

Mark Scheme January 2008

GCE O Level

GCE O Level Physics
7540

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Contents

| | |
|---------------------------|----|
| Mark scheme notes | 1 |
| 7540 paper 01 mark scheme | 2 |
| 7540 paper 02 mark scheme | 12 |

Notes on the mark schemes

Abbreviations used in the scheme

| | |
|-------|----------------------------|
| UP | unit penalty |
| TE | transmits the error |
| OWTTE | or words to that effect |
| SF | significant figures |
| SFP | significant figure penalty |
| MAX | maximum |
| dop | dependent on previous |

7540 paper 01 Mark scheme

| Question Number | Answer | Mark | | | | | | | | | | | | | | | | | | | | | |
|--------------------|---|------|----------|--------|--------|--------------|--|---|------|---|--|---------|---|--|----------------|---|--|------|---|--|--------|---|--|
| 1 (a) | Vectors and Scalars | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Quantity</th> <th>Scalar</th> <th>Vector</th> </tr> </thead> <tbody> <tr> <td>Acceleration</td> <td></td> <td>X</td> </tr> <tr> <td>Area</td> <td>X</td> <td></td> </tr> <tr> <td>Density</td> <td>X</td> <td></td> </tr> <tr> <td>Kinetic energy</td> <td>X</td> <td></td> </tr> <tr> <td>Mass</td> <td>X</td> <td></td> </tr> <tr> <td>Volume</td> <td>X</td> <td></td> </tr> </tbody> </table> | | Quantity | Scalar | Vector | Acceleration | | X | Area | X | | Density | X | | Kinetic energy | X | | Mass | X | | Volume | X | |
| | Quantity | | Scalar | Vector | | | | | | | | | | | | | | | | | | | |
| | Acceleration | | | X | | | | | | | | | | | | | | | | | | | |
| | Area | | X | | | | | | | | | | | | | | | | | | | | |
| | Density | | X | | | | | | | | | | | | | | | | | | | | |
| | Kinetic energy | | X | | | | | | | | | | | | | | | | | | | | |
| | Mass | | X | | | | | | | | | | | | | | | | | | | | |
| Volume | X | | | | | | | | | | | | | | | | | | | | | | |
| Each error -1 mark | (2) | | | | | | | | | | | | | | | | | | | | | | |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 1 (b) | Formula | |
| | <p>For example:</p> <ul style="list-style-type: none"> (Force =) mass x acceleration formula must not be incorrect allow ma or $\frac{1}{2}mv^2$ or s/t or d/t on its own formula and words must be correct Vectors and scalars identified and correctly related to formula dop | |
| | | 1 |
| | | 1 |
| | | (2) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 1 (c) | Second Force | |
| | <ul style="list-style-type: none"> Line pointing to the left from the point showing arrow Line of correct size (20mm) to half a small square in correct direction along centre line showing arrow | |
| | Lose maximum of 1 mark for no arrows seen | 1 |
| | | 1 |
| | | (2) |

(Total 6 Marks)

| Question Number | Answer | Mark |
|-----------------|--|------------------------|
| 2 (a) | <p>Momentum</p> <ul style="list-style-type: none"> • 4×3 • $= 12\text{kg m/s or Ns or kg} \cdot \text{m/s UP}$ | <p>1 1 (2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|------------------------------|
| 2 (b) | <p>Obeys Principle</p> <ul style="list-style-type: none"> • mass after = 6 • momentum after = 6×2 or $(4 \times 2) + (2 \times 2)$ or $8 + 4$ $= 12 \text{ (kgm/s) no UP}$ • same as before dop | <p>1 1 1 (3)</p> |

| Question Number | Answer | Mark |
|-----------------|--|------------------------|
| 2 (c)(i) | <p>Line</p> <ul style="list-style-type: none"> • Non-vertical line from (4,2) but not along horizontal entirely • <u>Sloping</u> downwards (straight or curved) dop <p>any line seen to left of $t = 4$ scores 0 0</p> | <p>1 1 (2)</p> |

| Question Number | Answer | Mark |
|-----------------|---|------------------|
| 2 (c)(ii) | <p>Energy change</p> <ul style="list-style-type: none"> • Kinetic to heat/internal/thermal ignore 'sound' | <p>1 (1)</p> |

