Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/42**

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

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)(i)	(a scalar) does **not** have direction	**B1**
1(a)(ii)	energy **and** temperature	**B1**
1(b)	straight line **and** non-zero gradient	**B1**
1(c)	scale ⩾ 1 cm: 1 m / s	**B1**
	two arrows/lines **and** correct resultant OR rectangle and correct diagonal (towards bottom left)	**B1**
	7.2→7.6 m / s	**B1**
	26.0° ⩽ angle below E–W ⩽ 30.5° OR 239.5° ⩽ bearing ⩽ 244°	**B1**
	Total:	**7**

Question	Answer	Marks
2(a)	Column 1 Box 3 mass same	**B1**
	Column 2 Box 4 weight 1/6	**B1**
	Column 3 Box 3 deceleration same	**B1**
2(b)	P=F / A in any form or (F=) PA	**C1**
	(F_1 = 500 000 × 0.00065 =) 330 (N)	**C1**
	$F_1d_1 = F_2d_2$ in any form or F_1d_1/d_2	**C1**
	(F_2 = 325 × 7/24 =) 95 N	**A1**
	Total:	**7**

Question	Answer	Marks
3(a)	'force and time'	**B1**
3(b)(i)1.	(momentum =) mv	**C1**
	(momentum = 2.4 × 3 =) 7.2 kg m / s OR Ns	**A1**
3(b)(i)2.	$(m_A + m_B)v = m_A$ x 3 OR momentum conserved	**C1**
	(v = 7.2 / 3.6 =) 2.0 m / s	**A1**
3(b)(i)3.	(impulse / Ft =) m(v – u)	**C1**
	(impulse / Ft = 1.2 × (2–0) =) 2.4 kg m / s OR N s	**A1**
3(b)(ii)	thermal/sound energy (produced at collision/lost)	**B1**
	Total:	**8**

Question	Answer	Marks
4(a)	impulse/change of momentum (of molecules) during collision	**B1**
	{force (to change momentum) <u>of molecules</u> OR <u>molecules</u> hitting walls} (causes pressure)	**B1**
4(b)	more (frequent) collisions <u>with walls</u>	**B1**
	greater (total) force (caused by molecules) OR reduced area OR grater (rate) change of momentum (of molecules)	**B1**
4(c)	$p_1V_1 = p_2V_2$ in any form OR (p_2 =) p_1V_1 / V_2	**C1**
	($p_2 = 500 \times 1.1 \times 10^5 / 200$ =) 2.8×10^5 Pa	**A1**
	Total:	**6**

Question	Answer	Marks
5(a)(i)	E = mc(Δ)T in any form or (E=) mc(Δ)T	**C1**
	(E= 0.6 × 4200 × 80 =) 200 000 (J)	**C1**
	E = VIt in any form or (t=)E / VI	**C1**
	(t= 201 600 / (12 × 240) =) 70 s	**A1**
5(a)(ii)	no (thermal) energy losses	**B1**
5(b)	put (hot) water in bottle AND place thermometers/measure temperatures each side of (centre of) bottle	**M1**
	put thermometers near bottle	**A1**
	good detail e.g. • thermometers equal distances from bottle • thermometer bulbs same height • record temperatures regularly	**A1**
	thermometer near black has higher reading/rises faster/larger temperature difference or reverse argument	**A1**
	Total:	**9**

Question	Answer	Marks
6(a)(i)	3.4 cm	**B1**
6(a)(ii)	30 cm	**B1**
6(b)	v= f λ in any form **or** (f =)v / λ	**C1**
	(f = 8.0/2.5=) 3.2 Hz	**A1**
6(c)(i)	3 crests straight AND some spreading out	**B1**
	2 wavelengths same as original	**B1**
6(c)(ii)1.	(wavelength) increases/ longer AND (because wave) travels further in same/periodic time or because wave has higher speed /moves faster	**B1**
6(c)(i)2.	More diffraction/spreading/deflection out/more curved OR no/smaller straight part in centre	**B1**
	Total:	**8**

Question	Answer	Marks
7(a)(i)	(n =) speed in air / speed in liquid	**C1**
	(n = 3×10^8 / 2.0×10^8) = 1.5	**A1**
7(a)(ii)	n = sin i / sin r in any form	**C1**
	(r = $\sin^{-1}$ (sin 40 / 1.5) =) 25°	**A1**
7(b)	one ray from object either with refraction at surface OR vertical	**M1**
	another ray from object, must have refraction at surface away from normal	**A1**
	both rays extended back to meet in the liquid AND intersection labelled image/ I	**B1**
	Total:	**7**

Question	Answer	Marks
8(a)(i)	P=VI in any form OR (I =) P / V	C1
	(I = 9.0 / 6.0 =) 1.5 A	A1
8(a)(ii)	V=IR in any form OR (R =) V/I OR $P=V^2/R$ in any form OR (R =) V^2 / P	C1
	(R = 6.0 / 1.5 =) 4.0 Ω or (R = 36 / 9.0 =) 4.0 Ω	A1
8(b)(i)	resistance <u>of wire</u> is greater (than at X) OR current is less OR p.d. <u>across lamp</u> is less	B1
8(b)(ii)	(for normal brightness of lamp,) resistance <u>of circuit</u> (= 12 / 1.5) = 8.0 Ω	C1
	resistance <u>of wire</u> = (8.0 – 4.0 =) = 4.0 Ω	C1
	(distance AX = 1.0 × 4/5 =) 0.80 m OR (sliding contact is) 0.80 m (from A)	A1
	OR V across AX = 6.0 V	(C1)
	resistance <u>of wire</u> = (6/current from a(i) =) 4.0 Ω	(C1)
	(distance AX = 1.0 × 4/5 =) 0.80 m OR (sliding contact is) 0.80 m (from A)	(A1)
	Total:	8

Question	Answer	Marks
9(a)(i)	arrow left to right **and** horizontal, labelled (M)	**B1**
9(a)(ii)	if M L to R arrow downwards, labelled (F) if M R to L arrow upwards, labelled (F)	**B1**
9(b)	force reversed/opposite of 9(a)(i)	**B1**
9(c)(i)	one ring (roughly circular) centred on wire	**M1**
	(at least) three rings (roughly circular)	**A1**
	field lines clockwise (as drawn)	**B1**
9(c)(ii)	(magnetic field is) stronger **or** field lines closer together	**B1**
9(d)	(vertically) downwards	**B1**
	Total:	**8**

Question	Answer	Marks
10(a)	2→4 arrows outwards at any angle 	**B1**
10(b)	NOR	**B1**
10(c)(i)	logic circuit with 2 inputs & 1 output. Circuit contains at least 2 acceptable gates. No other gates used	**M1**
	logic circuit that produces correct output	**A1**
10(c)(ii)	work from input to output, any intermediate point labelled X following acceptable gate(s) only with truth table correct for circuit drawn	**B1**
	Total:	**5**

Question	Answer	Marks
11(a)	(some) β/beta/radiation would penetrate gloves/reach other body parts (so insufficient protection)	**B1**
	middle: any path to the left within 45° of horizontal	**B1**
	bottom: path to the right and deflected down ending in a straight line	**B1**
11(b)	radiation from background/rock/air/outer space/cosmic rays	**B1**
	random variation owtte.	**B1**
11(c)	thick gloves would stop α/alpha (so helpful)	**B1**
	(some) β/beta/radiation would penetrate gloves/reach other body parts (so insufficient protection)	**B1**
	Total:	**7**