7]** |
| **6** | **(a)** | **(i)** | Refraction at Q approx. correct, ray emerge from AB parallel PQ | **B1** | |
| | | **(ii)** | Angle of incidence correctly marked | **B1** | |
| | | | Angle of refraction correctly marked | **B1** | |
| | | | (can score even if incorrect / no refraction shown) | | **3** |
| | **(b)** | **(i)** | Refractive index = speed in air / speed in glass | **B1** | |
| | | **(ii)** | Refractive index = $(3 \times 10^8 / 2 \times 10^8) = 1.5$ | **B1** | **2** |
| | **(c)** | **(i)** | Wavelength = v/f or $3 \times 10^8 / 6 \times 10^{14}$ | **C1** | |
| | | | Wavelength = $5 \times 10^{-7}$ m | **A1** | **2** |
| | | | | | **[7]** |
| **7** | **(a)** | | C,R,C,R,C,R marked (or v.v.) along XY | **B1** | **1** |
| | **(b)** | **(i)** | Above normal / high air pressure or particles close together | **B1** | |
| | | **(ii)** | Below normal / low pressure or particles further apart | **B1** | **2** |
| | **(c)** | | Oscillation / vibration of particles / molecules (or particles / molecules move to and fro) | **B1** | |
| | | | Oscillation is along XY | **B1** | **2** |
| | **(d)** | | Time = distance / speed or (2x) 50/340 | **C1** | |
| | | | Time = 0.29 s | **A1** | **2** |

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| | | | | | |
|---|---|---|---|---|---|
| **8** | **(a)** | | 1.52 kW | **A1** | **1** |
| | **(b)** | **(i)** | Each appliance is connected across 240 V supply or equivalent | **B1** | |
| | | **(ii)** | Any 2: all work on same voltage or on 240 V or mains<br>OR all have full/stated power OR each can be on or off<br>OR one goes off/breaks others stay on | **B2** | **3** |
| | **(c)** | **(i)** | Current = power/voltage or 200/240 | **C1** | |
| | | | Current = 0.83 A | **A1** | |
| | | **(ii)** | Energy = power x time or 1.2 x 3 | **C1** | |
| | | | Energy = 3.6 kWh or 1.3 x $10^7$ J | **A1** | |
| | | **(iii)** | Current = 60/240 | **C1** | |
| | | | R= V/I or 240/0.25 | **C1** | |
| | | | R =960Ω | **A1** | **7** |
| | | | | | **[11]** |
| **9** | **(a)** | | Solenoid ends connected to meter, both labelled | **B1** | |
| | | | One magnet in correct position to enter / leave solenoid, labelled | **B1** | **2** |
| | **(b)** | | Push magnet into coil / pull out / move near end of coil | **B1** | **1** |
| | **(c)** | | (magnet has / produces) magnetic lines of force / magnetic field | **B1** | |
| | | | lines cut (coils of) solenoid / coils / wires | **B1** | **2** |
| | **(d)** | **(i)** | Pull magnet out of coil / reverse effect to answer **(b)** | **B1** | |
| | | **(ii)** | Move magnet faster or effect in **(a)** faster | **B1** | **2** |
| | | | | | **[7]** |
| **10** | **(a)** | | Analogue, continuously increasing / decreasing readings | **B1** | |
| | | | Digital, readings increase / decrease by one unit | **B1** | **2** |
| | **(b)** | **(i)** | Transistors + other components such as resistors | **B1** | |
| | | **(ii)** | Standard symbol, must have labeled inputs and output | **B1** | |
| | | **(iii)** | Both inputs 0 (off), or either one input 0 (off), output 0 (off) | **B1** | |
| | | | Both inputs 1 (on), output 1 (on)<br>OR correct truth table drawn (**C1**)<br>Some explanation of what truth table shows (**A1**) | **B1** | **4** |
| | | | | | **[6]** |
| **11** | **(a)** | | Particle 1 carries straight on | **B1** | |
| | | | Particle 2 (slightly) deflected (less than 90°) | **B1** | |
| | | | Particle 3 “turns back” / (deflected more than 90°) | **B1** | **3** |
| | **(b)** | | Nucleus is heavy /dense / all or most of mass in atom in nucleus | **B1** | |
| | | | Most of atom is space or nucleus is (very) small cf. atom | **B1** | **2** |
| | **(c)** | | (mass) 4 | **B1** | **1** |
| | | | | | **[6]** |

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MARK SCHEME

**MAXIMUM MARK: 40**

SYLLABUS/COMPONENT: 0625/05

**PHYSICS**
Practical

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**1.**

| | |
|---|---|
| units, °C, mm | 1 |
| 6 sets | 1 |
| evidence of θ to 1°C, temps not decreasing | 1 |
| Graph: | |
| temp axis, labeled with symbol and unit, suitable scale | 1 |
| plots to ½ small sq (-1 each error or omission) | 2 |
| line judgement (best fit curve) | 1 |
| line thickness (penalise large plots here also) | 1 |
| room temp estimate lowest value or lower as justified by graph line | 1 |
| explanation from graph | 1 |

