

# Cambridge IGCSE™

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**PHYSICS****0625/42**

Paper 4 Theory (Extended)

**May/June 2025**

MARK SCHEME

Maximum Mark: 80

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**Published**

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| Question | Answer                                                                                                                                    | Marks     |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1(a)     | constant speed <b>OR</b> uniform speed                                                                                                    | <b>B1</b> |
| 1(b)     | 33 m                                                                                                                                      | <b>A2</b> |
|          | (distance =) area under graph <b>OR</b> $bh$ <b>OR</b> speed $\times$ time <b>OR</b> $11 \times 3$                                        | C1        |
| 1(c)(i)  | (rate of) decrease of velocity <b>OR</b> decrease in velocity (per unit time) <b>OR</b> negative acceleration                             | <b>B1</b> |
| 1(c)(ii) | tangent drawn at 9.0 s on graph                                                                                                           | <b>M1</b> |
|          | 0.50–0.70 m / s <sup>2</sup>                                                                                                              | <b>A2</b> |
|          | correct method of gradient calculation using any two correct pairs of co-ordinates ( $\pm \frac{1}{2}$ a small square) from their tangent | C1        |

| Question | Answer                                                                                                                                                                                                                                                                                                                     | Marks |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 2(a)     | (moment $\Rightarrow$ ) force $\times$ <u>perpendicular</u> distance (from the pivot)                                                                                                                                                                                                                                      | B1    |
| 2(b)     | X <b>AND</b> 50 cm labelled to the right of the pivot <b>AND</b> left of 80 cm                                                                                                                                                                                                                                             | B1    |
| 2(c)(i)  | sum of clockwise moments = sum of anticlockwise moments                                                                                                                                                                                                                                                                    | B1    |
|          | $\{mg \times 8\} + \{0.12 \times 38\} = \{0.34 \times 32\}$                                                                                                                                                                                                                                                                | B1    |
|          | any <b>one</b> from:                                                                                                                                                                                                                                                                                                       | B1    |
|          | <ul style="list-style-type: none"> <li>• <math>mg = \{0.34 \times 32\} - \{0.12 \times 38\} \div 8</math></li> <li>• <math>mg = \{10.88 - 4.56\} \div 8</math></li> <li>• <math>mg = 6.32 \div 8</math></li> <li>• <math>mg = 0.79</math></li> <li>• (mass <math>\Rightarrow</math>) <math>0.79 \div 9.8</math></li> </ul> |       |
| 2(c)(ii) | 520 kg / m <sup>3</sup>                                                                                                                                                                                                                                                                                                    | A2    |
|          | (density $\Rightarrow$ ) mass $\div$ volume <b>OR</b> $0.081 \div \{1(.0) \times 2.6 \times 10^{-2} \times 6(.0) \times 10^{-3}\}$                                                                                                                                                                                         | C1    |

| Question | Answer                                                                                                                                                                     | Marks     |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 3(a)     | (momentum =) mass $\times$ velocity <b>OR</b> ( $p =$ ) $mv$                                                                                                               | <b>B1</b> |
| 3(b)     | (velocity =) 0.19 m / s <b>AND</b> (direction) to the right                                                                                                                | <b>A4</b> |
|          | (momentum before collision) = $\{0.45 \times 0.34\} - \{0.21 \times 0.12\}$ <b>OR</b> 0.1278                                                                               | C1        |
|          | (momentum after collision) = $0.66 \times v$                                                                                                                               | C1        |
|          | momentum before collision = momentum after collision<br><b>OR</b> $\{0.45 \times 0.34\} - \{0.21 \times 0.12\} = 0.66 \times v$ <b>OR</b> $0.153 - 0.0252 = 0.66 \times v$ | C1        |
| 3(c)     | (-) 0.12 N                                                                                                                                                                 | <b>A2</b> |
|          | $F\Delta t = \Delta\{mv\}$ <b>OR</b> ( $F =$ ) $\Delta p \div (\Delta)t$ <b>OR</b> ( $F =$ ) $\Delta\{mv\} \div (\Delta)t$ <b>OR</b> ( $F =$ ) $0.26 \div 2.1$             | C1        |

