Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

PHYSICS **5054/22**

Paper 2 Theory **October/November 2018**

MARK SCHEME

Maximum Mark: 75

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)	it / speed does **not** have a direction / is a scalar quantity	**B1**
1(b)(i)	direction (of velocity) changes (as it moves around the Earth)	**B1**
	its velocity changes with time (this is an acceleration)	**B1**
1(b)(ii)	arrow from satellite towards (centre of) Earth	**B1**
1(c)	**no** work done **and** force perpendicular to motion / no movement in direction of force	**B1**
	(kinetic and gravitational potential) energy remains constant / no effect	**B1**

Question	Answer	Marks
2(a)	(place where entire) mass (seems) to be located	**B1**
2(b)	wide base / base area large	**B1**
	low centre of mass	**B1**
2(c)	suspend lamina next to plumb line / mass on string	**B1**
	mark vertical line on lamina / line along string / plumb line	**B1**
	repeat from another point **and** centre of mass at intersection of lines	**B1**

Question	Answer	Marks
3(a)	all the water is heated **or** the water is mixed up **or** water heated uniformly **or** distributes heat (better)	**B1**
	heated water rises **or** cold water sinks **or** convection transfers thermal energy (upwards)	**B1**

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Question	Answer	Marks
3(b)(i)	molecules move / vibrate faster / more kinetic energy	B1
	molecules push each other apart **or** molecules move apart **or** space between molecules increases **or** vibrate with greater amplitude	B1
3(b)(ii)	rises **and** liquids expand more (than solids)	B1

Question	Answer	Marks
4(a)(i)	radiation **or** infrared (radiation / waves) **or** light	B1
4(a)(ii)	it / a black surface is a good absorber / poor reflector of radiation	B1
	more energy / power output **or** more electricity produced	B1
4(b)(i)	(P =) VIt **or** $24 \times 15 \times 3600$ **or** $24 \times 15 \times 60$ **or** 22 000 (J)	C1
	1.3×10^6 J	A1
4(b)(ii)	(ΔQ =) $mc\Delta T$ **or** 29 (°C) **or** 45 – 16 (°C)	C1
	$51 \times 4200 \times 29$ **or** $51 \times 4200 \times (45 - 16)$	C1
	6.2×10^6 J	A1

Question	Answer	Marks
5(a)	charges / electrons are not free to move (in an insulator)	B1
	any sensible example e.g. plastic / nylon / glass / rubber	B1
5(b)(i)	negative charge on left of K **and** positive charge on right of L	M1
	equal numbers of charges **and** number $\leqslant 5$ **and** no charges on right of K **and** no charges on left of L	A1

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Question	Answer	Marks
5(b)(ii)	1 (negative) charge spreads throughout (surface of) sphere	**B1**
	2 (positive) charge on L disappears **or** L becomes neutral **or** equal number of positive and negative charges	**B1**

Question	Answer	Marks
6(a)	32 counts / minute	**B1**
6(b)(i)	second (beta-particles) **and** third (gamma-rays) boxes ticked	**B1**
6(b)(ii)	1 28	**B1**
	2 32	**B1**
6(c)(i)	(average) time (taken for)	**M1**
	count rate / number of nuclei / number of atoms to halve	**A1**
6(c)(ii)	some readings are bigger than those before / readings fluctuate	**B1**
	half-life / 5.3 years too long **or** 5 / 6 minutes too short	**B1**

Question	Answer	Marks
7(a)	magnetic (material)	**B1**
	temporary / soft magnetic (material)	**B1**
7(b)(i)	it / a.c. changes direction **or** changes polarity / from positive to negative (continually)	**B1**
	it / a.c. has varying size **or** is sinusoidal / like a sine wave	**B1**

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Question	Answer	Marks
7(b)(ii)	magnetic field (in core / secondary coil) is not changing / remains constant	**B1**
	no (electromagnetic) induction	**B1**