**TOTAL 10**

**2.**

| | |
|---|---|
| units V, A and Ω | 1 |
| 3 sets of readings | 1 |
| all V to at least 1 dp | 1 |
| first R value correct | 1 |
| all R to 2/3 sf | 1 |
| R values decreasing | 1 |
| Third R approx 0.5 x second R (allow from 0.25 x to 0.75 x) | 1 |
| Diagram: | |
| lamps correct | 1 |
| voltmeter correct | 1 |
| ammeter correct | 1 |

**TOTAL 10**

**3.**

| | |
|---|---|
| units for d, t and T, cm (or mm or m), s, s | 1 |
| 3 sets complete | 1 |
| 6 sets complete | 1 |
| T values correct | 1 |
| consistent dp for t (OR all T to 2 sf OR all T to 3 sf) | 1 |
| T values (decreasing as d decreases) | 1 |
| Diagram: | |
| Clear diagram showing method (using slot in mass or using diamter) (award 1 mark for adequate diagram, i.e. correct idea but not clear enough for a student to follow without any additional verbal instruction) | 2 |
| Statement NO | 1 |
| Reason, T/d not constant | 1 |

**TOTAL 10**

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**4.** First column only:

| | |
|---|---|
| x and y present and sensible (25 to 50 cm) whether or not unit is shown | 1 |
| y/x correct | 1 |
| h present and sensible | 1 |
| m correct | 1 |
| y/x and m both between 1 and 2 | 1 |
| h and y both units present and consistent values | 1 |

Whole of table:

| | |
|---|---|
| new y values decreasing | 1 |
| y/x and m values decreasing | 1 |
| y/x and m values all with no unit | 1 |

| | |
|---|---|
| y/x = m | 1 |

**TOTAL 10**

**PAPER TOTAL = [40]**

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INTERNATIONAL GCSE

MARK SCHEME

**MAXIMUM MARK: 40**

SYLLABUS/COMPONENT: 0625/06

**PHYSICS**
Alternative to Practical

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| | | | |
|---|---|---|---|
| **1** | **(a)** | 0.63 – 0.65 (A) (strictly) | |
| | | 1.64 – 1.66 (V) (strictly) | 1 |
| | | 3.32 (g) | 1 |
| | | 150 ($cm^3$) | 1 |
| | | 8 (mm) or 0.8 (cm) | 1 |
| | | All units correct | 1 |
| | **(b)** | Remove electrodes from beaker | 1 |
| | | A method to ensure gap remains the same<br>(or other suitable suggestion e.g. measurement arrangement that the beaker sits on) | 1 |
| | **(c)** | New variable (e.g. temperature, surface area / vol / size of electrodes, power source setting, depth of immersion) | 1 |
| | | **TOTAL** | **9** |
| **2** | **(a)** | All T values correct (0.34, 0.44, 0,49, 0.53, 0.60, 0.63) | 1 |
| | | All T values to 2 sf OR all to 3sf | 1 |
| | **(b)** | Graph: | |
| | | Scales suitable | 1 |
| | | Scales labeled and with units | 1 |
| | | Plots correct to ½ sq (-1 each error) | 2 |
| | | Line judgement | 1 |
| | | Line thickness (and small, neat plots) | 1 |
| | **(c)** | T = 0.51 (s) correct answer only; NO ecf | 1 |
| | **(d)** | Statement: NO | 1 |
| | | Reason: line not through origin (or equivalent) | 1 |
| | | (allow mark if candidate describes str. line or constant gradient) | |
| | | **TOTAL** | **11** |
| **3** | **(a)** | Correct voltmeter | 1 |
| | | Correct ammeter | 1 |
| | **(b)** | R = 3.3, 2/3 sf | 1 |
| | | Unit Ω or ohm | 1 |
| | **(c)** | Circuit with correct parallel connections | 1 |
| | | Ammeter and ONE voltmeter correct | 1 |
| | | Variable resistor correct | 1 |
| | | **TOTAL** | **7** |

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| | | | | |
| --- | --- | --- | --- | --- |
| **4** | **(a)** | **(i)** | x = 14 – 16mm | |
| | | **(ii)** | y = 76.5 – 78.5 mm | 1 |
| | | **(iii)** | u = 75mm (ecf) and v = 390mm (ecf) | 1 |
| | | | x,y,u and v all correct and with no unit | 1 |
| | | **(iv)** | m = 5.2 (ecf) 2/3 sf and with no unit | 1 |
| | **(b)** | | Upside down | 1 |
| | | | Precaution 1 | 1 |
| | | | Precaution 2 | 1 |
| | | | (e.g. repeats, use mark on block supporting lens to show centre of lens, place metre rule on bench to take readings or clamp rule in position, use a dark area, explanation of how to avoid parallax error, vertical screen/lens/both, centres of lens and object in line) | |
| | | | **TOTAL** | **8** |
| **5** | **(a)** | | 22 | 1 |
| | **(b)** | **(i)** | 14 (ecf) | 1 |
| | | **(ii)** | 64 | 1 |
| | | | units all correct | 1 |
| | **(c)** | | So that heat is not lost (wtte) | 1 |
| | | | **TOTAL** | **5** |

**PAPER TOTAL = [40]**