| Question  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Marks     |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 4(a)(i)   | <p>container A or container with (dull) black (surface)<br/> <b>AND</b><br/>           (dull) black (surfaces) are better emitters of infrared / radiation (than shiny white surfaces)</p>                                                                                                                                                                                                                                                                                                     | <b>A2</b> |
|           | <p>container A or container with (dull) black (surface)<br/> <b>AND</b><br/>           (dull) black (surfaces) are better emitters (than shiny white surfaces)</p>                                                                                                                                                                                                                                                                                                                             | C1        |
| 4(a)(ii)  | rate of transfer of energy from the container is equal to rate of transfer of energy to the container                                                                                                                                                                                                                                                                                                                                                                                          | <b>B1</b> |
| 4(a)(iii) | convection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>B1</b> |
| 4(b)      | <p>any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>metal is a good / better (thermal) conductor <b>OR</b> wood is a (thermal) insulator</li> <li>metal contains free / delocalised <u>electrons</u> <b>OR</b> wood does not contain free / delocalised <u>electrons</u></li> <li><u>electrons</u> carry (thermal) energy through metal <b>OR</b> <u>electrons</u> collide with (distant) ions</li> <li>wood only transfers (thermal) energy by lattice vibrations</li> </ul> | <b>B3</b> |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                              | Marks     |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 5(a)     | <u>echo method (outside):</u><br>1 method of producing short, loud sound (e.g. clap / shout / cry out / bang 2 pieces of wood together)<br>2 measuring tape or trundle wheel, stopwatch and wall<br>3 (person) starts stopwatch when clap etc heard and stops it when echo heard<br>4 $\text{speed} = 2 \times \text{measured distance} \div \text{time}$                                                           | <b>B4</b> |
|          | <b>OR</b>                                                                                                                                                                                                                                                                                                                                                                                                           |           |
|          | <u>direct method outside:</u><br>1 method of producing short, loud sound (e.g. fire gun)<br>2 measuring tape or trundle wheel, stopwatch<br>3 (student at one end) starts stopwatch when smoke seen from gun and stops it when sound heard<br>4 $\text{speed} = \text{distance} \div \text{time}$                                                                                                                   | <b>B4</b> |
|          | <b>OR</b>                                                                                                                                                                                                                                                                                                                                                                                                           |           |
|          | <u>direct method (using digital):</u><br>1 method of producing short sound e.g. clap or hammer striking block<br>2 measuring tape or metre ruler, digital timer and microphones<br>3 digital timer starts when sound reaches first microphone and stops when sound reaches second microphone. Time difference is recorded on digital timer<br>4 $\text{speed} = \text{distance} \div \text{time}$ for direct method | <b>B4</b> |

| Question  | Answer                                                                                                                  | Marks |
|-----------|-------------------------------------------------------------------------------------------------------------------------|-------|
| 5(b)(i)   | radio waves                                                                                                             | B1    |
| 5(b)(ii)  | $3(.0) \times 10^8 \text{ m/s}$                                                                                         | B1    |
| 5(b)(iii) | 0.12 m                                                                                                                  | A3    |
|           | $v = f\lambda$ <b>OR</b> $(\lambda =) v \div f$ <b>OR</b> $(\lambda =) \{3(.0) \times 10^8\} \div \{2.48 \times 10^9\}$ | C1    |
|           | $(\lambda =) \{3(.0) \times 10^8\} \div \{2.48 \times 10^9\}$ <b>OR</b> $(\lambda =) 1.2 \times 10^N$                   | C1    |

| Question  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Marks     |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 6(a)(i)   | <b>two</b> points labelled F on principal axis, <u>both 3.0 cm</u> from the centre of the lens                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>B1</b> |
| 6(a)(ii)  | <p><u>method 1</u><br/> <b>two</b> correct rays from:</p> <ul style="list-style-type: none"> <li>• ray from top of I through the centre of the lens</li> <li>• ray from top of I parallel to principal axis to the left of the lens, to centre of lens and then through RH focus</li> <li>• ray from top of I through LH focus to lens, to centre of lens and then parallel to principal axis on the right of the lens</li> </ul> <p><b>OR</b></p> <p><u>method 2</u><br/> <b>two</b> correct rays from:</p> <ul style="list-style-type: none"> <li>• ray from top of I through the centre of the lens</li> <li>• ray from top of I through RH focus of lens and extended back, from centre of lens, parallel to principal axis on the left of the lens</li> <li>• ray from top of I parallel to principal axis to the left of the lens, and extended back, from the centre of the lens, through the LH focus</li> </ul> | <b>M2</b> |
| 6(a)(iii) | object, labelled O, at the intersection of rays to the RH of the lens for method 1<br>object, labelled O, at the intersection of rays to the LH of the lens for method 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>A1</b> |
| 6(b)(i)   | real <b>OR</b> inverted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>B1</b> |
| 6(b)(ii)  | rays meeting behind the retina <b>OR</b> would meet behind retina if extended                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>B1</b> |
| 6(b)(iii) | any converging lens                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>B1</b> |