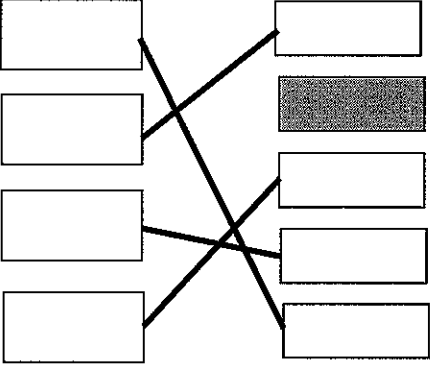
(Total 8 Marks)

| Question Number | Answer | Mark |
|-----------------|---|---------------------------------------|
| 3 (a) | <p>Convection</p> <ul style="list-style-type: none"> • hot/heated rock/liquid/fluid/molecules/particles (not air or gas) • less dense/expands (not molecules) • rises ora | <p>1</p> <p>1</p> <p>1</p> <p>(3)</p> |

| Question Number | Answer | Mark |
|-----------------|---|------------------------------|
| 3 (b) | <p>G.P.E.</p> <ul style="list-style-type: none"> • $2 \times 10 \times 2500$ allow use of 9.8 or 9.81 • = 50 000 kJ UP or 49 000 kJ or 49 050 kJ allow equivalent unit e.g. Nm or kNm | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|------------------------------|
| 3 (c) | <p>Why larger</p> <ul style="list-style-type: none"> • g / gravitational pull/gravity different • smaller dop ignore different 'mass' or 'height' | <p>1</p> <p>1</p> <p>(2)</p> |

(Total 7 Marks)

| Question Number | Answer | Mark |
|-----------------|---|------|
| 4 |  <p>2 arrows to a right hand box can score if one of them is correct 2 arrows from a left hand box is incorrect</p> | (4) |

(Total 4 Marks)

| Question Number | Answer | Mark |
|-----------------|---|--|
| 5 | <ul style="list-style-type: none"> • (electric) current • Ampere/Amp/A • Electron(s) • Negative/negatively/minus • Coulomb (allow phonetic)/C • 1v/one volt/a volt/1 volt/one joule per coulomb <p>Allow phonetic spellings</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>(6)</p> |

(Total 6 Marks)

| Question Number | Answer | Mark |
|-----------------|--|--------------------------|
| 6 (a)(i) | Anticlockwise Moment <ul style="list-style-type: none"> • 6×2 • $= 12 \text{ Nm UP}$ allow equivalent unit e.g. $\text{kgm}^2\text{s}^{-2}$ but not J | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|---|---------------------|
| 6 (a)(ii) | Clockwise Moment <ul style="list-style-type: none"> • 12 (Nm) must ecf from (i) no UP or same as (a)(i) | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|--------------------------|
| 6 (a)(iii) | Force F <ul style="list-style-type: none"> • $12 = F \times 0.5$ must ecf from (ii) • $F = 24 \text{ N UP}$ | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|--|--------------------------|
| 6 (b) | New Force F <ul style="list-style-type: none"> • Less • ACM less / (perpendicular) distance for ACM less dop | 1 1 (2) |

(Total 7 Marks)

| Question Number | Answer | Mark |
|-----------------|--|------|
| 7 (a) | Assumption <ul style="list-style-type: none"> • Zero /negligible/<u>very</u> small /nothing | 1(1) |

| Question Number | Answer | Mark |
|-----------------|--|---------------|
| 7 (b) | PD <ul style="list-style-type: none"> • 0.002×6000 or 2×6000 • = 12 V UP | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 7 (c)(i) | Current <ul style="list-style-type: none"> • 0.001 A / 1 mA UP | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|--|----------|
| 7 (c)(ii) | Resistance <ul style="list-style-type: none"> • 6000Ω UP <p>allow ecf from (c)(i) where $V = 6V$ e.g. 2 mA 3000Ω</p> | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|-------------------------|
| 7 (c)(iii) | Reason <p>no ecf from (c)(i)</p> <ul style="list-style-type: none"> • Half/ same current goes through both • Resistors must be equal ora <p>OR</p> <ul style="list-style-type: none"> • $V = 6000 \times 0.001 = 6V$ No UP • $Z = 6 / 0.001 = 6000 \Omega$ No UP <p>Max 2 marks</p> | 1 1 1 1 (2) |

