



**Cambridge Assessment International Education**  
Cambridge International General Certificate of Secondary Education

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

Paper 4 Extended Theory

**October/November 2018**

MARK SCHEME

Maximum Mark: 80

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**Published**

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This document consists of **11** printed pages.

| Question | Answer                                                                                                                            | Marks                      |
|----------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| 1(a)(i)  | ( $v =$ ) gradient <b>or</b> $1800 / 60$ <b>or</b> $900 / 30$<br><br>30 m/s                                                       | <b>C1</b><br><br><b>A1</b> |
| 1(a)(ii) | ( $v =$ ) $d / t$ or (average speed $=$ ) $d / t$ <b>OR</b> $(2700 - 1800) / (120 - 60) = 900 / 60$<br><br>( $v =$ ) 15 m/s       | <b>C1</b><br><br><b>A1</b> |
| 1(b)(i)  | 0 ( $\text{m/s}^2$ )                                                                                                              | <b>B1</b>                  |
| 1(b)(ii) | $1.4 \times 10^4 \text{ N}$                                                                                                       | <b>B1</b>                  |
| 1(c)     | speed / velocity decreases (with time) <b>or</b> negative acceleration <b>or</b> deceleration<br><br>to zero (speed) / stationary | <b>B1</b><br><br><b>B1</b> |

| Question | Answer                                                                                                                                                                                                                                                                                                                               | Marks                                                        |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| 2(a)     | (volume $=$ ) $\pi r^2 h$ <b>or</b> $\pi(0.035^2) \times 0.12$ <b>or</b> $4.62 \times 10^{-4} \text{ (m}^3\text{)}$<br><br>$\rho = m / V$ in any form <b>OR</b> ( $m =$ ) $\rho V$<br><br>(mass $= 900 \times 4.62 \times 10^{-4} =$ ) 0.41 (kg)<br><br>0.66 kg <b>or</b> 250 g <b>or</b> 0.25 kg correctly added to previous result | <b>C1</b><br><br><b>C1</b><br><br><b>A1</b><br><br><b>B1</b> |
| 2(b)(i)  | manometer                                                                                                                                                                                                                                                                                                                            | <b>B1</b>                                                    |
| 2(b)(ii) | $P = \rho gh$ in any form <b>or</b> ( $\rho =$ ) $P / gh$<br><br>( $\rho = 400 / (10 \times 0.05) =$ ) 800 kg/m <sup>3</sup><br><br>liquid on left goes further up tube<br><br>pressure of gas greater than air pressure + pressure from liquid column                                                                               | <b>C1</b><br><br><b>A1</b><br><br><b>B1</b><br><br><b>B1</b> |

| Question  | Answer                                                                        | Marks |
|-----------|-------------------------------------------------------------------------------|-------|
| 3(a)      | $mv - mu$ or $mu - mv$ in any form                                            | B1    |
| 3(b)(i)   | (impulse =) $Ft$ in any form                                                  | C1    |
|           | (impulse =) 2.4 N s                                                           | A1    |
| 3(b)(ii)  | $Ft = mv - mu$ in any form OR $(v - u =) Ft / m$                              | C1    |
|           | 43 m / s                                                                      | A1    |
| 3(b)(iii) | 1 kinetic energy (of racquet) to elastic / strain energy (in ball or strings) | B1    |
|           | 2. elastic / strain energy (in ball or strings) to kinetic energy (of ball)   | B1    |

| Question | Answer                                                                                                   | Marks |
|----------|----------------------------------------------------------------------------------------------------------|-------|
| 4(a)(i)  | any feasible named insulating material                                                                   | B1    |
|          | reduces thermal energy / heat loss or transfer to surroundings                                           | B1    |
|          | more (calculated electrical) energy (transferred) into block<br>or (it is an) insulator / poor conductor | B1    |
| 4(a)(ii) | insulation on top of block                                                                               | B1    |
| 4(b)     | (energy input = $VIt = 12 \times 3.8 \times 600 =$ ) 27 000 (J)                                          | B1    |
|          | SHC = $E / m\Delta T$ in any form OR $E / m\Delta T$                                                     | B1    |
|          | ( $\Delta T =$ ) 55 – 25 OR 30 (°C)                                                                      | B1    |
|          | (SHC = $27\,000 / (2 \times 30) = 450 \text{ J kg}^{-1}\text{°C}^{-1}$ OR $\text{J/(kg °C)}$ )           | B1    |

| Question  | Answer                                                                                                                                                                                                                         | Marks     |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 5(a)(i)   | dispersion                                                                                                                                                                                                                     | <b>B1</b> |
| 5(a)(ii)  | point A: red point B: violet                                                                                                                                                                                                   | <b>B1</b> |
| 5(a)(iii) | different speeds / refractive indices / refractions( for different colours / wavelengths)                                                                                                                                      | <b>B1</b> |
| 5(b)(i)   | 1 more reflection on top wall of fibre, between X and end of fibre AND 0 reflections on lower wall of fibre<br>AND ray reaches end of fibre                                                                                    | <b>B1</b> |
| 5(b)(ii)  | $\sin c = 1 / n$ in any form                                                                                                                                                                                                   | <b>C1</b> |
|           | $(c = \sin^{-1}(1 / 1.46) =) 43^{\circ}$                                                                                                                                                                                       | <b>A1</b> |
| 5(b)(iii) | Any <b>two</b> from <ul style="list-style-type: none"> <li>to carry (telephone) signals / communications</li> <li>for medical diagnosis / imaging</li> <li>specified artistic (display)</li> <li>specified lighting</li> </ul> | <b>B2</b> |

