Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/41**

Paper 4 Extended Theory **May/June 2017**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)	decrease of velocity / speed OR slows / slowing down	**B1**
1(b)(i)	Area under graph OR ½ (u +v)t OR ½ × (11 + 5) × 3 OR ½(6 × 3) OR (3 × 5)	**C1**
	24 m	**A1**
1(b)(ii)	(a =) Δv / Δt OR (v – u) / t OR (5 – 11) / (6 – 3)	**C1**
	2.0 m / s^2	**A1**
1(c)(i)	(deceleration) decreases	**B1**
1(c)(ii)	(Resultant force) decreases	**B1**
	Total:	**7**

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Question	Answer	Marks
2(a)(i)	Ft OR 180 × 0.050	**C1**
	9.0 Ns OR 9.0 kg m / s	**A1**
2(a)(ii)	$Ft = m(v – u)$ OR $Ft = mv – mu$ OR $Ft = mv$ OR (m =) Ft / v OR 9.0 / 20	**C1**
	0.45 kg	**A1**
2(a)(iii)	mgh = ½ mv^2 OR (h =) $v^2 / 2$ g	**C1**
	(h =) $20^2 / (2 × 10)$	**C1**
	20 m	**A1**
	OR $t = v / g = 2$	**(C1)**
	h = average speed × time	**(C1)**
	20 m	**(A1)**
2(b)	Elastic (energy) OR strain (energy)	**B1**
	Total:	**8**

Question	Answer	Marks
3(a)(i)	(Weight is) force/pull of gravity (acting on an object)	**B1**
3(a)(ii)	Mass × acceleration due to gravity OR *m*g OR 350 × 7.5	**C1**
	2600 N	**A1**
3(b)	(*ρ* =) *m* / *V* in any form	**C1**
	0.27 (kg / m^3) OR 270 (g / m^3)	**A1**
	Balloon moves/floats <u>up</u>	**B1**
	(Floats when) density of balloon less than density of atmosphere OR (sinks when) density of balloon greater than atmosphere	**B1**
	OR (*ρ* =) *m* / *V* in any form	**(C1)**
	110 g	**(A1)**
	Balloon rises	**(B1)**
	(Floats when) mass/weight of balloon less than mass/weight of atmosphere (of same volume as balloon) (Sinks when) mass/weight of balloon greater than mass/weight of atmosphere (of same volume as balloon)	**(B1)**
	Total:	**7**

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Question	Answer	Marks
4(a)(i)	60 W	**B1**
4(a)(ii)	Radiation and either conduction or convection	**B1**
4(b)(i)	Radiation mentioned	**B1**
	Higher reading or rises faster on thermometer A	**B1**
	Black (surface) is a good/better emitter (than polished surface) OR polished (surface) is a poor/bad/worse emitter (than black surface)	**B1**
4(b)(ii)	(Compared with black bulb thermometer) readings rise more slowly OR readings are low(er)	**B1**
	Shiny (bulb) surfaces are good/better reflectors (of radiation) OR Shiny (bulb) surfaces are poor/bad/worse absorbers (of radiation)	**B1**
4(c)	Firefighter does not get too hot/burned (from radiation)	**B1**
	Total:	**8**

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Question	Answer	Marks
5(a)	Pressure increases	**B1**
	Molecules (of gas) move faster/their kinetic energy increases/their momentum increases	**B1**
	(Molecules) collide with walls/piston more often/more frequently OR greater (rate of) change of momentum	**B1**
	(Molecules) exert greater/more force (on wall)/hit (walls) harder	**B1**
5(b)	Pressure (of gas) falls **and** volume (of gas) increases	**B1**
	Initially there is a larger pressure inside than outside/atmospheric pressure OR (Piston stops when) pressure (of gas) = external/outside/atmospheric pressure	**B1**
	Total:	**6**

Question	Answer	Marks
6(a)(i)	(Ray passes into the air and) refracts / changes direction / bends	**B1**
6(a)(ii)	Total internal reflection (takes place)	**B1**
6(b)(i)	Total internal reflection at B with angle of incidence equal to angle of reflection (by eye)	**B1**
	Refraction into air at right-hand face with angle of refraction greater than angle of incidence	**B1**
6(b)(ii)	(n =) 1/sin c OR 1/sin 41	**M1**
	1.5	**A1**
	Total:	**6**

