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<td>B</td>
<td>39</td>
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<td>D</td>
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TOTAL 40
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<tr>
<td>PHYSICS</td>
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<tr>
<td>Paper 2 (Core)</td>
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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 applied 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.

Underlining 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.
### Question 1

**Scheme**

1. **(a)** 8

   **(b)** EITHER greater OR smaller AND thread stretched when on rule AND overlap at ends OR worn rule ends

   **Target**

   **Grade**

   **Mark**

   F B1

### Question 2

**Scheme**

2. **(a)** (i) 10

   (ii) stretch OR shape (or suitable sketch)

   **(b)** (i) 120

   (ii) up(wards) OR vertical (NOT vertically down) Accept arrow on diagram

   (iii) increase size/area of blocks/larger blocks OR increase number of blocks OR less soil in pot (NOT put pot on harder ground)

   **Target**

   **Grade**

   **Mark**

   F B1

### Question 3

**Scheme**

3. **(a)** 0.97 – 0.51

   0.46

   **(b)** (i) 15

   (ii) 515 e.c.f.

   (iii) D = M/V in any form, seen or implied (words/letters/mix)

   EITHER OR OR

   460 0.46 0.46

   515 515 515 \times 10^{-6} e.c.f.

   0.8932… 8.932… \times 10^{-4} 893.2… No e.c.f.

   (any number of significant figures)

   0.89 8.9 \times 10^{-4} 890 (e.c.f. for significant figures)

   g/cm^3 kg/cm^3 kg/m^3

   (0.89 kg/dm^3 is OK)

   **Target**

   **Grade**

   **Mark**

   F C1

   F A1

   C B1

   F C1

   C C1

   C C1

   C A1

   F B1

   F B1

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### Question 4

(a) idea of air molecules moving (allow vibrating)  
(N.B. 'collide' = 'moving')  
idea of air molecules striking something (condone themselves)  
idea of air molecules striking walls  

(b) (i) moves down  
(ii) increases (e.c.f.)  
idea of more collisions (per unit time) (e.c.f.) must follow from (i)  
OR \( P \propto \frac{1}{V} \)  

### Question 5

(a) line starting at 0 °C  
reasonably horizontal line at any temp for \( \geq \) half the time  
horizontal from zero time as far as dotted line (ignore anything to R. of line)  

(b) (i) water boils OR heat loss = heat supplied (NOT evaporates/turns to gas)  
(ii) gives water/molecules energy to escape OR break bonds OR change state OR heat loss from sides/surface/to air  

### Question 6

(a) (i) normal correct, by eye  
(ii) reflected ray correct, by eye (ignore normal; ignore any arrow)  
(iii) both \( i \) and \( r \) correctly marked (condone sloppy normal and sloppy refracted ray)  

(b) parallel to ray striking mirror 1 (allow incident ray)  
OR same direction (NOT equal/same as)  
(N.B. sentence must be completed, i.e. no inference from line on diagram)
<table>
<thead>
<tr>
<th>Page 4</th>
<th>Mark Scheme</th>
<th>Syllabus</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7</strong></td>
<td><strong>a</strong></td>
<td>680</td>
<td>1020</td>
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<tr>
<td></td>
<td></td>
<td>1360</td>
<td>1700</td>
</tr>
<tr>
<td></td>
<td><strong>b</strong></td>
<td>5 points plotted $\pm \frac{1}{2}$ small square (-1 e.e.o.o.) ignore 0,0 (e.c.f.) reasonable line through his points – drawn with rule/thickness reasonable</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td><strong>c</strong></td>
<td>(i) flash light travels quickly OR sound travels slowly (accept figure)</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>light travels faster than sound (accept figure)</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>light travels much faster than sound (accept figures)</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>(iii)</td>
<td>1400 - 1450 OR correct value from his graph $\pm \frac{1}{2}$ square clear and correct indication on graph of how obtained (minimum: dot at appropriate point)</td>
<td>F</td>
</tr>
<tr>
<td><strong>8</strong></td>
<td><strong>a</strong></td>
<td>Charge(s) OR energy (NOT electricity (condone as extra), charged particles (condone as extra), current, electrons (condone as extra), voltage)</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td><strong>b</strong></td>
<td>(i) 0</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>(ii) mention of 6V</td>
<td>F</td>
<td>B1</td>
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<tr>
<td></td>
<td>mention of rising OR not instantaneous (NOT ‘reads’)</td>
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<td></td>
<td>(iii) any realistic example of something turned on/off after a time lapse, e.g. electronic egg timer, turn-off bedside radio</td>
<td>F</td>
<td>B1</td>
</tr>
<tr>
<td><strong>9</strong></td>
<td><strong>a</strong></td>
<td>(i) wire shown curved between A and B</td>
<td>F</td>
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<td>wire displaced all along between A and B, and reasonably smooth</td>
<td>C</td>
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<td></td>
<td>(ii) idea of force (in any direction)</td>
<td>F</td>
<td>M1</td>
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<tr>
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<td>on current/current-carrying conductor</td>
<td>C</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>when in magnetic field</td>
<td>C</td>
<td>A1</td>
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</tbody>
</table>