(Total 7 Marks)

| Question Number | Answer | Mark |
|-----------------|--|----------|
| 8 (a)(i) | <ul style="list-style-type: none"> From B to A /opposite direction /the other way /allow arrow on diagram from B to A on the then right hand side (S.Pole) side/clockwise | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 8 (a)(ii) | <ul style="list-style-type: none"> AB (now) moves down/ opposite direction dop | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 8 (b)(i) | <ul style="list-style-type: none"> Two (revolutions) ignore unit | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|--|---------------|
| 8 (b)(ii) | <ul style="list-style-type: none"> Frequency = $1/0.1$ or $2/0.2$ no ecf = <u>10 Hz</u> UP | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|--|----------|
| 8 (c)(i) | <ul style="list-style-type: none"> Twice the frequency / 20 Hz no UP ecf from b(ii) | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 8 (c)(ii) | <ul style="list-style-type: none"> Larger /greater | 1 (1) |

(Total 7 Marks)

| Question Number | Answer | Mark |
|-----------------|---|------------------------------|
| 9 (a) | <p>Alpha</p> <ul style="list-style-type: none"> • 2 protons • 2 neutrons <p>Allow symbol for alpha or He with superscript 4 and subscript 2 seen anywhere even as part of a decay. Allow correct reference to mass (nucleon) number and atomic(proton) number</p> <p>2 electrons (-1) (allow one mark for a helium nucleus)</p> | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|--|
| 9 (b) | <p>Rule 1</p> <ul style="list-style-type: none"> • Range of alphas 10 cm (or less)/small range/ few cm <p>Rule 2</p> <ul style="list-style-type: none"> • Might transfer radioactive material/polonium <u>inside</u> body ora • Alphas damage/kill cells most/very ionising poisonous <p>independent marks</p> <p><i>award marks for part (b) wherever seen</i></p> | <p>1</p> <p>(1)</p> <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|---------------------|
| 9 (c) | <ul style="list-style-type: none"> • (it is a) gamma source/emits more penetrating radiation/accept symbol for gamma (γ) ignore beta and alpha | <p>1</p> <p>(1)</p> |

(Total 6 Marks)

| Question Number | Answer | Mark |
|-----------------|--|---------------------------------------|
| 10 (a)(i) | <ul style="list-style-type: none"> • Move end (A) backwards and/or forwards OWTTE (Do not accept from side to side) • parallel to /alongside spring • Twice a second/once every half second/$T = 0.5$ s | <p>1</p> <p>1</p> <p>1</p> <p>(3)</p> |

| Question Number | Answer | Mark |
|-----------------|--|------------------------------|
| 10 (a)(ii) | <ul style="list-style-type: none"> • (measure) distance/length • <u>between</u> two (adjacent) compressions or rarefactions dop | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|---|------------------------------|
| 10 (b) | <p>Speed</p> <ul style="list-style-type: none"> • 2×0.75 or 2×75 • = 1.5 m/s UP 150 m/s -1 for UP | <p>1</p> <p>1</p> <p>(2)</p> |

(Total 7 Marks)

| Question Number | Answer | Mark |
|-----------------|---|---------------|
| 11 (a) | <ul style="list-style-type: none"> • 12 / 7.5 • = 1.6 UP for e.g. cm or ° | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 11 (b)(i) | <ul style="list-style-type: none"> • Total internal reflection / accept TIR allow TIR and absorption but not TIR and reflection/diffraction/interference | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|---------------|
| 11 (b)(ii) | <ul style="list-style-type: none"> • Greater than critical angle • Reference to appropriate angle such as <u>angle</u> of incidence/ <u>angle</u> with inside face of block dop | 1 1 (2) |

(Total 5 Marks)

TOTAL FOR PAPER: 70 MARKS

7540 paper 02 Mark scheme

| Number | Answer | Mark |
|----------|--|----------|
| 1 (a)(i) | Weight <ul style="list-style-type: none"> • = 300 N UP / 294.3 N / 294 N • accept units as Newton/newtons/n / (kg m /s²) / (kg m s⁻²) | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|-------------------------|
| 1 (a)(ii) | Difference to mass and weight two points from <ul style="list-style-type: none"> • mass same • mass never changes/not affected by <i>g</i>/only depends on amount of matter dop • weight (may) vary • value of <i>g</i> could vary/ weight varies in different parts of the world/different heights dop do not accept due to mass change max 3 | 1 1 1 1 (3) |

