Cambridge Assessment International Education

Cambridge IGCSE™

PHYSICS **0625/42**

Paper 4 Extended Theory **October/November 2020**

MARK SCHEME

Maximum Mark: 80

Published

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[Turn over

Question	Answer	Marks
1(a)(i)	X near (30,60)	**B1**
1(a)(ii)	Y AND Z near any horizontal section of graph	**B1**
1(b)	any **two** from: • weight OR force of / due to gravity acts down • (force of / due to) air resistance / drag / friction acts up / opposes motion • initially / up to 10 s: resultant force is downward OR downward force is greater than upward force • resultant force causes acceleration • air resistance increases as speed increases / she accelerates	**B1**
	any **two** from: • acceleration (down) initially / for first 10 s • acceleration decreases as air resistance increases / resultant force decreases • zero acceleration / constant speed / terminal velocity reached when upwards force = downwards force OR when no / zero resultant OR when forces balanced OR when downward force = air resistance • terminal velocity / constant speed reached after (about) 10 s OR at 60 m / s	**B2**
1(c)	(average speed =) {initial speed + final speed} / 2 words, symbols or numbers OR (average speed =) distance (from area) / time words, symbols or numbers	**C1**
	(average speed = 40 / 2 =) 20 m / s OR (av speed = 80 / 4 =) 20 m / s	**A1**

Question	Answer	Marks
2(a)	force × perpendicular distance (from point)	**B1**
2(b)(i)	0.80 N	**B1**
2(b)(ii)	(moment = force × distance =) 0.8 × 0.25	**C1**
	(moment =) 0.20 N m	**A1**
2(b)(iii)	same value as (ii) with correct unit	**B1**
2(b)(iv)	$F \times 0.75 = 0.20$ in any form OR (F =) 0.2 / 0.75	**C1**
	(F = 0.2 / 0.75 =) 0.27 N	**A1**
2(c)	(perpendicular) distance (from pivot) of F decreases / is less (than 0.75 m) OR (perpendicular) distance (from pivot) of W increases / is more (than 0.75 m)	**M1**
	(so) increased / greater (force F) (needed for greater moment)	**A1**

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Question	Answer	Marks
3	(output) $P = VI$ OR $E = VIt$ OR $E = Pt$ in any form words, symbols or numbers OR (P =) VI OR (P =) 240 × 9 OR (P =) 2160 (W) OR (E =) 240 × 9 × 60 = 129 600 (J)	**C1**
	(rate of energy input = 720 000 / 60 =) 12 000 (J / s) OR energy input = 720 000 (J)	**C1**
	(efficiency =) (100 ×) output power / input power OR (100 ×) output energy / input energy words, symbols or numbers	**C1**
	(efficiency =) 100 × {2160 / 12 000}	**C1**
	(efficiency =) 18(%)	**A1**

Question	Answer	Marks
4(a)	thermocouple	**B1**
4(b)	(ΔT =) {1.7 / 5.4} × 100	**C1**
	(T = 31 + 20 =) 51°C	**A1**
4(c)	any application involving high(er) / low(er) temperatures OR rapidly changing temperatures OR on vibrating machinery OR remote sensing OR data logging OR small areas / masses	**B1**

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Question	Answer	Marks
5(a)(i)	(thermal) energy (needed) to change state	**M1**
	of unit mass / 1 kg (of material) NOT per °C	**A1**
5(a)(ii)	molecules must be separated OR (intermolecular) bonds must be broken / overcome	**B1**
	work done (against bonds) OR energy is required / needed NOT increase of KE / speed	**B1**
5(b)	$E = ml$ in any form or (l =) $E \div m$ words, symbols or numbers	**C1**
	(m =) 1.5 OR 1500 OR OR 3.8 – 2.3 OR 3800 – 2300	**C1**
	($l = 1.26 \times 10^6 \div 1.5$ =) 8.4×10^5 J / kg	**A1**
5(c)	insulate OR apply lagging / insulation (to container)	**B1**
	reduction of thermal energy / heat losses	**B1**

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Question	Answer	Marks
6(a)(i)	**1** amplitude marked correctly	**B1**
	2 wavelength marked correctly	**B1**
6(a)(ii)	trough labelled T	**B1**
6(b)	$f = 15 / 60$ (= 0.25)	**B1**
	$v = f\lambda$ in any form OR (v =) $f\lambda$ words, symbols or numbers	**B1**
	(v =) 0.08×0.25 (= 0.02 m / s) OR 0.25×8 (= 2.0 cm / s)	**B1**
	Alternative route 1 : $v = d \div t$ words, symbols or numbers	**(B1)**
	distance moved in one minute = 15×8 OR 120 OR 15×0.08 OR 1.2	**(B1)**
	(v =) $120 / 60$ (= 0.02 m / s) OR $120 \div 60$ OR $15 \times 0.08 \div 60$ OR $1.2 \div 60$	**(B1)**
	Alternative route 2 : time for 1 oscillation = 4 s	**(B1)**
	distance moved in 4 s = 8 cm	**(B1)**
	so speed = $8 \div 4$ = 2 cm / s	**(B1)**
6(c)	oscillation at right angles to the direction of propagation / travel / energy transfer (of the wave)	**B1**
	oscillation parallel to / in the direction of propagation / travel / energy transfer (of the wave) OR has compressions and rarefactions OR needs / must have a medium	**B1**

