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PHYSICS

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Paper 2 Theory

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MARK SCHEME

Maximum Mark: 75

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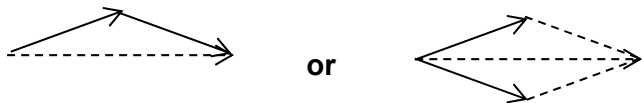
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Question	Answer	Marks
1(a)	scale at least: 1.0 cm : 10 kN	B1
	correct triangle or correct parallelogram and resultant, i.e. 	B1
	$90 \text{ kN} \leq \text{resultant} \leq 94 \text{ kN}$	B1
1(b)	no <u>resultant</u> force or balanced forces or all forces cancel	B1
	(force of tugboats cancelled) by drag / water resistance / water friction etc.	B1

Question	Answer	Marks
2(a)	shape	B1
	size / volume / density	B1
2(b)(i)	0.12 N	B1
2(b)(ii)	<u>weight</u> of first spring (increases extension) or <u>weight</u> of first spring (takes spring beyond the limit of proportionality)	B1
2(b)(iii)	where / point / load / extension / limit beyond which the extension is not directly proportional to load / extension-load graph is not straight	B1
2(c)(i)	elastic potential energy	B1
2(c)(ii)	friction / air resistance mentioned or thermal energy / heat produced	B1

Question	Answer	Marks
3(a)	$(P =) F/A$ or $240/(0.44 \times 0.21)$ or $240/0.092(4)$	C1
	$2.6 \times 10^3 \text{ Pa}$	A1
3(b)	atmospheric pressure (is acting on the block/ground)	B1
3(c)(i)	0.065 m or 6.5 cm or 65 mm	B1
3(c)(ii)	two separate approaches I/II	
	I centre of mass rises	B1
	gravitational potential energy gained	B1
	or II block has weight	B1
	force moves or something moves in direction of force or force makes block move/rotate	B1

Question	Answer	Marks
4(a)(i)	$(E =) Pt$ or 75×63 or $75 \times 63 \times 60$	C1
	$75 \times 63 \times 60 \times 60$ or 2.835×10^5 or 0.075×63	C1
	$1.7 \times 10^7 \text{ J}$	A1
4(a)(ii)	$2.0 \times 10^6 \text{ J}$	B1
4(b)(i)	non-renewable and gets used up / not replaced / will run out / finite	B1
4(b)(ii)	three separate approaches I / II / III	
	I greenhouse gases / CO / CO ₂ emitted	B1
	global warming / <u>increase</u> greenhouse effect / ice caps melt	B1
	or II acid rain / NO _x / SO ₂ emitted	B1
	breathing difficulty / damage to buildings / acidify lakes or damages / kills plants / sea-life / animals / fish	B1
	or III oil spills	B1
	damages / kills plants / sea-life / animals / fish	B1

Question	Answer	Marks
5(a)	joining together of (small) <u>nuclei</u> (to make bigger nuclei)	B1
	energy released	B1
	hydrogen (used) or helium (produced)	B1
5(b)	electromagnetic <u>radiation</u> / infra-red / light / ultraviolet	B1
	travels through vacuum or no medium needed	B1

Question	Answer	Marks
6(a)	reflection of <u>sound</u>	B1
6(b)(i)	decreases	B1
6(b)(ii)	does not change	B1
6(c)	$(\lambda =) c/f$ or 330/3700	C1
	0.089 m or 8.9 cm or 89 mm	A1

Question	Answer	Marks
7(a)(i)	$1/R = 1/R_1 + 1/R_2$ or $R_1 R_2 / (R_1 + R_2)$ or $1/R = 1/1800 + 1/9000$ or $9000 \times 1800 / 10\ 800$ or 0.00066667	C1
	1500 Ω	A1
7(a)(ii)	$(I =) V/R$ or 4.5/1500	C1
	0.0030 A or 3.0×10^{-3} A or 3.0 mA	A1
7(b)(i)	increases and resistance of LDR decreases	B1
7(b)(ii)	does not change and resistance / e.m.f. does not change / not affected by LDR	B1

