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

**PHYSICS** **0625/41**

Paper 4 Extended Theory **May/June 2018**

MARK SCHEME

Maximum Mark: 80

**Published**

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| Question | Answer | Marks |
|---|---|---|
| 1(a) | Mention of gradient of graph at t = 30 s **OR** tangent drawn at t = 30 s and triangle drawn | **1** |
| | Acceleration in range 0.30 to 0.45 m / $s^2$ | **1** |
| 1(b) | Acceleration less/at a slower rate | **1** |
| | Less driving force **OR** greater resistive force/friction/air resistance/drag | **1** |
| | Resultant force less | **1** |
| 1(c) | Area under graph | **1** |
| | Distance = (20 × 40) + (½ × 40 × 10) **OR** ½ × (30 + 20) × 40 | **1** |
| | 1000 m | **1** |

| Question | Answer | Marks |
|---|---|---|
| 2(a) | Chemical (potential energy) | **1** |
| 2(b)(i) | (E =) m × g × h **OR** 32 × 10 × 2.5 | **1** |
| | 800 J | **1** |
| 2(b)(ii) | Output power = E ÷ t **OR** 800 ÷ 5.4 **OR** 148.148 (W) | **1** |
| | Eff. = output (power) ÷ input (power) **OR** $P_{out} \div P_{in}$ **OR** $E_{out} \div E_{in}$ **OR** output power ÷ 0.65 **OR** 148.148 ÷ 0.65 **OR** 800 ÷ 0.65 | **1** |
| | = 230 W | **1** |
| 2(c) | Advantage: not dependent on weather/wind blowing **OR** always available | **1** |
| | Disadvantage: polluting **OR** $CO_2$/$SO_2$/greenhouse gases emitted **OR** leads to global warming **OR** oil must be transported **OR** not renewable **OR** oil will run out/be used up | **1** |

| Question | Answer | Marks |
|---|---|---|
| 3(a)(i) | W = (4.8 × 10 =) 48 N | 1 |
| 3(a)(ii) | (P = ) F ÷ A OR 48 ÷ (0.12 × 0.16) | 1 |
| | 2500 Pa | 1 |
| 3(b) | Atmospheric pressure (in addition to liquid pressure) | 1 |
| 3(c) | P = hdg or in words OR (d =) P ÷ hg OR 2500 ÷ (0.32 × 10) | 1 |
| | 780 kg / $m^3$ | 1 |
| | **OR** d = M ÷ V = 4.8 ÷ (0.12 × 0.16 × 0.32) | (1) |
| | 780 kg / $m^3$ | (1) |

| Question | Answer | Marks |
|---|---|---|
| 4(a)(i) | (Molecules) vibrate | 1 |
| 4(a)(ii) | random/haphazard/in all directions | 1 |
| | Any **one** of:<br>with high speed<br>freely<br>zig-zag<br>in straight lines | 1 |
| 4(b) | (Molecules) collide with walls (of box) **OR** (Molecules) rebound from walls (of box) | 1 |
| | Change of momentum (occurs) | 1 |
| | force (on walls) = (total) change of momentum per second | 1 |
| | Pressure = (total) force ÷ (total) area (of walls) | 1 |

| Question | Answer | Marks |
|---|---|---|
| 5(a)(i) | Refraction **OR** reflection | **1** |
| 5(a)(ii) | If refraction in **(i)**<br>Change or increase or decrease in speed of wave **OR** change of refractive index **OR** | **1** |
| | If reflection in **(i)**<br>Mention of surface or boundary | **(1)** |
| 5(b)(i) | 2 points both labelled F at 3.5 cm either side of optical centre of lens | **1** |
| 5(b)(ii) | Any **two** of:<br>Paraxial ray from tip of O refracted through farther F/3.5 cm<br>Undeviated ray from tip of O through optical centre of lens<br>Ray from tip of O through nearer F refracted paraxially | **2** |
| | Image/I drawn from intersection of rays to principal axis with indication that image is inverted | **1** |
| 5(b)(iii) | In range 3.6 to 4.1 cm | **1** |
| 5(b)(iv) | (Image is) real **and** light passes through it **OR** can be projected/seen on a screen **OR** refracted rays cross/meet | **1** |

