Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

PHYSICS **5054/21**

Paper 2 Theory **May/June 2019**

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.

Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

PUBLISHED

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.

Question	Answer	Marks
1(a)(i)	58 km	**B1**
1(a)(ii)	0.8(0) hr **or** 48 min	**B1**
1(b)	steep(er) / larg(er) slope / gradient **or** travels a larger distance in the same / unit time **or** takes a shorter time to travel the same distance **or** covers more distance in less time	**B1**
1(c)	(s =) d / t numerical or algebraic; 58 / 4	**C1**
	15 km / hr	**A1**

Question	Answer	Marks
2(a)	coal and oil underlined	**B1**
2(b)(i)	water boils or turns to steam	**B1**
	<u>pressure / force</u> of steam turns turbine **or** steam at high pressure / pressure difference (across turbine)	**B1**
2(b)(ii)	(Q =) mcT numerical or algebraic	**B1**
	$4.9 \cdot 10^7$ J	**B1**

Question	Answer	Marks
3(a)	*in spring:* elastic or strain (potential energy)	**B1**
	in muscles: chemical (potential energy)	**B1**
3(b)	spring extends a different distance for the same (extra) load **or** load is no longer proportional to extension **or** becomes easier to pull	**B1**
3(c)(i)	(W =) Fd numerical or algebraic; 400 · 0.23	**C1**
	92 J	**A1**
3(c)(ii)	measure / determine the no. of times he extends the spring in 60 s	**B1**
	power = (total) work / time explained	**B1**

Question	Answer	Marks
4(a)	no / small(er) force between gas molecules (so they separate) **or** large(r) force between liquid molecules (keeps them together)	**B1**
	small(er) distance between liquid molecules **or** large(r) distance between gas molecules **or** density of liquid larger	**B1**
4(b)(i)	$P_1V_1 = P_2V_2$	**B1**
4(b)(ii)	volume change = 8 · 5 or 40 cm^3 **or** final volume = 60 (cm^3) seen	**C1**
	$1.2 \cdot 10^5 \cdot 100 = p \cdot 60$	**C1**
	$2(.0) \cdot 10^5$ Pa	**A1**
4(b)(iii)	more hits per second **or** hit more often / more frequently **or** more hits <u>on walls</u>	**B1**

Question	Answer	Marks
5(a)	adjusts the variable resistor / rheostat **or** change the number of cells	**B1**
5(b)(i)	current proportional to voltage **or** V = kI where k is a constant	**M1**
	provided temperature / physical conditions unchanged	**A1**
5(b)(ii)	at least two values of V/I or I/V shown to be the same;	**B1**
5(b)(iii)	use 0–10 A range for 220 and 320 mA readings **and** 0–200 mA range for 100 mA reading **or** start with 10 A / highest range **and** either reduce to 200 mA for last reading reduce range **and** keeping high value on scale / not over scale	**B1**

Question	Answer	Marks
6(a)	blows / melts / cuts off circuit / stops current **and** when the current is high	**B1**
6(b)(i)	(I =) P/V numerical or algebraic	**B1**
	6.2, 6.25 or 6.3 A	**B1**
6(b)(ii)	any integral value 7–13 A	**B1**
6(c)	double insulated **or** outside case / body is plastic / rubber	**B1**

Question	Answer	Marks
7(a)(i)	magnetic field / flux mentioned	**B1**
	change in field / flux (in coil) **or** field (lines) cut coil / wire	**B1**
7(a)(ii)	more turns **or** stronger magnet **or** move magnet faster	**B1**
7(b)(i)	 correct symbol	**B1**
7(b)(ii)	converts more of the input energy / power into light / useful energy / power **or** less energy / power wasted with same input energy / power **or** in same time **or** same input power / energy / current gives more light / less energy wasted / power wasted / heat / greater power out **or** less input power / energy gives same output power / energy	**B1**

