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Cambridge IGCSE™

PHYSICS **0625/41**

Paper 4 Extended Theory **May/June 2021**

MARK SCHEME

Maximum Mark: 80

Published

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[Turn over

Question	Answer	Marks
1(a)(i)	any value from 35 to 43 m / s^2	**A2**
	(a =) (v – u) / t in any form **or** gradient (of line) **or** (58 – 50) / 0.20 **or** equivalent values from the graph	**C1**
1(a)(ii)	3800 N	**A3**
	(F =) ma in any form **or** Δp / Δt in any form **or** 76 × candidate's **1(a)(i)** **or** 760 seen	**C1**
	76 × candidate's **1(a)(i)** evaluated **or** 76 × (candidate's **1(a)(i)** + 10) **or** 76 × (candidate's **1(a)(i)**)+ 760	**C1**
1(b)	(deceleration because) upward force greater than weight **or** upward resultant force	**B1**
	air resistance decreases (with decreasing speed / with time) **or** deceleration decreases **or** resultant (upward) force decreases	**B1**
	(until / finally) weight equals air resistance **or** forces balance **or** at terminal / constant velocity / speed	**B1**
1(c)	at zero speed there is no air resistance	**B1**
	weight / downwards force is (still) acting **or** there is (now) a resultant force (downwards at zero speed)	**B1**
	OR forces balance at a speed greater than zero	**(B1)**
	speed cannot decrease / no deceleration once forces balance	**(B1)**

Question	Answer	Marks
2(a)(i)	0.078 N s **or** 0.078 kg m / s	**A2**
	(I =) $m_t(\Delta)v_t$ in any form **or** 1.2×0.065	**C1**
2(a)(ii)	150 m / s	**A2**
	$v_b = (m_t + v_t) / m_b$ in any form **or** initial momentum = final momentum **or** $1.2(0052) \times 0.065 / 0.00052$ **or** $0.078(0338) / 0.00052$	**C1**
2(b)	work done against / due to / because of friction **or** kinetic energy (of trolley) used to do work	**B1**
	kinetic energy decreases (to zero)	**B1**
	thermal energy produced	**B1**

Question	Answer	Marks
3(a)	molecules (already very) close / touching	**B1**
	(repulsive) forces (very) large	**B1**
3(b)(i)	6.5×10^5 Pa	**A3**
	(p =) F / A in any form **or** 8800 / 0.016 **or** (F_{air} =)$1.0 \times 10^5 \times 0.016$	**C1**
	5.5×10^5 **or** 5.5×10^5 (+ 1.0×10^5) **or** (1600 + 8800) / 0.016	**C1**
3(b)(ii)	pressure due to (increased height of) oil in cylinder mentioned **or** pressure (in liquid) increases as depth increases	**B1**
	to keep the upwards force constant **or** to lift the (extra) oil **or** to counteract / oppose the increased pressure / force / weight of the oil	**B1**
3(b)(iii)	(initial) force has to be greater than 8800 N to start the motion **or** the upwards force (just) balances the weight (so no movement) **or** piston / oil has weight **or** friction (between moving parts)	**B1**

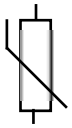
Question	Answer	Marks
4(a)	aluminium is a (good) conductor (of heat) **and** plastic is a poor conductor / does not conduct (heat)	**B1**
4(b)(i)	increase in kinetic energy of molecules **or** increase in potential energy of molecules	**B1**
4(b)(ii)	any **three** from: • atoms (touching the hotplate) / lattice vibrate (faster) • atoms pass on energy / vibration to neighbouring atoms / to other atoms by collision • atoms pass on energy to electrons • electrons hit distant atoms **or** electrons move (through lattice)	**B3**
4(b)(iii)	molecules escape from the liquid (as a vapour)	**B1**
	bonds broken / (attractive) forces overcome	**B1**
	molecules gain potential energy **or** work done (to separate molecules / break bonds / overcome forces)	**B1**
4(b)(iv)	840 W	**A3**
	(E =) ml_v in any form **or** $0.11 \times 2.3 \times 10^6$ **or** 2.53×10^5	**C1**
	(rate =) ml_v / t in any form **or** $0.11 \times 2.3 \times 10^6 / 300$ **or** $2.53 \times 10^5 / 300$	**C1**