| Question Number | Answer | Mark |
|-----------------|--|----------|
| 1 (b)(i) | Feature of graph <ul style="list-style-type: none"> • slope / gradient | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|---------------|
| 1 (b)(ii) | Time <ul style="list-style-type: none"> • 8 mm • hence 0.8 s UP ecf 0.8 s on its own scores both marks | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|--|----------|
| 1 (b)(iii) | Displacement <ul style="list-style-type: none"> • 12 mm UP | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|---------------|
| 1 (b)(iv) | Velocity <ul style="list-style-type: none"> • 12 / 0.8 • = 15 mm/s UP must ecf / ecf from ii and iii Do not allow fractional answers. If (ii) and (iii) blank allow correct answer | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 1 (b)(v) | Unbalanced Force <ul style="list-style-type: none"> • constant velocity or speed/no (zero) acceleration/ uniform motion do not accept because forces are balanced or not moving | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|--|---------------|
| 1 (c)(i) | Air <ul style="list-style-type: none"> • far apart/large distance apart/ <u>very</u> loosely packed • random/moving freely/irregular/<u>very</u> fast not colliding | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|--|---------------|
| 1 (c)(ii) | Water <ul style="list-style-type: none"> • close-(packed)/not just closer than air/touching/in contact • random/move over each other/ move anywhere within water or liquid/move around not closer than air or Brownian motion | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 1 (c)(iii) | Larger Disc <ul style="list-style-type: none"> • Shallower (slope)/less displacement/less vertical movement (of pen)/less amplitude (of pen or trace) | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|--|------------------------------|
| 1 (c)(iv) | <p>-15°C</p> <ul style="list-style-type: none"> • Water frozen/solid/ice • Disc/sphere/pen cannot move dop <p>Not can't push disc into ice</p> | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|------------------------------|
| 1 (c)(v) | <p>Pressure</p> <ul style="list-style-type: none"> • (continual) bombardment / collisions • by air molecules/air pressure/ atmospheric pressure <p>independent marks</p> | <p>1</p> <p>1</p> <p>(2)</p> |

(Total 20 Marks)

| Question Number | Answer | Mark |
|-----------------|--|------------------------------|
| 2 (a) | <p>Length of PQ</p> <ul style="list-style-type: none"> wire gets hot/molecules vibrate more/heating effect expands/molecules move apart dop no credit for force stretches wire/wire melts/wire extends | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|---|------------------------------|
| 2 (b) | <p>Tension in spring</p> <ul style="list-style-type: none"> (tension) decrease length (of spring or string)decreases dop no credit for spring relaxes | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|------------------------------|
| 2 (c) | <p>Elastic Behaviour</p> <ul style="list-style-type: none"> when <u>current</u> switched off/reduced or tension/load reduced/removed or <u>wire</u> cools (spring) returns to previous/original length/position ora | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|------------------------------|
| 2 (d) | <p>Maximum Temperature</p> <ul style="list-style-type: none"> (Rate of) heat energy transferred to wire <u>equals</u> (rate of) heat lost to surroundings | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|--------------------|
| 2 (e)(i) | Heat Energy Absorbed <ul style="list-style-type: none"> • = $0.00004 \times 500 \times$ any appropriate temp (change) • $\times 180$ (correct temp change) • = <u>3.6 J</u> UP | 1 1 1 (3) |

| Question Number | Answer | Mark |
|-----------------|--|---------------|
| 2 (e)(ii) | Rate of Heat Energy Absorbed <ul style="list-style-type: none"> • (power) = $3.6 / 0.2$ ecf • = 18 W or J/s UP | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|---|-------------------------|
| 2 (f)(i) | Graph <ul style="list-style-type: none"> • Axes correct orientation and correct scale $2\text{cm} = 0.1 \text{ mm}$, $2\text{cm} = 0.2\text{A}$ • Axes labelled with units • Points plotted to within 1 mm (-1 for each incorrect, assume 0,0 plotted) • Curve considering all points linear scale can only score label mark | 1 1 2 1 (5) |

| Question Number | Answer | Mark |
|-----------------|---|---------------|
| 2 (f)(ii) | Find Current <ul style="list-style-type: none"> • 0.86 - 0.92 A UP unless on graph axis • shown on graph (line across and/or down) | 1 1 (2) |