Question	Answer	Marks
8(a)(i)	1 quantity of matter (in a body)	**B1**
	2 balance **or** scales	**B1**
8(a)(ii)	(*k.e.* =) $\frac{1}{2}mv^2$	**C1**
	$\frac{1}{2} \times 0.16 \times 8.7^2$	**C1**
	6.1 J	**A1**
8(b)(i)	1 deceleration **or** retardation	**B1**
	2 negative gradient **or** line slopes downwards (left to right)	**B1**
8(b)(ii)	1 0.88 s $\leqslant$ time $\leqslant$ 0.90 s	**B1**
	2 area **or** counting squares **or** $\frac{1}{2}bh$ in some form	**C1**
	3.7 s $\leqslant$ distance $\leqslant$ 4.1 m	**A1**
8(b)(iii)	ball hits ground **or** short time for deceleration **or** large force **or** ground is hard	**B1**
8(b)(iv)	internal / thermal energy (of ball and ground) has increased	**B1**
	(internal energy) from kinetic energy	**B1**

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Question	Answer	Marks
8(c)	any **two** from: smaller time to drop to zero velocity / hit ground line not straight **or** velocity does not change uniformly **or** gradient not constant smaller area under (first part of) graph **or** less distance travelled slower final velocity initial downward gradient steeper	**B2**

Question	Answer	Marks
9(a)	frequency of sound wave small(er) **or** its frequency is less than 20 000 Hz	**B1**
9(b)(i)	transmission of energy	**B1**
	(through a medium) with no net movement of medium **or** by vibrating particles	**B1**
	vibrations parallel (and antiparallel) to wave / energy travel direction **or** cannot be polarised	**B1**
9(b)(ii)	1 two centres of rarefactions labelled *R*	**B1**
	2 distance from one point to adjacent identical point indicated (with double-headed arrow)	**B1**
	3. (v =) $f\lambda$ **or** 25 000 × 0.047 / 0.048 / 0.049 **or** 25 000 × 4.7 / 4.8 / 4.9 **or** 25 000 × 47 / 48 / 49	**C1**
	1200 m / s	**A1**
9(c)(i)	decreases	**B1**
9(c)(ii)	four / five straight lines in air that touch the compressions still in the liquid **and** no intermediate / extra lines between the correct lines	**B1**
	at least four compressions in air parallel to each other	**B1**
	at least four straight lines at shallower angle from horizontal **and** slope correct	**B1**

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Question	Answer	Marks
9(d)	object (to be cleaned) immersed in liquid / solvent	**B1**
	object / liquid agitated / vibrated by ultrasound	**B1**
	dirt (particles) shaken off **or** dislodges / removes dirt	**B1**

Question	Answer	Marks
10(a)	electrons **c.a.o.**	**M1**
	towards the ammeter **or** away from the negative terminal **or** towards the positive terminal	**A1**
10(b)(i)	thermistor **c.a.o.**	**B1**
10(b)(ii)	$1 / R_T = 1 / R_1 + 1 / R_2$ **or** $1 / R_T = 1 / 1.5 + 1 / 6.0$ **or** $(R_T =) R_1R_2 / (R_1 + R_2)$ **or** $1.5 \times 6.0 / (1.5 + 6.0)$	**C1**
	1.2 (Ω)	**C1**
	2.5 Ω	**A1**
10(b)(iii)	$(I =) V / R$ **or** $12 / 2.5$	**C1**
	4.8 (A)	**A1**
10(b)(iv)	$I_A = I_R + I_Z$	**B1**
10(c)	resistance of Z / thermistor decreases	**B1**
	resistance of parallel combination decreases **or** total resistance (of circuit) decreases **or** current increases	**B1**
	voltage (across 1.3 Ω) increases	**B1**
	trace moves towards top of screen / upwards	**B1**

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Question	Answer	Marks
10(d)(i)	8	**B1**
10(d)(ii)	1.5 V	**B1**

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