

Cambridge IGCSE™

PHYSICS**0625/41**

Paper 4 Extended Theory

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MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)(i)	43 cm AND 63 cm	B1
1(a)(ii)	20 cm	B1
1(b)	0.28 N / cm	A2
	$k = F / x$ OR $(k =) F / x$ OR 5.6 / 20	C1
1(c)(i)	4.9 N	B1
1(c)(ii)	3.2(0) m / s ²	A3
	$F = ma$ OR $(a =) F / m$ OR $(6.5 - 4.9) / 0.50$	C1
	(resultant force =) 6.5 – 4.9 OR 1.6	C1

Question	Answer	Marks
2(a)(i)	1.8×10^5 kg m / s OR 1.8×10^5 N s	A2
	$p = mv$ OR $(p =) mv$ OR 1400 × 130	C1
2(a)(ii)	(scaled) area under the (graph) line	B1
2(a)(iii)	420 m	A2
	$\frac{1}{2}V_{\text{max}}t$ OR $\frac{1}{2} \times 130 \times 6.5$ OR $\frac{1}{2}bh$	C1
2(b)(i)	gradient is negative OR speed decreases	B1
2(b)(ii)	gradient is changing OR line / graph / it is a curve / curved	B1
2(c)	(from) kinetic (energy store)	B1
	to internal / thermal (energy store as final store)	B1

Question	Answer	Marks
3(a)	force $\times$ perpendicular distance (from pivot)	A2
	Any one from: • force $\times$ distance from pivot • reference to <u>perpendicular</u> distance (from pivot) • reference to <u>perpendicular</u> force	C1
	(it measures the) turning effect (of a force)	B1
3(b)(i)	point where (all) the weight (of an object) seems to act	B1
3(b)(ii)	$2.2 \times 10^7 \text{ N m}$	A2
	1.7 (m) OR 3.4 / 2 seen	C1
3(c)	resultant force = 0 OR (all) forces cancel out	B1
	resultant moment = 0 OR moments balance	B1

Question	Answer	Marks
4(a)	1 Any one method to transfer measurable amount of thermal energy for $\Delta\theta$: (a) to aluminium block (with electrical heater) (b) from aluminium block to known liquid (c) from known liquid to insulated aluminium (calorimeter) (d) to known liquid and aluminium (calorimeter) 2 Determination of energy transferred for $\Delta\theta$, to match workable method in 1: (a) Use of $E = Pt$ OR $E = IVt$ (b) Use of $E = mc\Delta\theta$ with s.h.c. of known liquid (c) Use of $E = mc\Delta\theta$ with s.h.c. of known liquid (d) Use of $E = Pt$ OR $E = IVt$ AND $E = mc\Delta\theta$ (with known s.h.c. of liquid) 3 Any one measurement from: • initial and final temperature / temperature change • time (of heating) • mass of aluminium 4 $c = E / m\Delta\theta$ OR $(c =) E / m\Delta\theta$	B1
4(b)(i)	Any three from: 1 (net) transfer of energy from higher temperature to lower temperature OR (net) transfer of energy from water / to dish 2 (energy transfer) by conduction OR aluminium is a good conductor (of thermal energy) 3 temperature of water decreases AND temperature of dish increases 4 no (net) transfer of energy when temperature of dish = temperature of water	B3
4(b)(ii)	(particles) gain energy in <u>kinetic</u> store (as temperature of aluminium increases)	B1
	(average) separation of (aluminium) particles increases OR (aluminium) particles move further apart	B1
4(b)(iii)	(water) molecules with more/enough energy escape from the surface	A2
	escape of more energetic molecules (from water) OR (molecules) leave from the surface	C1

