Cambridge
O Level

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Cambridge Ordinary Level

PHYSICS **5054/21**

Paper 2 Theory **May/June 2017**

MARK SCHEME

Maximum Mark: 75

Published

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Question	Answer	Marks
1(a)	A – contact or reaction force B – driving force C – force of gravity D – air resistance and friction	**B1**
1(b)(i)	800 kg	**B1**
1(b)(ii)	400 N	**B1**
1(b)(iii)	(a =) F / m formula or with numbers	**C1**
	0.50 m / s^2	**A1**
1(c)	change in v = at in words or numbers	**C1**
	12 m / s	**A1**

Question	Answer	Marks
2(a)	greater pressure in Fig. 2.2 **and** smaller area (in contact) in Fig. 2.2 **or** <u>more force</u> through the back legs	**B1**
	pressure is inversely proportional to area **or** pressure is force / area	**B1**
2(b)	Any 2 of • centre of mass (on or) outside base / chair / leg • weight acts on left of / outside chair leg	**B1**
	• (anticlockwise) moment (created)	**B1**

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Question	Answer	Marks
3(a)	conduction in metal **or** convection (in liquid) mentioned by name	**B1**
	conduction explained as heat / energy passing from molecule to molecule **or** movement / diffusion / collision of (free) electrons	**B1**
	convection explained by rising of hot liquid **or** correct density changes	**B1**
3(b)	air is a bad conductor **or** less area in contact / all of cup does not touch plate	**B1**
3(c)	white **and** shiny	**B1**
	less radiation emitted / less emission	**B1**

Question	Answer	Marks
4(a)(i)	image height / object height **or** image distance / object distance	**B1**
4(a)(ii)	rays go to / meet at image **or** can be formed on a screen	**B1**
4(b)(i)	horizontal ray continued to bottom of I	**B1**
4(b)(ii)	2.4 cm	**B1**
4(b)(iii)	any two other rays drawn, e.g. through centre of lens	**B1**

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Question	Answer	Marks
5(a)	$1 / R_t = 1 / R_1 + 1 / R_2$ or $R_t = R_1R_2 / (R_1 + R_2)$ formulae or numbers using 20 and 40 Ω **or** 13(.3 Ω)	**C1**
	$R_t = R_1 + R_2$ or 20 + any attempt at parallel calculation	**C1**
	33(.3) Ω	**A1**
5(b)	$V_2 = V_3$	**B1**
	V_1 largest or larger than either V_2 or V_3	**B1**

Question	Answer	Marks
6(a)(i)	200 W	**B1**
6(a)(ii)	power × time **or** any numerical value of power × 3	**C1**
	0.6(0)	**A1**
6(a)(iii)	(I =) P / V algebraic or numerical	**C1**
	0.17 A	**A1**
6(b)	(if in neutral) rest of circuit / lamps / television not live / still high voltage / still 240 V **or** live has high voltage / 240 V / can cause shock	**C1**
	(if in neutral) <u>when</u> (switched) <u>off</u> circuit / lamps / television not live / still high voltage / still 240 V	**A1**

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Question	Answer	Marks
7(a)(i)	arrow or other indication left to right in rod or correct in circuit labelled C	**B1**
7(a)(ii)	arrow from N-pole to S-pole labelled M	**B1**
7(a)(iii)	arrow downwards labelled F	**B1**
7(b)(i)	rod cuts magnetic field / flux lines **or** flux (in circuit)1 changes	**B1**
	induced e.m.f. / voltage / current formed	**B1**
7(b)(ii)	move rod faster	**B1**

Question	Answer	Marks
8(a)	(high frequency) electromagnetic wave / ray	**B1**
8(b)	top line of beta 0	**B1**
	Xe proton and neutron numbers both balance	**B1**
8(c)	gamma rays pass out of / are not stopped by body	**B1**
	less chance of cell or gene damage / cancer / radiation sickness / mutation / ionisation (of body tissues)	**B1**

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Section B

Question	Answer	Marks
9(a)(i)	not being replaced **or** will run out	**B1**
9(a)(ii)	only oil in 1st column	**B1**
	only wind and hydroelectric in 2nd column	**B1**
	geothermal in 3rd column	**B1**
9(a)(iii)	less greenhouse gases / global warming / acid rain / **or** toxic gases / oil spills **and** how they affect a named organism / ecosystem	**B1**
9(a)(iv)	nuclear waste / radioactive waste causes (storage) problems **or** explosion / melt down / leak emits radioactivity	**B1**
9(b)(i)	generator (and transformer)	**B1**
9(b)(ii)	kinetic (energy)	**B1**
9(b)(iii)	1 24 000 kg	**B1**
	2 formula (E) = mL **or** (E **=**) mcT seen	**C1**
	$24\,000 \times 2.3 \times 10^6$ **or** $5.5(2) \times 10^{10}$ (J)	**C1**
	$24\,000 \times 4200 \times 90$ **or** $9.0(72) \times 10^9$ (J)	**C1**
	6.4×10^{10} J	**A1**
9(b)(iv)	low current	**B1**
	less energy / heat loss (in resistance or cables) **or** thinner wires can be used	**B1**

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Question	Answer	Marks
10(a)(i)	both reflected rays correct by eye	**B1**
	image in correct position shown by continuation of rays behind mirror	**B1**
10(a)(ii)	virtual **or** upright **or** laterally inverted **or** same size (as object)	**B1**
10(b)(i)	line (joining points)	**C1**
	line joining points / particles on wave with same phase **or** line joining points along a crest etc.	**A1**
10(b)(ii)1	correct angle to surface $\pm$ 7° with correct orientation **and** similar wavelength (by eye)	**B1**
10(b)(ii)2	at least two lines at smaller angle to surface with correct orientation in slower medium	**B1**
	showing smaller and constant wavelength with wavefronts deviated in correct direction	**B1**
10(c)(i)	(v =) fλ **or** 2(000) $\times$ 16	**C1**
	32 000 cm / s **or** 320 m / s	**A1**
10(c)(ii)1	a range with 15–25 Hz as the lowest frequency **and** 15–30 kHz as the highest	**B1**
10(c)(ii)2	1.6 cm (if highest frequency is 20 000 Hz)	**B1**
10(c)(iii)	tube or other method to produce (narrow) beam of sound on source and/or on detector	**B1**
	stated detector **or** stated reflector	**B1**
	detector moved to find maximum loudness **or** angles *i* and *r* measured with suitable experiment	**B1**

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Question	Answer	Marks
11(a)	battery and ammeter symbols correct	**B1**
	thermistor symbol correct	**B1**
	all connected in series	**B1**
11(b)(i)1	0.05 (A) seen	**C1**
	(V =) IR **or** 0.05 × 240	**C1**
	12 V	**A1**
11(b)(i)2	(R =) V / I **or** 0.12 (A) seen	**C1**
	100 Ω	**A1**
11(b)(ii)	description of change in resistance in two equal changes in temperature, e.g. 240–100 and 100–48	**C1**
	difference values obtained are not the same, with one value shown e.g. 140 and 52 (Ω)	**A1**
11(c)(i)	two different metals connected together	**B1**
	voltmeter, ammeter or galvanometer in series	**B1**
	clear junction of two different metals used as the place to measure temperature	**B1**
11(c)(ii)	ANY 2 lines from measures high(er) temperatures more sensitive to changes in temperature measures fast(er) changing temperatures / reading can be taken more rapidly produce electronic output / output may be stored or processed / may be read remotely	**B2**

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