Question	Answer	Marks
5(a)	molecules / they speed up **or** gain kinetic energy	**B1**
	molecules move further apart **or** push others away	**B1**
5(b)	forces between liquid molecules weak(er than in solids)	**B1**
	less energy / work done to separate molecules **or** greater separation for same work done / same increase in energy	**B1**
5(c)(i)	greater sensitivity	**B1**
	volume increase (of liquid in second thermometer) is greater **or** liquid moves a greater distance (for the same temperature increase)	**B1**
5(c)(ii)	smaller range **and** either of: • smaller temperature increase for liquid / meniscus to reach end of tube • expands more / greater sensitivity **and** tube of same length	**B1**
5(d)(i)	statement of <u>problem</u> (e.g. bridges buckle (in hot weather))	**B1**
5(d)(ii)	suggested solution to problem stated in **5(d)(i)** (e.g. allow gaps at the ends of the bridge)	**B1**
	more detail (e.g. as the bridge expands the gaps close)	**B1**

Question	Answer	Marks
6(a)	two points labelled C at the centre of the two compressions	**B1**
6(b)	6200−6500 Hz	**A3**
	(λ =) value from 0.051 to 0.053 (m) seen anywhere	**C1**
	(f =) v / λ in any form **or** 330 / 0.052 **or** 330 / 5.2 **or** 63	**C1**
6(c)	compressions / rarefactions closer **or** more compressions / rarefactions (in same distance)	**B1**
	less diffraction / spreading out	**B1**
	(because of) smaller wavelength **or** ratio wavelength / gap width smaller	**B1**

Question	Answer	Marks
7(a)(i)	any **three** from: • *y*-axis labelled *e.m.f.* **and** *x*-axis labelled *time* • at least one cycle of a sinusoidal wave • only **two** complete cycles of a sinusoidal wave • constant amplitude **and** constant period for first two periods of a sinusoidal wave	**B3**
7(a)(ii)	peak **or** trough **or** corresponding time labelled P	**B1**
7(a)(iii)	(amplitude / maximum e.m.f.) increases	**B1**
	(e.m.f.) changes direction more often **or** greater frequency	**B1**
7(b)	alternating current in primary coil	**B1**
	alternating / changing magnetic field **or** magnetic field cuts secondary coil (continuously)	**B1**
	(alternating) e.m.f. induced in the secondary coil	**B1**

Question	Answer	Marks
7(c)	smaller current (and same resistance when the power is transmitted and an equal rate)	**B1**
	less thermal energy loss / produced (in cables)	**B1**

Question	Answer	Marks
8(a)	 **and** between P and Q	**B1**
8(b)	1.5 V **c.a.o.**	**B1**
8(c)(i)	1600 Ω	**A3**
	($V_{800\,\Omega}$ =) 4.0 (V)	**C1**
	(I =) V / R in any form or 4.0 / 800 or 0.0050 (A) **or** (R =) V / I or 8.0 / 0.0050	**C1**
	OR 1600 Ω	**(A3)**
	($V_{800\,\Omega}$ =) 4.0 (V)	**(C1)**
	(R_{Th} =) $R_{800\,\Omega} \times V_{Th} / V_{800\,\Omega}$ in any form **or** (R_{Th} =) 800 × 8.0 / 4.0 in any form	**(C1)**
	OR 1600 Ω	**(A3)**
	$\frac{12}{800+R_{Th}}$ **or** $\frac{8.0}{R_{Th}}$ **or** $\frac{R_{Th}}{800+R_{Th}}$	**(C1)**
	$\frac{12}{800+R_{Th}} = \frac{8.0}{R_{Th}}$ in any form	**(C1)**

Question	Answer	Marks
8(c)(ii)	larger proportion of the e.m.f. (across thermistor) **or** smaller voltage across 800 Ω	**B1**
	temperature (of thermistor) is smaller / has decreased	**B1**
	resistance of thermistor / circuit is large(r)	**B1**

Question	Answer	Marks
9(a)	$^{2}_{1}H$ **and** $^{3}_{1}H$ **and** in this order	**B1**
9(b)(i)	joining together of (small / H) nuclei	**B1**
	to produce a bigger nucleus / He nucleus **or** with the release of energy	**B1**
9(b)(ii)	($^{2}_{1}H + ^{3}_{1}H \rightarrow$) $^{1}_{0}n$	**B1**
	(+) $^{4}_{2}(....)$	**B1**
	He **or** α seen	**B1**
9(c)	any **two** from: • geothermal (energy) • tidal (energy) • nuclear (energy)	**B2**