Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/43**

Paper 4 Extended Theory **May/June 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)(i)	constant velocity / speed	**B1**
1(a)(ii)	deceleration / negative acceleration	**B1**
1(a)(iii)	Stationary	**B1**
1(b)	v = gradient OR $\frac{\text{distance}}{\text{time}}$ OR $\frac{160}{100}$ OR evidence of use of gradient	**C1**
	(*v* =) 1.6 m/s	**A1**
1(c)	line curves upwards with increasing gradient NOT vertical	**B1**

Question	Answer	Marks
2(a)	KE = 1/2 mv^2 in any form OR (KE) = $1/2 \times 1.2 \times 10^6 \times 0.04^2$	**C1**
	(KE =) 960 J	**A1**

Question	Answer	Marks
2(b)	EITHER	
	(change in momentum) = *mv* OR (change in momentum) = $1.2 \times 10^6 \times 0.04$	**C1**
	(=) 4.8×10^4 (kg m/s)	**C1**
	change in momentum = Ft in any form	**C1**
	(Force = $4.8 \times 10^4 / 0.3$ =) 1.6×10^5 N	**A1**
	OR	
	a = (v-u)/t = 0.04/0.3	**(C1)**
	= 0.13 (m/s^2)	**(C1)**
	F = ma	**(C1)**
	(Force = $1.2 \times 10^6 \times 0.13$ =) 1.6×10^5 N	**(A1)**
2(c)	Work done or KE transferred = Fd in any form	**C1**
	(distance = $960 / 1.6 \times 10^5$ =) 6 .0 $\times 10^{-3}$ m OR 0.006 m OR 0.60 cm	**A1**
2(d)	smaller force (on dock/ship) because increases time of collision OR increased distance of collision (on the dock/ship)	**B1**

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Question	Answer	Marks
3(a)	(p) = ρgh in any form OR (p=) $1030 \times 10 \times 3.0 \times 10^3$	**C1**
	3.1×10^7 Pa	**A1**
3(b)(i)	$v = d/t$ OR $v = 2d/t$ in any form	**C1**
	$1500 = \frac{2d}{0.50}$ OR $2d = 1500 \times 0.50$	**C1**
	380 m	**A1**
3(b)(ii)	distance smaller (first box ticked) AND speed of sound lower (in air than liquid)	**B1**

Question	Answer	Marks
4(a)	Any two from: bubbles form OR occurs throughout liquid only occurs at one temperature/boiling point does not produce cooling OR not affected by surface area / humidity / draught OR does not lower KE of molecules left in the liquid.	**B2**
4(b)	$E = Pt$ in any form OR (E) = 370×240	**C1**
	= 89 000 (J)	**A1**
	$E = mc\Delta T$ in any form	**C1**
	(temperature increase =) 89 000 / {5.0×420} =) 42 °C	**A1**

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Question	Answer	Marks
5(a)	any mention of radiation/infra-red radiation wrt silvered surfaces	**B1**
	silvered surfaces are poor emitters / poor absorbers / (good) reflectors	**B1**
	glass is a poor conductor OR glass reduces thermal energy / heat gain by conduction	**B1**
	vacuum prevents thermal energy / heat gain by conduction OR convection	**B1**
	stopper reduces thermal energy / heat gain by convection	**B1**
5(b)	any suitable insulator e.g. cork, plastic, rubber	**B1**

Question	Answer	Marks
6(a)(i)	diffraction	**B1**
6(a)(ii)	wave on left half the wavelength of waves in Fig 6.1	**B1**
	both wavelengths on right same wavelength as on left	**B1**
	much less spreading than in Fig 6.1	**B1**
6(b)	3 numbers correct	**B1**
	all 5 numbers correct (Correct answer: 1, 4, 5, 3, 2)	**B1**
6(c)(i)	3.0×10^8 m/s	**B1**
6(c)(ii)	$v = f\lambda$ in any form OR ($\lambda = v/f$)	**C1**
	96×10^6 seen	**C1**
	($\lambda = \frac{3.0 \times 10^8}{96 \times 10^6}$ =) 3.1 m	**A1**

