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PHYSICS**0625/42**

Paper 4 Extended Theory

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MARK SCHEME

Maximum Mark: 80

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Question	Answer	Mark
1(a)	$(A = 44 \times 20 =) 880 \text{ (m}^2\text{)}$	C1
	$V = A \times \text{depth in any form OR } (d =) V / A$	C1
	$(d = 264 / 880 =) 0.30 \text{ m}$	A1
1(b)	$\rho = m / V \text{ in any form OR } (\rho =) m / V$	C1
	$(\rho = 2.7 \times 10^5 / 264 =) 1020 \text{ kg / m}^3$	A1
1(c)	$p = \rho gh \text{ in any form OR } (p =) \rho gh$	C1
	$(p = 1020 \times 10 \times 0.3 =) 3\,100 \text{ Pa}$	A1
1(d)	tape measure	B1

Question	Answer	Mark
2(a)	no resultant force OR forces are balanced OR all forces in opposite directions are equal OR forces cancel	B1
	no resultant {moment / torque / turning effect} OR (sum of) clockwise moment(s) = (sum of) anticlockwise moment(s)	B1
2(b)(i)	1. down arrow labelled W at dashed line on 50 cm mark	B1
	2. up arrow labelled R at pivot	B1
2(b)(ii)	expression / evaluation for one correct moment seen	C1
	expressions / evaluation for all correct moments seen	C1
	equation seen relating correct expressions / evaluations for moments: moment of 0.5 N + moment F = moment of W OR 90 F = 43 OR 0.9F = 0.43	C1
	(F = 43 / 90 OR 0.43 / 0.9 =) 0.48 N	A1
2(b)(iii)	upwards force = downwards force	C1
	(R =) 1.2 N	A1

Question	Answer	Mark
3(a)	they / molecules collide with <u>walls</u>	B1
	<u>change of momentum</u> causes <u>force</u> (to be exerted on walls)	B1
	pressure = force / area (so pressure is exerted on walls)	B1
3(b)	$pV = \text{constant}$ or $p_1 V_1 = p_2 V_2$ in any form	C1
	$p_1 \times 820 = 20\,000 \times 330$ OR $(p_1 =) 20\,000 \times 330 / 820$	C1
	$(p_1 =) 8000 \text{ Pa}$	A1

Question	Answer	Mark
4(a)	$E = VIt$ in any form OR $(E =) VIt$ OR $(E =) 3 \times 12 \times 23 \times 60$	C1
	$(E =) 50\,000 \text{ (J)}$	C1
	$C = E / \Delta T$ in any form OR $(C =) E / \Delta T$ OR $(C =) 49\,680 / 50$ OR $50\,000 / 50$	C1
	$(C =) 990 \text{ J / } ^\circ\text{C}$	A1
4(b)	1. larger sphere emits / radiates / loses thermal energy more	M1
	greater (surface) <u>area</u>	A1
	2. greater (rate of radiation)	B1

Question	Answer	Mark
5(a)(i)	(compression region:) particles / they close(r)	B1
	(rarefaction region:) particles / they far / further apart	B1
5(a)(ii)	(longitudinal) oscillations / vibrations parallel to direction of wave (motion) / energy transfer OR medium is required OR cannot be polarised	B1
	(transverse) oscillations / vibrations perpendicular to direction of wave (motion) / energy transfer OR medium not required OR can be polarised	B1
5(b)(i)	$v = f\lambda$ in any form OR ($\lambda =$) v / f	C1
	($\lambda =$) 3500 / 120	C1
	($\lambda =$) 29 m	A1
5(b)(ii)	frequency not changed (in different medium)	B1
	audible / yes AND audible range 20 Hz – 20 kHz	B1

Question	Answer	Mark
6(a)(i)	{light from water OR light to air / eye OR light from coin} bends / changes direction / is refracted	B1
	refracts / bends away from normal OR angle of incidence is smaller than angle of refraction	B1
6(a)(ii)	refraction	B1
6(a)(iii)	rays do not meet at image / only appear to come from image / do not originate from image / cannot be seen on a screen	C1
6(b)	$3.0 \times 10^8 \text{ m/s}$	B1
6(c)	$n = c_a / c_w$ in any form OR $(c_w =) c_a / n$	C1
	$(c_w =)$ candidate's (b) / 1.3	C1
	$(c_w =) 2.3 \times 10^8 \text{ m/s}$	A1

Question	Answer	Mark
7(a)(i)	deflection	B1
	(then) reverse deflection / current / voltage OR greater deflection OR deflection for shorter time OR <u>change</u> of (magnetic) field / flux	B1
	larger deflection OR deflection for shorter time	M1
7(a)(ii)	higher speed OR larger (rate of) <u>change</u> of magnetic field / flux	A1
	{current / power too high OR trip hazard} AND cut (in insulation) AND plug / socket on damp / wet (grass)	B1
	<u>overheating</u> / <u>fire</u> in extension lead OR trip hazard	B1
7(b)	short circuit / shock / electrocution through cut (in insulation)	B1
	short circuit / shock / electrocution through plug on damp / wet (grass)	B1

Question	Answer	Mark
8(a)	R proportional to length	C1
	R proportional to 1 / area	C1
	$(R =) 0.14 \times (3 / 2) \times (4 / 9)$	C1
	$(R =) 0.093 (\Omega)$	A1
8(b)(i)	first two rows correct	B1
	last two rows correct	B1
8(b)(ii)	NOR gate correctly connected accept OR gate followed by NOT gate	M1
	correct symbol(s) for NOR gate accept OR gate followed by NOT gate	A1

Question	Answer	Mark
9(a)	where / region a(n electric) charge experiences a force	B1
9(b)	All criteria must be met • 5 lines with both ends within 2 mm of plates by eye • middle 3 lines straight and within 10° of horizontal by eye • top / bottom lines, straight or with outward smooth curves, ends vertically ≤ 16 mm below / above ends of plates, if curved horizontally symmetrical by eye • spacing between lines: 7 mm $\leq$ spacing $\leq$ 23 mm	B1
	at least 1 arrow left to right NOT any arrow R to L	B1
9(c)(i)	$I = Q / t$ in any form OR $(Q =) It$	C1
	$(Q =) 0.21 \times 10 \times 60 \times 60$	C1
	$(Q =) 7600 \text{ C}$	A1
9(c)(ii)	$E = VQ$ in any form OR $(E =) VQ$ OR $(E =) 1.2 \times 7560$	C1
	$(E =) 9100 \text{ J}$	A1
9(c)(iii)	chemical (potential energy)	B1

Question	Answer	Mark
10(a)	neutron charge = 0 γ -ray mass = 0 AND charge = 0 He nucleus mass = 4 m He nucleus charge = 2 e	B1 B1 B1 B1
10(b)	any 3 different valid points, e.g. • detail of handling source appropriately for, e.g. use of tongs • protective clothing • minimise exposure by time OR distance OR activity • detail of shielded storage • detail of secure storage • monitoring exposure • must be disposed of securely • limitation of access to approved personnel • procedure in place in case of accident / criminal act to protect people and / or environment	3 × B1