| Question | Answer                                                                                                                                                                                                                                                                         | Marks     |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 7(a)     | (region) where a(n electric) charge experiences a force<br><b>OR</b><br>(region) where a force acts on a(n electric) charge                                                                                                                                                    | <b>B1</b> |
| 7(b)(i)  | any <b>two</b> from:<br><ul style="list-style-type: none"> <li>• friction (between cloth and rod causes electrons to gain energy)</li> <li>• <u>electrons</u> move</li> <li>• (electrons move) from cloth / to plastic (making plastic negative and cloth positive)</li> </ul> | <b>B2</b> |
| 7(b)(ii) | moves away (from the charged plastic rod)                                                                                                                                                                                                                                      | <b>A2</b> |
|          | moves / experiences a force / repels                                                                                                                                                                                                                                           | C1        |
| 7(c)(i)  | energy transferred in one hour at a rate of transfer of 1 kW                                                                                                                                                                                                                   | <b>B1</b> |
| 7(c)(ii) | 1 5.5 (kW h)                                                                                                                                                                                                                                                                   | <b>A2</b> |
|          | $P = (\Delta)E \div t$ <b>OR</b> $(\Delta E =) Pt$ <b>OR</b> $(\Delta E =) 0.025 \times 220$ <b>OR</b> $25 \times 220$                                                                                                                                                         | C1        |
|          | 2 $0.11 \times A$                                                                                                                                                                                                                                                              | <b>A2</b> |
|          | $P = VI$ <b>OR</b> $(I =) P \div V$ <b>OR</b> $(I =) 25 \div 230$                                                                                                                                                                                                              | C1        |

| Question  | Answer                                                                                                                                                                                                   | Marks |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 8(a)(i)   | P and Q: <u>slip</u> rings                                                                                                                                                                               | B1    |
|           | X and Y: brushes                                                                                                                                                                                         | B1    |
| 8(a)(ii)  | coil cuts magnetic field                                                                                                                                                                                 | B1    |
| 8(a)(iii) | any <b>one</b> from: <ul style="list-style-type: none"> <li>• increase strength of magnetic field</li> <li>• increase speed of rotation of coil</li> <li>• increase number of turns (of coil)</li> </ul> | B1    |
| 8(b)(i)   | 1.2 A                                                                                                                                                                                                    | B1    |
|           | (total) resistance of two (identical) resistors in series is added / doubled                                                                                                                             | B1    |
| 8(b)(ii)  | 6(.0) A                                                                                                                                                                                                  | B1    |
| 8(b)(iii) | 2.1 $\Omega$                                                                                                                                                                                             | A2    |
|           | $V = IR$ OR $(R =) V \div I$ OR $(R =) 5(.0) \div 2.4$                                                                                                                                                   | C1    |

| Question | Answer                                                                                                                                                                            | Marks     |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 9(a)(i)  | radiation (always) present in the environment <b>OR</b> radiation from natural sources                                                                                            | <b>B1</b> |
| 9(a)(ii) | any <b>one</b> from:<br><ul style="list-style-type: none"> <li>• radon gas</li> <li>• rocks <b>OR</b> buildings</li> <li>• food <b>OR</b> drink</li> <li>• cosmic rays</li> </ul> | <b>B1</b> |
| 9(b)(i)  | $^{219}_{86}\text{Rn}$                                                                                                                                                            | <b>B1</b> |
|          | $^4_2\alpha$                                                                                                                                                                      | <b>B1</b> |
| 9(b)(ii) | alpha (particles) would be absorbed / stopped by the skin owtte                                                                                                                   | <b>B1</b> |
| 9(c)(i)  | gamma / radiation needs to pass out of the body (to detector)                                                                                                                     | <b>B1</b> |
| 9(c)(ii) | after a few days / some time, little radiation is emitted owtte                                                                                                                   | <b>B1</b> |

| Question   | Answer                                                                                                                                                                                | Marks |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 10(a)(i)   | planet B                                                                                                                                                                              | B1    |
| 10(a)(ii)  | high(est) (surface) temperature<br>–180 (°C)                                                                                                                                          | B1    |
| 10(a)(iii) | planet A                                                                                                                                                                              | B1    |
|            | gravitational field strength is highest so acceleration (due to gravity) is greater<br><b>OR</b><br>gravitational field strength is highest so greater (downward) force on the object | B1    |
| 10(b)(i)   | red supergiant                                                                                                                                                                        | B1    |
|            | (new) heavier elements <b>OR</b> hydrogen                                                                                                                                             | B1    |
|            | any <b>two</b> from:<br><ul style="list-style-type: none"> <li>• neutron star</li> <li>• black hole</li> <li>• new stars (with orbiting planets)</li> </ul>                           | B2    |
| 10(b)(ii)  | distance (from Earth) to galaxy                                                                                                                                                       | B1    |