Question	Answer	Marks
8(a)(i)	attempt to use potential divider formula or split 12 V in ratio 200:1200 **or** I = 12 / (2000 + 1200) numerical or algebraic with total resistance	**C1**
	7.5 V	**A1**
8(a)(ii)	resistance (of thermistor / circuit) falls	**B1**
	fixed resistor has larger fraction / share of total voltage **or** voltage across thermistor falls **and** sum of voltages the same **or** current in circuit increases (and V = IR explained for fixed resistor)	**B1**
	EITHER	
8(b)	(increased current in coil causes) coil / core / relay to become magnetised	**B1**
	coil / core attracts (iron / magnetic) switch	**B1**
	OR	
8(b)	transistor switches on / (gives) high (collector) current	**B1**
	occurs when base and emitter voltage is high (> 0.6 V) **or** small current into base gives larger output / collector current	**B1**

Section B

Question	Answer	Marks
9(a)(i)	amount / measure / quantity of matter / substance (in a body) **or** (property of a body) that resists (change in) motion	**B1**
9(a)(ii)	force / pull of gravity **or** in a gravitational field	**B1**
9(b)	(a =) F / m algebraic or numerical **or** 400 (N) seen	**C1**
	400 / 60	**C1**
	6.7 m/s^2	**A1**
9(c)(i)	initial curve of correct shape from origin at 0 to 30 s	**B1**
	horizontal line at 44 m/s from 30 s to 40 s	**B1**
	speed drops from 44 to 5 m/s in a time of 4 s	**B1**
	constant speed of 5 m/s until 200 s (and then to zero)	**B1**
9(c)(ii)	(a =) (v – u) / t algebraic or numerical	**C1**
	9.7 **or** 9.8 m/s^2	**A1**
9(d)(i)	upwards force / air resistance = weight / downward force	**B1**
9(d)(ii)	increase in air resistance / upwards force (from parachute)	**B1**
	upwards / force / air resistance larger than weight / downwards force **or** resultant force upwards	**B1**
9(d)(iii)	air resistance decreases (as speed reduces) until it equals weight **or** (with parachute open) air resistance = weight at lower speed	**B1**

Question	Answer	Marks
10(a)(i)	1.7 (cm) seen or any multiple of wavelength measured on diagram	**C1**
	6.4–7.2 cm	**A1**
10(a)(ii)	number of waves/cycles/oscillations in one second / unit time	**C1**
	number of wavelengths/crests/troughs/ wave cycles/wave oscillations generated/made/pass a point in one second/unit time **or** number of oscillations of a source/particle in one second / unit time	**A1**
10(a)(iii)	2.5 Hz	**B1**
10(a)(iv)	moved up and down	**B1**
	regularly **or** at constant frequency / 2.5 times a second	**B1**
10(a)(v)	*speed* smaller / decreases **and** *wavelength* smaller / decreases	**B1**
10(b)(i)	tape measure **or** trundle wheel **or** microphones	**B1**
	stopwatch **or** timer	**B1**
10(b)(ii)	start timer on seeing the smoke from gun / sound picked up by microphone	**B1**
	stop timer on hearing sound	**B1**
	measure (large) distance between students	**B1**
10(b)(iii)	both between and including 1000 and 10 000 m/s	**B1**
	solid speed > liquid speed	**B1**

Question	Answer		Marks
11(a)(i)	Geiger Muller (tube / counter / detector)		**B1**
11(a)(ii)	keep distance (away from source) **or** use absorber **or** use for short time		**B1**
11(b)(i)	time between emissions varies / unpredictable **or** different readings (when repeated for same time)		**B1**
11(b)(ii)	repeated count for a specified time	measure time when count / event occurs	**B1**
	result not the same	not always the same	**B1**
11(c)(i)	radiation when there is no source **or** naturally occurring (radiation) **or** always present		**B1**
11(c)(ii)	measure count (rate) with no source		**B1**
	subtract from (measured) count (rate for same time)		**B1**
11(d)(i)	4.5 cm		**B1**
11(d)(ii)	alpha		**M1**
	range of alpha less than 5–7 cm (in air)		**A1**
11(d)(iii)	air atoms / molecules lose / gain electrons (to become ions)		**B1**
11(e)	points plotted at (0, 300) and (40, 150)		**B1**
	points plotted at (80, 75) and (120, 37.5)		**B1**
	smooth curve joining at least 3 correct points		**B1**