Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/42**

Paper 4 Extended Theory **October/November 2019**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Question	Answer	Mark
1(a)	(A = 44 × 20 =) 880 (m^2)	**C1**
	V = A × depth in any form OR (d =) V / A	**C1**
	(d = 264 / 880 =) 0.30 m	**A1**
1(b)	ρ = m / V in any form OR (ρ =) m / V	**C1**
	(ρ = 2.7 × 10^5 / 264 =) 1020 kg / m^3	**A1**
1(c)	p = ρgh in any form OR (p =) ρgh	**C1**
	(p = 1020 × 10 × 0.3 =) 3 100 Pa	**A1**
1(d)	tape measure	**B1**

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Question	Answer	Mark
2(a)	no resultant force OR forces are balanced OR all forces in opposite directions are equal OR forces cancel	**B1**
	no resultant {moment / torque / turning effect} OR (sum of) clockwise moment(s) = (sum of) anticlockwise moment(s)	**B1**
2(b)(i)	1. down arrow labelled W at dashed line on 50 cm mark	**B1**
	2. up arrow labelled R at pivot	**B1**
2(b)(ii)	expression / evaluation for one correct moment seen	**C1**
	expressions / evaluation for all correct moments seen	**C1**
	equation seen relating correct expressions / evaluations for moments: moment of 0.5 N + moment F = moment of W OR 90 F = 43 OR 0.9F = 0.43	**C1**
	(F = 43 / 90 OR 0.43 / 0.9 =) 0.48 N	**A1**
2(b)(iii)	upwards force = downwards force	**C1**
	(R =) 1.2 N	**A1**

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Question	Answer	Mark
3(a)	they / molecules collide with walls	**B1**
	change of momentum causes force (to be exerted on walls)	**B1**
	pressure = force / area (so pressure is exerted on walls)	**B1**
3(b)	pV = constant or $p_1 V_1 = p_2 V_2$ in any form	**C1**
	$p_1 \times 820 = 20\,000 \times 330$ OR $(p_1 =)\ 20\,000 \times 330 / 820$	**C1**
	$(p_1 =)$ 8000 Pa	**A1**

Question	Answer	Mark
4(a)	$E = VIt$ in any form OR $(E =)\ VIt$ OR $(E =)\ 3 \times 12 \times 23 \times 60$	**C1**
	$(E =)$ 50 000 (J)	**C1**
	$C = E / \Delta T$ in any form OR $(C =)\ E / \Delta T$ OR $(C =)$ 49 680 / 50 OR 50 000 / 50	**C1**
	$(C =)$ 990 J / °C	**A1**
4(b)	1. larger sphere emits / radiates / loses thermal energy more	**M1**
	greater (surface) area	**A1**
	2. greater (rate of radiation)	**B1**

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Question	Answer	Mark
5(a)(i)	(compression region:) particles / they close(r)	**B1**
	(rarefaction region:) particles / they far / further apart	**B1**
5(a)(ii)	(longitudinal) oscillations / vibrations parallel to direction of wave (motion) / energy transfer OR medium is required OR cannot be polarised	**B1**
	(transverse) oscillations / vibrations perpendicular to direction of wave (motion) / energy transfer OR medium not required OR can be polarised	**B1**
5(b)(i)	$v = f\lambda$ in any form OR (λ =) v / f	**C1**
	(λ =) 3500 / 120	**C1**
	(λ =) 29 m	**A1**
5(b)(ii)	frequency not changed (in different medium)	**B1**
	audible / yes AND audible range 20 Hz – 20 kHz	**B1**

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Question	Answer	Mark
6(a)(i)	{light from water OR light to air / eye OR light from coin} bends / changes direction / is refracted	**B1**
	refracts / bends away from normal OR angle of incidence is smaller than angle of refraction	**B1**
6(a)(ii)	refraction	**B1**
6(a)(iii)	rays do not meet at image / only appear to come from image / do not originate from image / cannot be seen on a screen owtte	**C1**
6(b)	3.0×10^{8} m / s	**B1**
6(c)	$n = c_a / c_w$ in any form OR (c_w =) c_a / n	**C1**
	(c_w =) candidate's **(b)** / 1.3	**C1**
	(c_w =) 2.3×10^{8} m / s	**A1**

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Question	Answer	Mark
7(a)(i)	deflection	**B1**
	(then) reverse deflection / current / voltage OR greater deflection OR deflection for shorter time OR change of (magnetic) field / flux	**B1**
7(a)(ii)	larger deflection OR deflection for shorter time	**M1**
	higher speed OR larger (rate of) change of magnetic field / flux	**A1**
7(b)	{current / power too high OR trip hazard} AND cut (in insulation) AND plug / socket on damp / wet (grass)	**B1**
	overheating / fire in extension lead OR trip hazard	**B1**
	short circuit / shock / electrocution through cut (in insulation)	**B1**
	short circuit / shock / electrocution through plug on damp / wet (grass)	**B1**

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Question	Answer	Mark
8(a)	R proportional to length	**C1**
	R proportional to 1 / area	**C1**
	(R =) 0.14 × (3 / 2) × (4 / 9)	**C1**
	(R =) 0.093 (Ω)	**A1**
8(b)(i)	first two rows correct	**B1**
	last two rows correct	**B1**
8(b)(ii)	NOR gate correctly connected accept OR gate followed by NOT gate	**M1**
	correct symbol(s) for NOR gate accept OR gate followed by NOT gate	**A1**

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Question	Answer	Mark
9(a)	where / region a(n electric) charge experiences a force	**B1**
9(b)	All criteria must be met • 5 lines with both ends within 2 mm of plates by eye • middle 3 lines straight and within 10° of horizontal by eye • top / bottom lines, straight or with outward smooth curves, ends vertically <= 16 mm below / above ends of plates, if curved horizontally symmetrical by eye • spacing between lines: 7 mm $\leqslant$ spacing $\leqslant$ 23 mm	**B1**
	at least 1 arrow left to right NOT any arrow R to L	**B1**
9(c)(i)	I = Q / t in any form OR (Q =) It	**C1**
	(Q =) 0.21 $\times$ 10 $\times$ 60 $\times$ 60	**C1**
	(Q =) 7600 C	**A1**
9(c)(ii)	E = VQ in any form OR (E =) VQ OR (E =) 1.2 $\times$ 7560	**C1**
	(E =) 9100 J	**A1**
9(c)(iii)	chemical (potential energy)	**B1**

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Question	Answer	Mark
10(a)	neutron charge = 0 γ-ray mass = 0 AND charge = 0 He nucleus mass = 4 m He nucleus charge = 2 e	**B1** **B1** **B1** **B1**
10(b)	any 3 different valid points, e.g. • detail of handling source appropriately for, e.g. use of tongs • protective clothing • minimise exposure by time OR distance OR activity • detail of shielded storage • detail of secure storage • monitoring exposure • must be disposed of securely • limitation of access to approved personnel • procedure in place in case of accident / criminal act to protect people and / or environment	**3** × **B1**

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