| Question | Answer | Marks |
|---|---|---|
| 6(a)(i) | At least 3 circular wavefronts centred on gap extending to at least half of semicircle | 1 |
| | Same spacing as incident wavefronts | 1 |
| 6(a)(ii) | At least 3 straight, parallel, wavefronts, approximately same length as width of gap | 1 |
| | Ends of straight lines curving towards but not reaching barrier | 1 |
| 6(b) | Any **four** of:<br>Diagram to show: labelled barrier, incident straight or curved waves<br>Diagram shows appropriately reflected waves<br>Water surface e.g. tank of water/ripple tank/pond/acceptable alternative<br>How waves are produced: e.g., moving end or length of solid rod dipping into surface **OR** small solid object thrown in.<br>Detail of barrier: made of metal, glass or wood fixed in position<br>How observed: by eye, video, film, stroboscope | 4 |

| Question | Answer | Marks |
|---|---|---|
| 7(a) | (Metals) contain free/mobile electrons/delocalised electrons | 1 |
| 7(b)(i) | $R \propto L$ **and** $R \propto 1 \div A$ **OR** $R \propto L \div A$ **OR** $R = 16 \times ½ \div 2$ **OR** $R = 16 \div 4$ | 1 |
| | 4.0 Ω | 1 |
| 7(b)(ii) | $1 \div R = (1 \div R_1) + (1 \div R_2)$ **OR** $R = (R_1 \times R_2) \div (R_1 + R_2)$ **OR** $(1 \div R) = (1 \div 4) + (1 \div 16)$ **OR** $(4 \times 16) \div (4 + 16)$ | 1 |
| | 3.2 Ω | 1 |
| 7(c)(i) | 3E or $3 \times E$ | 1 |
| 7(c)(ii) | $I_B > I_2 > I_1$ (6th box ticked) | 1 |

| Question | Answer | Marks |
|---|---|---|
| 8(a) | (Q =) mcΔθ **OR** 200 × 4.2 × 22 | **1** |
| | 18000 J | **1** |
| 8(b) | Q = m × L **OR** (L =) Q ÷ m **OR** 18 480 ÷ 60 | **1** |
| | 310 J / g | **1** |
| 8(c) | (Thermal) energy/heat transfers from surroundings **OR** into water | **1** |

| Question | Answer | Marks |
|---|---|---|
| 9(a) | Would not be effective **OR** No | **1** |
| | With current on **OR** the (alternating) current should not be switched off | **1** |
| | Magnet should be withdrawn from the coil | **1** |
| | **OR** Magnet would be alternately magnetised in different directions | **(1)** |
| | Would remain magnetised in the direction occurring at the moment of switching off | **(1)** |
| 9(b)(i) | Coil turns | **1** |
| | Clockwise/continuously | **1** |
| | Current (in coil) reverses every half turn/when coil is in vertical position **OR** force on current in a magnetic field | **1** |
| 9(b)(ii) | **1** × (4 × T) | **1** |
| | **2** × (2 × T) | **1** |
| | **3** × (T ÷ 2) | **1** |

| Question | Answer | Marks |
|---|---|---|
| 10(a) | To produce an alternating/changing magnetic field | 1 |
| | so that current/voltage is <u>induced</u> (continuously) in the <u>secondary</u> coil **OR** <u>secondary</u> circuit | 1 |
| 10(b)(i) | $N_s \div N_p = V_s \div V_p$ in any form **OR** $(N_s =) N_p \times V_s \div V_p$ **OR** $8000 \times 6 \div 240$ | 1 |
| | 200 | 1 |
| 10(b)(ii) | $I_pV_p = I_sV_s$ in any form **OR** $(I_p =) I_s \times V_s \div V_p$ **OR** $2.0 \times 6 \div 240$ | 1 |
| | 0.050 A | 1 |
| 10(b)(iii) | (Number of lamps =) $2 \div 0.05 = 40$ | 1 |

| Question | Answer | Marks |
|---|---|---|
| 11(a) | Number of protons = 86 and number of electrons = 86 | 1 |
| | Number of neutrons = 136 | 1 |
| 11(b) | $^{218}_{84}$Po | 1 |
| | $+ ^{4}_{2}\alpha$ | 1 |
| 11(c) | 7.6 days = 2 half-lives or evidence of two halvings | 1 |
| | (number of Rn atoms left = $6.4 \times 10^6 \div 4 =) 1.6 \times 10^6$ | 1 |
| | number of α-particles emitted = $(6.4 \times 10^6 - 1.6 \times 10^6 =) 4.8 \times 10^6$ | 1 |