Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

PHYSICS **5054/21**

Paper 2 Theory **May/June 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.

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)	distance measured (between 2 marks) with metre rule or tape measure	**B1**
	time measured (between 2 marks) with stopwatch / stopclock / timer	**B1**
	(average speed =) (total) distance / time	**B1**
1(b)(i)	decrease in speed **or** deceleration	**B1**
1(b)(ii)	(Δv =) a $\times$ t in any form numerical or algebraic	**C1**
	4.5 m / s	**A1**

Question	Answer	Marks
2(a)(i)	equal and opposite forces **or** no resultant force	**B1**
2(a)(ii)	box moves / slides	**B1**
2(a)(iii)	constant velocity **or** constant speed and direction	**B1**
2(b)	(resultant force) 15 (N) seen	**C1**
	(a=) F / m in any form numerical or algebraic	**C1**
	0.60 m / s^2	**A1**

Question	Answer	Marks
3(a)	they / molecules hit (inside) wall	**B1**
	they / molecules create a force **and** a reference to <u>area</u>	**B1**
3(b)(i)	$p_1V_1 = p_2V_2$ in any form numerical or algebraic	**C1**
	400 cm^3	**A1**
3(b)(ii)	ANY 2 from • no gas / air / molecules escape(s) • temperature constant • no forces between molecules	**B2**

Question	Answer	Marks
4(a)	force × distance (moved)	**C1**
	force × distance <u>moved</u> in direction of force	**A1**
4(b)	mgh in any form numerical or algebraic	**C1**
	21 J	**A1**
4(c)	larger force is needed (by woman / on rope)	**B1**
	(because of either) • friction / heat produced • <u>weight</u> of rope / her arms • flag / rope gains K.E. • flag accelerates / gains speed	**B1**

Question	Answer	Marks
5(a)	correct circuit symbols for battery, resistor, variable resistor, ammeter and voltmeter	**B1**
	ammeter in series with resistor **and** voltmeter in parallel in correct series circuit	**B1**
5(b)(i)	(R=) V / I in any form numerical or algebraic	**C1**
	3.5 Ω	**A1**
5(b)(ii)	voltage **or** current **or** power too large	**B1**
	calculation of power as 5(.04) W or 5.6 W **or** max voltage as 3.4(2) V or 3.2(4) V **or** max current as 0.88 A or 0.93 A	**B1**
5(b)(iii)	no **and** half voltage (2.1 V across each) **or** half current (0.54 A through each) **or** quarter power (1.13 W in each)	**B1**

Question	Answer	Marks
6(a)	rod in coil	**B1**
	current passed through coil	**B1**
6(b)	bring close to (both ends of) another magnet	**B1**
	repelled (from one end) by magnet	**B1**

Question	Answer	Marks
7(a)	friction (between shoes and carpet) causes charging **or** electrons move from foot to carpet or carpet to foot	**B1**
	charge / electrons (on person) flows (to handle causing shock) or v.v.	**B1**
7(b)(i)	they / drops repel (each other)	**B1**
	they / drops have same charge (as each other)	**B1**
7(b)(ii)	(positive) drops attracted by negative (leg)	**B1**

Question	Answer	Marks
8(a)	coil A (has more turns) **and** voltage to house less than 25 000 V / step down transformer	**B1**
8(b)	to transfer the field from primary to secondary **or** to increase flux / field / flux linkage in coil B	**B1**
8(c)	changing magnetic field / flux (in B or secondary) **or** field lines cut	**B1**
8(d)	advantage: • visual effect • ability for more development above ground • no chance of touching it **and** electrocution (in normal use) • less likely to be damaged by storm / wind	**B1**
	disadvantage: • cost of construction • difficulty of maintenance **or** damage due to digging / erosion • difficulty of knowing where line is / finding or repairing faults	**B1**

Question	Answer	Marks
9(a)	**true false false true** all 4 correct 2 marks	**B1**
	3 correct 1 mark	**B1**
9(b)(i)	correct refraction towards normal on entering prism	**B1**
	splitting into colours occurs at first surface	**B1**
	red at top and blue / violet at bottom inside and outside prism if shown	**B1**
9(b)(ii)	(different colours have) different speeds in the glass **or** different refractive indices	**B1**
	different (angles of) refraction **or** refract at different angles	**B1**
9(c)(i)	3(.0) $\times$ 10^8 m / s	**B1**
9(c)(ii)	(t=) d / s in any form algebraic or numerical, e.g.	**C1**
	500 s	**A1**
9(d)(i)	(I=) Q / t in any form algebraic or numerical, e.g. 180 / 2	**C1**
	1.5 A	**A1**
9(d)(ii)	1st column helium nucleus **or** 2 protons and 2 neutrons	**B1**
	2nd column positive **and** neutral / no / charge / none	**B1**
	3rd column paper / thin metal / skin / few cm air etc. **and** (thick) lead / thick metal / concrete / stone / earth OR never completely stopped / nothing	**B1**

Question	Answer	Marks
10(a)(i)	*Pair 1* boiling occurs at one temperature / constant temperature evaporation occurs at all / any temperature	**B1**
	Pair 2 boiling occurs within / throughout liquid or causes bubbles evaporation occurs at surface	**B1**
	Pair 3 boiling requires a heat source / affected by rate of heating evaporation causes cooling / affected by wind etc.	**B1**
	Pair 4 temperature remains constant during boiling evaporation temperature drops / liquid cools	**B1**
10(a)(ii)	(thermal energy) used to break bonds **or** work done against intermolecular forces	**B1**
	molecules move further apart **or** P.E. increases **or** (molecules) push back the atmosphere	**B1**

Question	Answer	Marks
10(b)(i)	(M=) DV in any form algebraic or numerical	**C1**
	0.077 kg / s **or** 0.077 kg	**A1**
10(b)(ii)	(E=) mcT in any form algebraic or numerical	**C1**
	37 – 16 or 21 (°C) seen	**C1**
	6800 J	**A1**
10(b)(iii)	1input / electrical <u>energy or power</u> mentioned	**B1**
10(b)(iii)	2 (efficiency =) output (energy / power) ÷ input (energy / power)	**B1**
10(b)(iv)	avoid electrocution / shock / current through body **or** avoid pipe being live **or** to allow a current / charges to earth / ground **or** fuse blows to stop electrocution	**B1**
	when <u>live</u> / <u>heater</u> touches metal / water	**B1**

Question	Answer	Marks
11(a)(i)	tank with water	**B1**
	dipper (bar or point) touches or in surface of water	**B1**
	light source **/** stroboscope / video	**B1**
	dipper moves up and down (to create wave)	**B1**
11(a)(ii)	observe (surface of) water OR place particle / cork on surface OR equivalent movable / rotating object	**B1**
	moves up and down	**B1**
11(a)(iii)	line joining points	**M1**
	that are at the same point in the motion	**A1**
11(b)(i)	*difference*: Q has a greater / different amplitude or phase	**B1**
	similarity: same frequency; same time for one wave (period); both transverse; oscillation up and down	**B1**
11(b)(ii)	time 300 (ms) or 0.3 (s)	**C1**
	(f=) 1 / t numerical or algebraic in any form	**C1**
	3.3 Hz	**A1**
11(b)(ii)	2 (λ =) v / f **or** v = dt – numerical or algebraic in any form	**C1**
	0.060 m	**A1**