| Question  | Answer                                                                                | Marks |
|-----------|---------------------------------------------------------------------------------------|-------|
| 6(a)(i)   | C marked within the shortest gap                                                      | B1    |
| 6(a)(ii)  | R marked within longest gap                                                           | B1    |
| 6(a)(iii) | double-headed arrow <b>across</b> two wavelengths                                     | B1    |
| 6(b)      | $(v = ) f \lambda$ in any form                                                        | C1    |
|           | $(v = 750 \times 0.45 = ) 340 \text{ m/s}$                                            | A1    |
| 6(c)      | air OR any / a gas<br>AND speed is (typical) of sound in a gas                        | B1    |
| 6(d)(i)   | longitudinal OR vibration parallel to wave travel direction OR transfer energy        | B1    |
| 6(d)(ii)  | frequency / pitch less OR below 20 000 Hz OR audible (to someone with normal hearing) | B1    |

| Question  | Answer                                                                               | Marks |
|-----------|--------------------------------------------------------------------------------------|-------|
| 7(a)(i)   | $P = I V$ in any form OR $(I = ) P / V$                                              | C1    |
|           | $(I = 60 / 110 = ) 0.55 \text{ A}$                                                   | A1    |
| 7(a)(ii)  | $(I = ) 1.6 \text{ A}$                                                               | B1    |
| 7(a)(iii) | 110 V                                                                                | B1    |
| 7(b)(i)   | $I = V / R$ in any form OR $(R = ) V / I$<br>OR $(R = ) V^2 / P$ OR $(R = ) P / I^2$ | C1    |
|           | $(R = 110 / 0.55 = ) 200 \Omega$                                                     | A1    |
| 7(b)(ii)  | 2nd box (twice the length)                                                           | B1    |
|           | 4th box (half the area of cross-section)                                             | B1    |

| Question | Answer                                                                                                     | Marks |
|----------|------------------------------------------------------------------------------------------------------------|-------|
| 8(a)(i)  | (moves) towards negative rod / to right                                                                    | B1    |
|          | opposite / unlike charges attract                                                                          | B1    |
| 8(a)(ii) | (wood / it) or cubes( / float) rotates / turns / spins                                                     | B1    |
|          | 2 forces cause moment / couple / torque / turning effect                                                   | B1    |
| 8(b)     | conductors: free / delocalised electrons OR electrons move                                                 | B1    |
|          | insulators: no free / delocalised electrons OR electrons / charges cannot move OR electrons fixed in place | B1    |
| 8(c)     | at least 4 approx. evenly spaced straight lines with correct arrows radially outwards                      | B1    |

| Question | Answer                                                                                                                                                                                                                           | Marks |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 9(a)     | steel, nickel, cobalt                                                                                                                                                                                                            | B1    |
| 9b(i)    | magnetic field (lines) cut OR changing magnetic field / flux linkage (in coil)                                                                                                                                                   | B1    |
|          | e.m.f. / voltage <u>induced</u>                                                                                                                                                                                                  | B1    |
| 9(b)(ii) | (end Q) is an N-pole                                                                                                                                                                                                             | B1    |
|          | repels / opposes (approaching) N-pole / magnet                                                                                                                                                                                   | B1    |
| 9(c)     | any <b>two</b> from:<br>withdraw N-pole (from end Q) OR move magnet to the right<br>insert S-pole (into end Q)<br>insert <u>N-pole</u> into other end<br>withdraw <u>S-pole</u> from other end <b>or</b> carry on past mid-point | B2    |

| Question  | Answer                                                                                                                                                                                                                                    | Marks     |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 10(a)(i)  | any <b>two</b> from <ul style="list-style-type: none"> <li>• soil / rocks / buildings / the Earth</li> <li>• cosmic rays / space</li> <li>• the Sun</li> <li>• medical sources</li> <li>• food or drink</li> <li>• air / radon</li> </ul> | <b>B2</b> |
| 10(a)(ii) | random (variation of background radiation / radioactivity)                                                                                                                                                                                | <b>B1</b> |
| 10(b)     | 160 and 10 (counts/min)                                                                                                                                                                                                                   | <b>C1</b> |
|           | (160 / 10 = ) 16                                                                                                                                                                                                                          | <b>C1</b> |
|           | 4 half-lives                                                                                                                                                                                                                              | <b>A1</b> |
|           | (24 / 4 = ) 6 days                                                                                                                                                                                                                        | <b>B1</b> |
| 10(c)     | 2 correct lines                                                                                                                                                                                                                           | <b>B1</b> |
|           | 4 correct lines                                                                                                                                                                                                                           | <b>B1</b> |
|           | 6 correct lines                                                                                                                                                                                                                           | <b>B1</b> |