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Question	Answer	Marks
7(a)(i)	total internal reflection OR T.I.R.	B1
7(a)(ii)	sin $C = 1 \div n$ in any form OR (C =) $\sin^{-1}\{1 \div 1.4\}$	C1
	($C = \sin^{-1}\{1 \div 1.4\} = \sin^{-1} 0.714$ =) 46°	A1
7(b)	description of fibre passing to site to be examined / treated	B1
	light passes down fibre (to site) AND (image) returns (to sensor / observer) OR alternative use to endoscopy	B1
	extra detail, e.g. laser light source, illuminated organ, image, camera / type of sensor	B1
7(c)	any mention of frequency	B1
	(all of light) same / single / one frequency	B1

Question	Answer	Marks
8(a)	conditions (outdoors) may be damp / wet	C1
	water conducts (electricity) OR clear statement of need for waterproof / outdoor specification (components)	A1
8(b)	protects components / appliances / circuit / wires / user / mains supply prevents electrical supply overheating / fires / electrocution / shocks	B1
	excess current / power in circuit / wires OR fuse melts / blows OR circuit breaker opens	B1

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Question	Answer	Marks
9(a)(i)	C pointing horizontally to right	**B1**
	B AND D pointing horizontally to left	**B1**
9(a)(ii)	S on left AND N on right	**B1**
9(b)	any one of the following methods:	
	1 heat magnet	**C1**
	to high temperature / red hot	**A1**
	2 hammer the magnet	**(B1)**
	repeatedly / in E–W direction	**(B1)**
	3 (place) magnet in a coil / solenoid carrying a.c.	**(M1)**
	remove magnet from coil OR decrease current (slowly) to zero	**(A1)**
9(c)(i)	at least 3 concentric circles	**B1**
	closer together near the wire AND clockwise arrow	**B1**
9(c)(ii)	arrows OR field reverses / is in opposite direction	**B1**

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Question	Answer	Marks
10(a)(i)	recognisable ammeter in gap AB AND straight lines in CD AND EF	**B1**
10(a)(ii)	recognisable voltmeter across 4 Ω	**B1**
	correct voltmeter symbol used	**B1**
10(a)(iii)	$V = IR$ in any form or ($V =$) IR words, symbols or numbers	**C1**
	($V_{2\Omega} = 2 \times 2.5 =$) 5 V	**C1**
	($I_{4\Omega} = 5 \div 4 =$) 1.3 A must be clear that I refers to 4 Ω OR calculates R_p = 1.33 Ω OR 4 ÷ 3 Ω	**C1**
	($I_{6\Omega} = 2.5 + 1.3 =$) 3.8 A OR ($I_{6\Omega} = 5 \div 1.33 =$) 3.8 A	**A1**
	Alternative route for first 3 mps	
	I proportional to $1 \div R$ OR $I_{2\Omega} \times R_{2\Omega} = I_{4\Omega} \times R_{4\Omega}$	**C1**
	$I_{4\Omega} = I_{2\Omega} \div 2$	**C1**
	($I_{4\Omega} = I_{2\Omega} \div 2 = 2.5 \div 2 =$) 1.3 A	**C1**
	Alternative route by potential divider	
	$V = IR$ in any form or ($V =$) IR words, symbols or numbers	**C1**
	($V_{2\Omega} = 2 \times 2.5 =$) 5 V	**C1**
	$V_T = 7.33 \times 5 \div 1.33$ (= 27.51 V)	**C1**
	($I_{6\Omega} = 27.51 \div 7.33 =$) 3.8 A	**A1**

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Question	Answer	Marks
10(b)	any sort of triangle symbol pointing to left in EF	**B1**
	a wire in CD	**B1**

Question	Answer	Marks
11(a)	nuclear fission – nucleus / atom splits (into two) **AND** nuclear fusion – two nuclei / atoms join together	**B1**
	One from • {nuclear fission –large(r) mass (number) OR heavy nuclei / atoms involved OR neutrons involved / emitted} **AND** nuclear fusion – small(er) mass (number) OR light nuclei / atoms involved OR no neutrons • fission in a nuclear reactor AND fusion in Sun / stars • fission produces very radioactive / long lasting waste • fission makes lighter new elements AND fusion makes heavier new elements • fission at normal p / T AND fusion at high p / T • fusion produces more energy (than fission)	**B1**
11(b)(i)	longer half-life – radioactive substance active in body for a long time	**B1**
	shorter half-life – might be insufficient time for investigation OR it takes time / hours for the tracer to spread round the body	**B1**
11(b)(ii)	proton numbers balance for equation expected answer : ${}_{42}Mo \rightarrow {}_{43}Tc + {}_{-1}\beta$	**B1**
	all nucleon numbers correct	**B1**
	correct proton and nucleon number for β-particle	**B1**
11(b)(iii)	any suitable use, e.g. sterilisation of equipment, treatment of cancer, gamma for diagnosis, radiotherapy NOT any link to X-rays	**B1**

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