(Total 20 Marks)

| Question Number | Answer | Mark |
|-----------------|--|------------------------------|
| 3 (a)(i) | <p>Circuit</p> <ul style="list-style-type: none"> • Ammeter in series with lamp and mains supply • Voltmeter in parallel with lamp or lamp and ammeter • 3 Correct symbols used ignore additional components if they do not affect the experiment | <p>1 1 1 (3)</p> |

| Question Number | Answer | Mark |
|-----------------|---|------------------------|
| 3 (a)(ii) | <p>Power</p> <ul style="list-style-type: none"> • 230×0.44 • = 101.2 W or J/s (allow rounding to 100 W) UP accept correct use of $R=V/I$ (1) then correct answer from V^2/R (1) | <p>1 1 (2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|------------------|
| 3 (a)(iii) | <ul style="list-style-type: none"> • (230 V is a) high voltage/danger of electrocution | <p>1 (1)</p> |

| Question Number | Answer | Mark |
|-----------------|--|----------|
| 3 (b)(i) | Lamps <ul style="list-style-type: none"> • Parallel | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|----------------------------------|
| 3 (b)(ii) | Fuse <ul style="list-style-type: none"> • Protects wiring , circuit or appliance/ prevents excessive current /<u>very</u> high/large current <p>Plus max three points from</p> <ul style="list-style-type: none"> • Thin wire • Low melting point • (wire/fuse) heats up • Melts/burns/breaks (not blows) • Breaks circuit/ stops current | 1 1 1 1 1 (4) |

| Question Number | Answer | Mark |
|-----------------|---|--------------------|
| 3 (b)(iii) | <ul style="list-style-type: none"> • Not appropriate • (if all lamps on) current larger than 1 A dop • fuse will melt/ break circuit/ allow blow here dop mark 1 | 1 1 1 (3) |

| Question Number | Answer | Mark |
|-----------------|--|--------------------|
| 3 (b)(iv) | E (And A) <p>Any two points from</p> <ul style="list-style-type: none"> • E Dim /dimmer or A brighter • E Larger/ more resistance or A lower resistance • E Smaller current /half or less voltage or D and E share voltage or A larger current / more voltage <p>Ignore references to series or parallel</p> <p>Max 2 marks</p> | 1 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|--|----------|
| 3 (c)(i) | <ul style="list-style-type: none"> • Earth (wire) accept ground | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 3 (c)(ii) | <ul style="list-style-type: none"> • “Prevents” (electric) shock/ electrocution award mark if seen in c(iii) | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|---------------------------------------|
| 3 (c)(iii) | <p>Any two points from</p> <ul style="list-style-type: none"> • Low resistance (path) • If case live/ live wire touches metal (parts) • Large current/current or electricity to earth • Melts/blows/breaks fuse <p>Only award if seen here</p> <p>Max 2 marks</p> | <p>1 1 1 1</p> <p>(2)</p> |

(Total 20 Marks)

| Question Number | Answer | Mark |
|-----------------|---|-------------------|
| 4 (a)(i) | <ul style="list-style-type: none"> • 0.80 to 0.90 cm UP • 6.8/8 or 5.9/7 or 5.1/6 or 4.2/5 or 3.9/4 (must be seen)but independent of first mark | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|--|--------------|
| 4 (a)(ii) | Wavelength <ul style="list-style-type: none"> • 5 x spacing <u>ecf</u> 4.25 cm UP only once for cm in (i) and (ii) | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|--|--------------|
| 4 (a)(iii) | Frequency <ul style="list-style-type: none"> • 8 Hz UP | 1 (1) |

| Question Number | Answer | Mark |
|-----------------|---|-------------------|
| 4 (a)(iv) | Speed <ul style="list-style-type: none"> • use of $c=f\lambda$ ie 8 x answer (ii) <u>ecf/ecf</u> 8 x 4.25 or speed = distance/time • = 34 cm/s UP | 1 1 (2) |

| Question Number | Answer | Mark |
|-----------------|---|------------------------|
| 4 (a)(v) | Shallow <ul style="list-style-type: none"> • wavelength smaller • frequency same • speed slower independent marks | 1 1 1 (3) |

| Question Number | Answer | Mark |
|-----------------|--|---------------------|
| 4 (b)(i) | <p>Compare</p> <ul style="list-style-type: none"> Light <u>much</u> faster than sound <u>ora</u> or light is 300 000 000 m/s sound is 340 m/s (do not allow just "light faster than sound") allow incorrect speeds with ratio ≥ 1000 | <p>1</p> <p>(1)</p> |

