Cambridge Assessment International Education

Cambridge IGCSE™

PHYSICS **0625/43**

Paper 4 Extended Theory **May/June 2021**

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.

Cambridge International is publishing the mark schemes for the May/June 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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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.

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.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
5	‘List rule’ guidance For questions that require ***n*** responses (e.g. State **two** reasons …): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked *ignore* in the mark scheme should not count towards ***n***. • Incorrect responses should not be awarded credit but will still count towards ***n***. • Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response. • Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

6	<u>Calculation specific guidance</u> Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'. For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values. For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme. Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.
7	<u>Guidance for chemical equations</u> Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme. State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
1(a)	(extension =) 15 cm	**A2**
	$F = kx$ **OR** $x = F/k$ **OR** 3.0/0.2	**C1**
1(b)	extension is proportional to load	**B1**
	up to the limit of proportionality, extension proportional to load	**B1**
1(c)	graph initially straight line with positive gradient that passes through the origin	**B1**
	point labelled, increasing gradient to the right	**B1**
1(d)	• from elastic / strain energy • to gravitational potential energy EITHER: • to kinetic energy, when moving from A to equilibrium OR from kinetic energy, when moving from equilibrium to B	**B3**

Question	Answer	Marks
2(a)(i)	pressure = force/area accept P inversely proportional to area	**B1**
	same force exerted by each group of books	**B1**
	area (in contact with bookshelf) in group B is greater OR area (in contact with bookshelf) in group A is smaller	**B1**
2(a)(ii)	(pressure =) 1900 Pa	**A3**
	force = $6 \times 0.52 \times 10$ OR 31(.2) seen	**C1**
	area = $6 \times 0.013 \times 0.21$ OR 0.016(38) seen OR 163.8 (cm^2)	**C1**

Question	Answer	Marks
2(b)	(depth =) 19 m	**A3**
	$p = \rho gh$ OR $(3.0 - 1.0) \times 10^5 = 1030 \times 10 \times h$ in any form	**C1**
	$h = (3.0 - 1.0) \times 10^5/1030 \times 10$ OR $h = 2.0 \times 10^5/1030 \times 10$	**C1**

Question	Answer	Marks
3(a)	thinking time is constant	**B1**
3(b)	kinetic energy	**B1**
	kinetic energy = $\frac{1}{2} mv^2$	**B1**
	work done (to lose KE) = Fd (so stopping distance is proportional to v^2)	**B1**
	OR (alternative route)	
	time to decelerate is proportional to v	**(B1)**
	d = average $v \times t = \frac{1}{2} v \times t$	**(B1)**
	d is proportional to v^2	**(B1)**
3(c)(i)	0.68 s	**A2**
	$t = d/v$ OR 15/22 in any form	**C1**
3(c)(ii)	15 000 N	**A2**
	Ft = change in momentum OR $F \times 2.1 = 1400 \times 22$ in any form OR $F = ma$ OR (F =)$(1400 \times 22)/2.1$)	**C1**

Question	Answer	Marks
4(a)(i)	Energy transferred when 1 kg / unit mass of a substance freezes or melts	A2
	Energy transferred when a substance freezes/melts/changes state	C1
4(a)(ii)	cup containing mixture of ice and water	M1
	mixture of ice and water will remain at 0 °C until all ice is melted (but temperature of water at 0 °C rises) or reverse argument OR energy needed for change of state so temperature doesn't rise until this has taken place	A1
4(b)(i)	in evaporation more – energetic / faster moving molecules / molecules with high(er) kinetic energy escape (from surface)	B1
	low(er) energy / slow molecules remain OR so remaining liquid is cooler	B1
	thermal energy is taken from person to liquid (so person cools down)	B1
4(b)(ii)	(great(er) / fast(er) evaporation of sweat as) wind blows fast moving molecules away OR molecules do not re-enter the liquid	B1

Question	Answer	Marks
5(a)(i)	part of a circle, at least quarter of a circle, centred on centre of gap	B1
	waves same wavelength as incident waves	B1
5(a)(ii)	waves pass through gap remaining straight	B1
	less / no diffraction occurs	B1
5(b)	1.8 m	A2
	$\lambda = v/f$ OR 1500/850 in any form	C1

Question	Answer	Marks
6(a)	principal focuses marked in correct position	**B1**
6(b)	1 mark for each of: • 1 correct ray • 2nd correct ray • 3rd correct ray and image, labelled I, in correct position with arrow at bottom	**B3**
6(c)	real	**B1**
	inverted and enlarged	**B1**
6(d)(i)	(image produced by a magnifying glass is) upright OR NOT inverted OR virtual	**B1**
6(d)(ii)	position marked between principal focus and lens	**B1**

Question	Answer	Marks
7(a)	energy supplied	**M1**
	to drive a unit charge / 1 C round a complete circuit	**A1**
7(b)(i)	(R =) 2.3 Ω OR 2.2 Ω	**A3**
	$R = V/I$ in any form	**C1**
	current in R = 4 (A) OR p.d. across R = 9 (V)	**C1**
7(b)(ii)	1.1 Ω	**A3**
	resistance proportional to length (so twice length twice resistance)	**C1**
	resistance inversely proportional to area (so twice diameter decreases resistance by factor of 4)	**C1**

Question	Answer	Marks
8(a)	digital signal only two states – low or high OR 0 or 1	B1
	analogue signal any value	B1
8(b)	 correct symbol for NOR gate	B1
8(c)(i)	AND	B1
	OR	B1
8(c)(ii)	rows 1, 2, 5, 6 all 1	B1
	rows 3, 4, 7, 8 all 0	B1

Question	Answer	Marks
9(a)	(N_S =) 24 000	A2
	$N_S = N_P \times V_S / V_P$ OR $50 \times 110 \times 10^3$ / 230 in any form	C1
9(b)	labelled diagram showing: • (soft)-iron core • copper coils • fewer coils on secondary than primary	B3
9(c)	alternating voltage in primary	B1
	alternating / varying / changing magnetic field (in iron core)	B1
	voltage is induced in the secondary coil	B1

Question	Answer	Marks
10(a)(i)	curve bending downwards while in magnetic field (and labelled α)	**B1**
10(a)(ii)	curve bending in opposite direction from α while in magnetic field **OR** up the page if no curve shown for α in **(a)(i)** (and labelled β)	**B1**
	greater curvature for β than for α	**B1**
10(a)(iii)	line passing straight through magnetic field (and labelled γ)	**B1**
10(b)	any **two** from: • stand behind shielding provided / wall / as far away as possible • store in lead-lined boxes • limit exposure time / (monitoring exposure) with film badge • do not allow pregnant staff to work	**B2**
10(c)(i)	$^{131}_{53}\mathrm{I}$	**B1**
10(c)(ii)	any **two** from: • γ can be detected outside body • needs long enough half-life to be detected / reach part of the body required • needs short enough half-life to soon have very little activity • gamma weakly ionising or pass out of body without harm	**B2**