Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/43**

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	Marks
1(a)	attempt to use 2 rectangles for A	**C1**
	A = ((1 × 3.2) + (1.1 × 1.6) = 3.2 + 1.76 =) 4.96 (m^2)	**C1**
	9.9 m^3	**A1**
1(b)	$\rho = m / V$ OR $m = \rho V$ OR (m =) 9.9 × 1.1 × 10^3	**C1**
	(m =) 1.1 × 10^4 kg	**A1**
1(c)	depth of water = 1.2 m	**C1**
	(P =) ρgh OR (P = 1.1 × 10^3 × 10 × 1.2)	**C1**
	(P =) 1.3 × 10^4 Pa	**A1**

Question	Answer	Marks
2(a)(i)	moment = force × distance	**C1**
	moment = force × perpendicular distance	**A1**
2(a)(ii)	turning effect owtte	**B1**
2(a)(iii)	(quantity that has) magnitude and direction	**B1**
2(b)	provides (anticlockwise) moment	**M1**
	total clockwise moment = total anticlockwise moment OR resultant turning effect = 0	**A1**

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Question	Answer	Marks
3(a)(i)	from gravitational potential	**B1**
	to kinetic	**B1**
3(a)(ii)	KE gained = PE lost or $1 / 2mv^2 = mgh$	**C1**
	$h = v^2 / 2g$	**C1**
	22 m	**A1**
3(a)(iii)	No energy lost to surroundings (as thermal energy) OR No air resistance	**B1**
3(b)	Any **two** from geothermal, nuclear and tidal	**B2**

Question	Answer	Marks
4	Solids – molecules in lattice arrangement	**B1**
	solids – strong forces between molecules	**B1**
	liquids – molecules not fixed in place OR molecules have an irregular arrangement OR molecules (slightly) further apart (on average) than in solids OR spaces between the molecules	**B1**
	liquids – (average) forces too weak to keep molecules in a definite pattern OR forces just enough to hold molecules in the bulk of the liquid	**B1**
	gases – molecules far apart	**B1**
	gases – weak / no forces between molecules (except during collisions)	**B1**

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Question	Answer	Marks
5(a)	(energy =) power x time in any form	**C1**
	= 3000 × 3.5 × 60	**C1**
	= 630 000 J	**A1**
5(b)	(E =) $mc\Delta T$ in any form	**C1**
	m = 1700 / 1000	**C1**
	ΔT = (100–19) OR ΔT = 81	**C1**
	(E =) $\frac{1700}{1000} \times 4200 \times 81$	**C1**
	= 580 000 J	**A1**
5(c)	Efficiency = $\frac{\text{useful energy output}}{\text{total energy input}}$ OR $\frac{580\,000}{630\,000}$ (× 100)	**C1**
	= 0.92 OR 92%	**A1**

Question	Answer	Marks
6(a)(i)	compression	**B1**
6(a)(ii)	rarefaction	**B1**
6(b)	correct wavelength indicated	**B1**
6(c)	closer together at compression and further apart at rarefaction	**B1**
	amplitude changes	**B1**
	loudness does not affect wavelength	**B1**
6(d)	more spread out / further apart	**B1**
	Velocity / speed greater in water than air	**B1**
	(so) wavelength greater	**B1**

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Question	Answer	Marks
7(a)	ray parallel to axis and through F	**M1**
	ray through centre of lens	**M1**
	position of image correct and labelled	**A1**
7(b)	enlarged and upright	**B1**
	virtual	**B1**
7(c)	different colours have different wavelengths / different frequencies / refracted by different amounts OR dispersion (in glass)	**B1**

Question	Answer	Marks
8(a)	radial lines from sphere	**B1**
	arrows pointing towards sphere	**B1**
8(b)	$Q = It$, in any form OR 0.21×75	**C1**
	16 C	**A1**

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Question	Answer		Marks
9(a)(i)	voltmeter shown connected across LED		**B1**
9(a)(ii)	ammeter shown connected in series with LED		**B1**
9(b)	p.d. across two resistors in parallel = (3.7 – 2.1 =) 1.6 V	resistance of circuit = (3.7 / 0.19) = 19.5 Ω AND resistance of LED (= 2.1 / 0.19) = 11.1 Ω	**B1**
	combined resistances of two resistors in parallel = R / 2 OR $1 / R = 1 / R_1 + 1 / R_2$ OR $R = R_1 R_2 / R_1 + R_2$ OR current in either R = I / 2	resistance across parallel combination of resistors = (19.5 – 11.1) = 8.4 Ω	**B1**
	$R = V / I$ in any form	$R = V / I$ in any form	**C1**
	$R / 2 = 1.6 / 0.19$	$R / 2$ = 8.4 Ω	**C1**
	17 Ω	17 Ω	**A1**

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Question	Answer	Marks
10(a)(i)	movement of magnet relative to coil OR induces emf / pd / current (across / in LED)	**B1**
	light goes off when magnet no longer directly below coil	**B1**
10(a)(ii)	door closes more quickly than it was opened so higher current in LED	**B1**
	door / magnet moving for shorter length of time	**B1**
10(b)	Any two from: • quick response • protects against electric shock • protects against overheating • (easily) re-settable • avoids damage to lawnmower	**B2**

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Question	Answer	Marks
11(a)	top: any path to the left within 45 degrees to the horizontal	**B1**
	middle: path to the right and deflected up (ending in a straight line)	**B1**
	bottom: path to the right and deflected down (ending in a straight line)	**B1**
11(b)	192	**B1**
	use or clear indication of 4 half-lives	**C1**
	(192 / 16 =) 12	**A1**
	28	**B1**
11(c)	any 3 different valid points e.g. • must be stored with shielding • must be stored securely / safely • must be transported with shielding • must be transported securely • expensive to store • expensive to transport • in case of accident / terrorism could escape to environment / danger to people • site of storage uninhabitable for thousands of years	**3 x B1**

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