| Question Number | Answer | Mark |
|-----------------|---|------------------------------|
| 4 (b)(ii) | <p>Distance</p> <ul style="list-style-type: none"> 340×6 $= 2040 \text{ m UP}$ | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|---|---------------------------------------|
| 4 (b)(iii) | <p>Reason any two from</p> <ul style="list-style-type: none"> Wind/ air movement Temperature change humidity <p>give both marks if both points seen in one reason. Ignore other irrelevant reasons</p> | <p>1</p> <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|---------------------------------------|
| 4 (c)(i) | <p>Apparatus</p> <ul style="list-style-type: none"> Gun/ (loud) source of sound Stopwatch/stopclock/time Measuring tape/ruler / not scale | <p>1</p> <p>1</p> <p>1</p> <p>(3)</p> |

| Question Number | Answer | Mark |
|-----------------|--|---------------------------------------|
| 4 (c)(ii) | <p>Measurements</p> <ul style="list-style-type: none"> (Measure) time (Measure) distance Repeat (in opposite direction) | <p>1</p> <p>1</p> <p>1</p> <p>(3)</p> |

(Total 20 Marks)

| Question Number | Answer | Mark |
|-----------------|---|---------------------|
| 5 (a)(i) | <p>Material</p> <ul style="list-style-type: none"> iron /soft iron /mumetal <p>DO NOT ACCEPT steel or iron/steel ignore references to number of turns or current or of laminations</p> | <p>1</p> <p>(1)</p> |

| Question Number | Answer | Mark |
|-----------------|--|---------------------|
| 5 (a)(ii) | <p>Reason</p> <ul style="list-style-type: none"> easy to (de)magnetise/magnetic allow soft magnetic material | <p>1</p> <p>(1)</p> |

| Question Number | Answer | Mark |
|-----------------|--|------------------------------|
| 5 (a)(iii) | <p>Voltage</p> <ul style="list-style-type: none"> $10/30 \times 12$ $= 4 \text{ V UP}$ <p>accept $10/30 = 0.33$ (1) hence $0.33 \times 12 = 3.96\text{V}$ (1) do not accept rounding to 0.3</p> | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|---|---------------------------------------|
| 5 (b)(i) | <p>Factors</p> <p>Any two from</p> <ul style="list-style-type: none"> • <u>primary</u> voltage • Turns on <u>primary</u> • (Iron) core (metal) do not allow current <p>Max 2 marks</p> | <p>1</p> <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|---------------------------------------|
| 5 (b)(ii) | <p>Circuit</p> <ul style="list-style-type: none"> • Transformer symbol (two coils and line or just two coils)/accept transformer diagram • voltmeter across (primary) coil • voltmeter across (secondary) other coil <p>ignore ammeters, switches, bulbs or resistors accept correct circuit if supply not shown or cells shown</p> | <p>1</p> <p>1</p> <p>1</p> <p>(3)</p> |

| Question Number | Answer | Mark |
|-----------------|--|------------------------------|
| 5 (b)(iii) | <p>Measure</p> <ul style="list-style-type: none"> • Turns on <u>secondary</u> • Voltage/PD/EMF across <u>secondary</u> <p>secondary must be seen once if unambiguous</p> | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|---|--|
| 5 (b)(iv) | <p>Description</p> <p>Any five from</p> <ol style="list-style-type: none"> 1. Switch on circuit/ current 2. note/set/ record a (primary) voltage 3. fix/note/set /record <u>primary</u> turns 4. note/set/ record secondary voltage/another voltage 5. note/set /record <u>secondary</u> turns 6. Change turns on secondary 7. repeat measurements <p>marks 2 to 5 may come from table headings. Mark 6 may come from table values</p> <p>Max 5 marks</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>(5)</p> |

| Question Number | Answer | Mark |
|-----------------|--|-------------------------------------|
| 5 (b)(v) | <p>Graph</p> <ul style="list-style-type: none"> • Axes labelled (secondary) turns and (secondary) voltage • Upward sloping line heading from origin dop | <p>1</p> <p>1</p> <p>(2)</p> |

| Question Number | Answer | Mark |
|-----------------|--|-------------------------------------|
| 5 (c) | <p>Smaller Voltage</p> <ul style="list-style-type: none"> • Not ideal (transformer)/not 100% efficient • Energy/heat lost to surroundings/ not all energy transferred (to secondary)/energy converted to heat./hysterisis/ eddy currents/flux leakage <p>no credit for current or voltage lost in (iron) core or just energy lost</p> | <p>1</p> <p>1</p> <p>(2)</p> |

(Total 20 Marks)

TOTAL FOR PAPER: 100 MARKS

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