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### 10 (a) (i) electrons OR cathode rays (NOT beta-particles)
- Something ‘hitting’ the screen (NOT ‘form a spot’)
- Idea of fluorescence (of the screen, NOT ‘the gas’)
- Focus
- Time base OR ms/cm
- Electrons/cathode rays deflected (e.c.f. from (i); allow ‘attracted’ if intention clear)
- Something deflected horizontally
- Some idea of repeated sweeps/back and forth

### 10 (a) (ii) (y-)input (allow y-plates)
- Trace moves horizontally/sideways/left/right
- Trace moves vertically/up/down

### 11 (a) Connection to either side of cell, but not shorted out
- VR in series with lamp, and not shorted out OR correctly connected as a potential divider (condone inclusion of a switch)

### 11 (b) (i) $R_1 + R_2$
- 12

### 11 (b) (ii) 1. Resistance = p.d./current in any form (words/letters/mix)
- 6/12 e.c.f.
- 0.5 or $\frac{1}{2}$ e.c.f.
2. his calculated current
   his calculated current \hspace{2cm} all 3  \hspace{2cm} C \hspace{2cm} B1
   his calculated current

A OR amp OR ampere somewhere in (ii) \hspace{2cm} F \hspace{2cm} B1

(iii) voltmeter shown correctly connected (any recognisable symbol; allow re-drawn circuit) \hspace{2cm} C \hspace{2cm} B1  \hspace{2cm} 10 \hspace{2cm} \text{mark alongside diagram}

<table>
<thead>
<tr>
<th>12</th>
<th>(a)</th>
<th>his weight</th>
<th>F</th>
<th>B1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b)</td>
<td>distance OR height</td>
<td>F</td>
<td>B1</td>
<td></td>
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<tr>
<td>(c)</td>
<td>(i)</td>
<td>1000N climber OR heavier OR first</td>
<td>F</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>(ii)</td>
<td>his answer to (i)</td>
<td>F</td>
<td>B1</td>
</tr>
<tr>
<td>(d)</td>
<td>(i)</td>
<td>chemical (accept fuel)</td>
<td>C</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>(ii)</td>
<td>food (accept muscles)</td>
<td>C</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>(iii)</td>
<td>maintaining body function</td>
<td>\hspace{2cm} \text{any 1} \hspace{2cm} C \hspace{2cm} B1  \hspace{2cm} 7</td>
<td></td>
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</table>

his answer to (i)  

Mark first correct answer, condone extras
<table>
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6 (a) (i) incident ray, refracted ray and normal drawn all correct and meeting at a point C1
   (ii) angle of incidence and refraction correctly identified B1
   (iii) values correct within agreed limits B1 4

(b) use of $\sin i/\sin r$
   correct substitution from candidates values
   value correct within agreed limits from candidate's values
   C1  C1 A1 3

7 (a) value $3 \times 10^2$ m/s A1 1

(b) speed of light (much) greater than speed of sound or value for sound A1 1

(c) (i) source and receiver arrangement
   with detail and labels C1  A1
   (ii) distance between source and receiver
   time between flash and bang B1  B1
   (iii) speed $= \text{distance}/\text{time}$ B1 max 4

8 (a) (i) use of charge $= It$ or $I = 90/45$
   current = 2 A C1  A1
   (ii) resistance $= \text{voltage}/\text{current}$ or $6/2$
   resistance is 3 ohm C1  A1
   (iii) energy $= Vt$ or $Vq$ or $6 \times 90$
   energy is 540 J C1  A1 6

(b) idea of energy transfer
   is $(6)$ J/C C1  A1 2

9 (a) (i) power $= VI$ or $24 \times 2$
   power is 48 W C1  A1
   (ii) voltage $= \text{power}/\text{current}$ or $48/0.4$
   voltage is 120 V C1  A1 4

(b) (i) no/very little energy/power lost or energy/power in = energy/power out B1
   (ii) any mention of magnetic field
   changing magnetic field B1  B1
   field passes through core or secondary coil
   induces voltage in secondary coil B1  B1
   number of turns on secondary determines voltage output
   B1 max 4 B1 [8]
10 (a) (i) circular line of force around wire through P
   arrow(s) on line anticlockwise - none wrong M1
   A1
   (ii) arrow through Q to left A1 3