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Question	Answer	Marks
7(a)	Number of wavefronts (generated/produced/passing a point) in 1 sec/per sec/in unit time	**B1**
7(b)(i)	(Part of wave where) pressure/density is higher OR molecules are closer together	**B1**
7(b)(ii)	At least 3 wavefronts shown as part semi-circles	**B1**
	Same separation between wavefronts drawn by candidate as for incident wavefronts	**B1**
7(b)(iii)	Less spreading out OR less diffraction	**B1**
7(c)(i)	(λ =) v / f OR 340 / 6800	**C1**
	0.050 m	**A1**
7(c)(ii)	In range 900 – 2000 m / s	**B1**
	Total:	**8**

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Question	Answer	Marks
8(a)	Steel/aluminium/nickel/cobalt/alnico/neodymium/ferrite/alcomax	**B1**
8(b)(i)	Mention of magnetic field or magnetic flux OR field created by bar magnet	**B1**
	(Magnetic) field (lines) of magnet cut by coil OR (magnetic) field (lines) linked with/through/in the coil changes OR(magnetic) flux (through coil) changes	**B1**
	e.m.f. induced	**B1**
8(b)(ii)	Direction of movement of magnet through the coil OR which pole of magnet enters the coil	**B1**
	Direction of induced e.m.f. opposes change producing it OR (coil) end near magnet/left-hand end becomes a N-pole OR (coil) repels magnet (when moved in)	**B1**
8(c)	Hammer the magnet	**M1**
	repeatedly/until demagnetised/in E/W direction	**A1**
	OR Heat the magnet	**(M1)**
	high temperature/red hot/in E-W direction	**(A1)**
	OR Place magnet in coil carrying A.C.	**(M1)**
	Remove magnet from coil OR decrease the current (slowly) to zero	**(A1)**
	Total:	**8**

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Question	Answer	Marks
9(a)(i)	LDR OR light-dependent resistor	**B1**
9(a)(ii)		**B1**
9(b)(i)	$I = V / R$	**C1**
	(total resistance =) 1.2 + 2.4 OR 3.6 seen	**C1**
	I = 6.0 / (1.2 + 2.4) OR 1.67 or 1.7 (mA)	**C1**
	(V =) 4.0 V	**A1**
	OR (V_1)= [R_1 / (R_1 + R_2)] V	**(C1)**
	(total resistance =) 1.2 + 2.4 OR 3.6 seen	**(C1)**
	(V_1) = (2.4 / 3.6) 6.0	**(C1)**
	= 4.0 V	**(A1)**
9(b)(ii)	Replace the 1.2 kΩ resistor with one of higher value OR Increase the temperature (of the thermistor or the room)	**B1**
	Total:	**7**

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Question	Answer	Marks
10(a)	Electrons/negative charges removed from/flow from/lost (from the object)	**B1**
10(b)(i)	At least 3 plus signs in top half of sphere	**B1**
	Same number of minus signs in bottom half of sphere	**B1**
	OR Excess of plus signs over minus signs in top half of sphere	**(B1)**
	Equal excess of minus signs over plus signs in bottom half of sphere	**(B1)**
10(b)(ii)	(with rod present) connect earth (to sphere) OR touch (sphere) with conductor/finger	**M1**
	Remove earth wire **and** then remove charged rod OR remove conductor/finger **and** then rod.	**A1**
	Total:	**5**

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Question	Answer	Marks
11(a)	Background count rate stated as in range 17 – 21 counts / s	**B1**
	Background used on at least 2 of first 3 readings	**C1**
	Any halving of corrected or uncorrected reading	**C1**
	(half-life =) ½ hour	**A1**
11(b)	$^{3}_{1}H$ on LHS of an equation	**B1**
	$^{0}_{-1}\beta$ on RHS of equation	**B1**
	Equation all correct: $^{3}_{1}H = {}^{0}_{-1}\beta + {}^{3}_{2}X$	**B1**
11(c)	Top: any path to the left within 45° horizontal	**B1**
	Middle: path to the right and deflected down (ending in a straight line)	**B1**
	Bottom: path not deflected OR path to the right and deflected up <u>much</u> less than middle path	**B1**
	Total:	**10**

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