Question	Answer	Marks
7(a)	40°	**B1**
7(b)	n = 1.3 OR seen in calculation	**C1**
	sin *i* / sin *r* = *n* in any form OR sin 40 / sin*r* = *n* sin *i* / sin *r* = 1 / *n*	**C1**
	(sin *r* = 1.3 × sin 40°) (r =) 57°	**A1**

Question	Answer	Marks
8(a)	*P* = *VI* in any form	**C1**
	I (= $\frac{700}{240}$) = 2.9 A	**A1**
8(b)	13 A fuse	**B1**
	any **two** out of: 2.9 + 7.5 SEEN if too low it would break / blow / melt when the appliances are operating normally if fuse too high wouldn't break / blow until current was too high which would be dangerous (to people /wires /appliance)	**B2**
8(c)	(Resistance inversely proportional to area so) resistance of thicker wire is lower	**B1**
	Fuse will melt at higher current	**B1**
	because heating effect = $I^2 R$ OR less heating effect (for same current) owtte	**B1**
8(d)(i)	Any **two** renewable sources of energy from: solar, wind, water, hydroelectric, waves, tidal, geothermal	**B2**
8(d)(ii)	Any relevant disadvantage for one of their <u>correct</u> answers to **(d)(i)** e.g.: Energy for wind / waves / Sun not always available Cost of building wind turbines or tidal barrages or hydroelectric dams Wind turbines affect the scenery of some areas Solar (farms) use (agricultural) land / takes up a lot of space	**B1**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>9(a)</td><td>light dependent resistor OR LDR</td><td>B1</td></tr>
<tr><td rowspan="3">9(b)</td><td>
<table>
<tr><th>Input 1</th><th>Input 2</th><th>Output</th></tr>
<tr><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>0</td></tr>
</table>
</td><td></td></tr>
<tr><td>2 input columns and one output column AND 4 correct rows of input</td><td>B1</td></tr>
<tr><td>All 4 rows with correct, in any order</td><td>B1</td></tr>
<tr><td rowspan="4">9(c)</td><td>D E
1 1
1 1
0 0
0 1</td><td></td></tr>
<tr><td>all D correct</td><td>B1</td></tr>
<tr><td>first 2 rows of E correct</td><td>B1</td></tr>
<tr><td>last 2 rows of E correct</td><td>B1</td></tr>
<tr><td>9(d)</td><td>conductors have free / delocalised electrons / electrons which move (freely) (electrons in insulators don’t move or are fixed)</td><td>B1</td></tr>
</table>

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Question	Answer	Marks
10(a)	Correct shape of graph showing one rotation	**B1**
	Graph starts from maximum voltage (positive or negative) (labelled horizontal)	**B1**
	Graph passes through zero twice, labelled 1 / 4 and 3 / 4 revolution	**B1**
10(b)	induced e.m.f. caused by coil cutting magnetic field OR coil moving in magnetic field	**B1**
10(c)	slip rings	**B1**
	(provide) continuous connection while coil rotating	**B1**
10(d)	Any two of: increase strength of magnetic field increase speed of rotation of the coil increase numbers of turns of coil	**B2**

Question	Answer	Marks
11(a)	$^{241}_{95}\text{Am} \rightarrow {}^{4}_{2}\alpha + {}^{237}_{93}\text{Np}$	
	Am on L with correct proton no	**B1**
	Am on L with correct nucleon no	**B1**
	alpha symbol on R with correct proton and nucleon no	**B1**
	Np on R with correct proton and nucleon no.	**B1**
11(b)(i)	current decreases / is stopped AND alpha particles absorbed (by smoke) owtte	**B1**
11(b)(ii)	Any **two** from: alpha particles highly ionizing / more ionising than beta particles or gamma rays alpha particles short range (in air) safer to use alpha because they do not travel out of smoke detector	**B2**

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