(b) (i) none/stays same B1
   (ii) direction reverses B1 2

(c) at S - stronger B1
   at T - same (strength) B1
   at W - same (strength) B1 3 [8]

11 (a) (i) source, detector B1
   named absorber/air and labels B1
   (ii) take detector reading with no source (background)
   detector reading with source, detector and air only B1
   detector reading with appropriate named absorber
   (including distance in air) B1
   (iii) same reading with absorber(including air) as
   background so all alpha absorbed by cardboard/paper/air, others
   would get through B1 max 6

(b) curved path stated or drawn B1
   path at right angles to magnetic field B1
   into paper B1 3 [9]

TOTAL 80
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<tr>
<td>PHYSICS</td>
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<tr>
<td>Practical</td>
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</tbody>
</table>
1. two room temp readings (sensible)  
table completed, temps rising  
evidence of temp to better than 1 deg  
all temps to better than 1 deg  
time unit  
temp unit  
Graph  
temp axis labelled  
scale suitable  
plotting (check one on A)  
plotting (check one on B)  
line judgement shape  
thickness  
Statement  
Justification (adequate)  
OR good  

TOTAL 15

2. d sensible  
unit  
diagram blocks parallel and in correct position  
rule position shown  
r correct  
h sensible with unit  
V calculation correct  
c stated (sensible)  
at least 5 turns used  
calculation of V  
average calculated  
2/3 sf  
unit  
sensible G estimate  
v correct, 2/3 sf, unit  

TOTAL 15

3. three correct units  
both I to at least 1 dp  
both V to at least 1 dp  
R value (check first) correct  
both R to 2/3 sf  
correct ratio (as decimal)  
no unit  
2/3 sf  
ratio 1.8 – 2.2  

TOTAL 15
Diagram
voltmeter in parallel across the motors 1
ammeter correct 1
variable resistor connected to vary current through one motor 1
correct symbols for all three 1

TOTAL 15

4. angle 30 (±1) 1
angle 40 (±1) 1
pins F and G at least 5cm apart 1

GF correct and neat 1
new GF line correct and neat 1

x line correct position 1
record of x correct 1
unit 1

y line correct position 1
record of y correct 1
unit (same as x, stated or not) 1

correct ratio x/y 1
no unit 1
2/3 sf 1
value 1

TOTAL 15
MARK SCHEME

MAXIMUM MARK: 40

SYLLABUS/COMPONENT: 0625/06

PHYSICS
Alternative to Practical
1 (a) Seven correct values: 0, 2, 3, 6, 9, 10, 12 (-1 each error)  
     2

(b) Graph:  
     Scales, labelled, suitable size  1  
     Axes, right way round  1  
     Plots to ½ sq (-1 each error)  2  

(c) Line shape  1  
     Line thickness  1  
     Triangle greater than ½ line and method used  1  
     Correct interpolation to ½ sq  1  

     TOTAL 10

2 (a) 36° (±1°)  1  
     (b) Refracted ray drawn  1  
         22° (±1°)  1  
         normal correct (by eye)  1  
         neat, thin, correct lines  1  

(c) Correct refracted ray (by eye) with arrow  1  
(d) Separation (LHS) at least 5cm  1  
     Separation (RHS) at least 5cm  1  

     TOTAL 8

3 (a) (i) Voltmeter across lamp  1  
     (ii) Variable resistor/rheostat  1  

(b) Correct position  1  

(c) V  1  
    A  1  
    Ω  1  
    correct R at 9.8V = 8.16666 (any sf)  1  
    all R to 2/3 sf  1  
    consistent 2 sf or consistent 3 sf  1  

     TOTAL 9

4 (a) (i) 6.8cm (68mm)  1  
     (ii) 6.8  1  
         unit, mm  1  

(b) (i) 3.8/3.77 or 0.38/0.377  1  
     mm or cm as appropriate  1  

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(ii) 0.94/0.95 (or evidence of division by 4) 1

(iii) 0.75094/0.75095 1

(c) Thickness of string/thickness of marks on string/stretching of string/metre rule measures to 1mm 1

TOTAL 8

5 (a) (i) polystyrene 1

(ii) Least steep curve (or numbers suitably quoted) 1

(b) Three from:
- Thickness of insulator
- Room temp.
- Starting temp.
- Mass/vol./amount of water
- Using same can 3

TOTAL 5
**Grade thresholds** taken for Syllabus 0625 (Physics) in the June 2003 examination.

<table>
<thead>
<tr>
<th>Component</th>
<th>maximum mark available</th>
<th>minimum mark required for grade:</th>
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<td>Component 6</td>
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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.