Question	Answer	Marks
5(a)	0.20 m	B1
5(b)	any value in range from 330 m/s $\leq$ value $\leq$ 350 m/s	B1
5(c)(i)	(b) $\div$ (a) evaluated AND Hz	A2
	$f = v / \lambda$ OR ($f =$) v / λ OR (b) $\div$ (a)	C1
5(c)(ii)	audible/yes/it is OR inaudible / no / it isn't consistent with value in 5(c)(i) AND consistent explanation with reference to 20 (Hz) $\leq$ normal range of human hearing $\leq$ 20 000 (Hz)	B1
5(d)	1 (explanation mentions) diffraction	M1
	2 Only a little diffraction owtte	A1
	3 (because) gap width large (compared to wavelength) owtte	A1
	4 Little / no sound heard at J AND (some) sound heard at K	A1

Question	Answer	Marks
6(a)	work done by a unit charge passing through a component (electrical) work done AND moving charge	A2 C1
6(b)	(p.d. $\Rightarrow$) E – reading on voltmeter OR subtract reading on voltmeter from E	B1
6(c)(i)	(intensity of light on LDR) increased AND (temperature of thermistor) decreased	B1
6(c)(ii)	reading on voltmeter / it decreases	B1
	<i>Any two from:</i> 1 e.m.f. is constant 2 $R_{\text{LDR}}/R_{\text{thermistor}}$ decreases OR R_{LDR} is a smaller proportion of the total resistance 3 $V_{\text{LDR}}/V_{\text{thermistor}}$ decreases OR V_{LDR} is a smaller proportion of e.m.f. 4 $\frac{R1}{R2} = \frac{V1}{V2}$	B2

Question	Answer	Marks
7(a)	(soft) iron	B1
7(b)(i)	(at least) one complete field line between the poles of the bar (either above or below the bar)	B1
	no crossing AND attempt at correct shape AND at least six lines from / to poles	B1
	at least one arrowhead towards S pole	B1
7(b)(ii)	current (in the coil) decreases	B1
	(current decreases so magnetic field) strength decreases	B1
	(field strength decreases so) fewer field lines (in same area) OR (field strength decreases so) field lines further apart	B1
7(c)	<i>Any two from:</i>	B2
	1 (changing resistance causes) changing current (through solenoid)	
	2 (changing current causes) changing magnetic field (around solenoid)	
	3 (square) coil cuts (changing) magnetic field OR coil in changing magnetic field	
	e.m.f. <u>induced</u> (between terminals)	B1

Question	Answer	Marks
8(a)	6 electrons AND 6 protons (i.e. $6 \times$ AND $6 \bullet$)	B1
	8 neutrons (i.e. $8 \circ$)	B1
	protons and neutrons in nucleus AND electrons orbiting nucleus	B1
8(b)	(carbon) has one more neutron OR nitrogen has one fewer neutron	B1
	(carbon) has one fewer proton / electron OR nitrogen has one more proton / electron	B1
8(c)(i)	electron	B1
8(c)(ii)	a neutron changes into a proton (and electron)	B1
8(d)	17 000 years	A3
	$1.2 \times 10^{11} / 9.6 \times 10^{11}$ OR $1 / 8$ OR one halving seen e.g. $9.6 \times 10^{11} \div 2$	C1
	3 (half-lives) OR $1 / 8 \times 9.6 \times 10^{11} = 1.2 \times 10^{11}$	C1

Question	Answer	Marks
9(a)	group / collection of (billions of) <u>stars</u>	B1
9(b)	9.5×10^{17} (km)	A2
	(1 light-year $\Rightarrow$) 9.5×10^{15} (m) OR (1 light-year $\Rightarrow$) $3 \times 10^8 \times 365 \times 24 \times 3600$	C1
9(c)(i)	increase in wavelength (of light from far galaxy) OR (amount of) redshift	B1
9(c)(ii)	brightness of a supernova	B1
9(c)(iii)	(their) speeds are (directly) proportional to distances (from Earth) OR $H_0 = v/d$	B1
9(c)(iv)	4.5×10^{17} (s)	A2
	(age of Universe $\Rightarrow$) $1/H_0$ OR $1/(2.2 \times 10^{-18})$	C1