Question	Answer	Marks
8(a)	$(Q =) It$ or 120×3.5	C1
	420 C	A1
8(b)	(small current) magnetises something physical or produces a magnetic field or produces an electromagnet	M1
	(terminals of motor) switch / contacts / terminals (in first circuit) attract / close	A1

Question	Answer	Marks
9(a)(i)	$(F =) ma$ or 160×0.35	C1
	56 N	A1
9(a)(ii)	$(v = u +) at$ or 0.35×1.2	C1
	0.42 m/s	A1
9(b)(i)	straight line of positive gradient from origin to $t = 1.2$ s	B1
	horizontal line after $t = 1.2$ s	B1
9(b)(ii)	area mentioned	B1
	area <u>under</u> the line or convert cm^2 (of graph paper) to distance or in terms of the scales	B1
9(c)(i)	1 arrow from space-station towards centre of Earth	B1
	2 gravitational field / attraction	B1
	of Earth	B1
9(c)(ii)	two separate approaches	
	I change of displacement	M1
	per unit time or divided by time	A1
	or II rate of change of distance or distance moved per unit time	M1
	in specified direction	A1
9(c)(iii)	1 (it / velocity) changes and (because its) direction changes / force perpendicular to velocity	B1
	2 (remains) constant and depends on speed / g.p.e. remains constant / (k.e.) is a scalar quantity / speed is constant	B1

Question	Answer	Marks
10(a)(i)	$(I =) P/V$ or 2.8/230 or 2800/230	C1
	0.012 or 12	C1
	12 A	A1
10(a)(ii)	12 A < integral number of amperes < 20 A	B1
10(b)(i)	$(Q =) m\Delta Tc$ or $6.3 \times (49 - 23) \times 4200$ or $6.3 \times 26 \times 4200$	C1
	$6.9 \times 10^5 \text{ J}$	A1
10(b)(ii)	<u>more thermal</u> energy is lost (per unit time)	B1

Question	Answer	Marks
10(c)(i)	(when heated) water expands / volume of water increases / water becomes less dense	B1
	heated water / water with more energetic particles rises	B1
	cooler / denser water sinks or circulation or convection current	B1
10(c)(ii)	two separate approaches I / II	
	I atoms / molecules / ions / particles vibrate (more violently)	B1
	collide with neighbouring atoms/molecules / ions / particles	B1
	energy / heat / vibration passed on (to neighbour)	B1
	or	
	II particles / atoms / molecules / ions vibrate (more violently)	B1
	atoms / molecules / ions / particles strike electrons	B1
10(c)(iii)	electrons travel through transporting energy / heat	B1
10(c)(iii)	<u>particles</u> / <u>molecules</u> / <u>atoms</u> move apart (on average)	B1
	volume increases and density decreases	B1

Question	Answer	Marks
11(a)(i)	steel	B1 B1
11(a)(ii)	iron	
11(a)(iii)	iron B1 (i) and (iii) both correct B1 (ii) correct	
11(b)(i)	clear use (e.g. change voltage / current)	M1
	detail of operation (to transmit electricity or in a charger etc.)	A1
11(b)(ii)	1 voltage on vertical axis and time on horizontal axis	B1
	clear attempt at sinusoidal curve for at least one cycle	B1
	2 ($V_S =$) $V_P N_S / N_P$ or $220 \times 85 / 1700$	C1
	11 V	A1
11(c)(i)	1 <u>magnetic</u> field / flux / flux linkage mentioned	B1
	magnetic field (lines) cut solenoid or v.v. or changing (magnetic) field / flux / flux linkage (in solenoid)	B1
	<u>induced</u> e.m.f. / voltage	B1
	2 it / current magnetises solenoid / produces magnetic field / flux(linkage) in solenoid / <u>produces</u> a S-pole (in solenoid)	B1
	magnet repelled or experiences a force to the left	B1
11(c)(ii)	smaller reading / deflection	B1
	reading in opposite direction	B1