Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education (9–1)

PHYSICS (9–1) **0972/31**

Paper 3 Core 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.

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.

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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)(i)	balance	**B1**
1(a)(ii)	density = mass ÷ volume in any form	**C1**
	1260 ÷ 150	**C1**
	8.4	**A1**
	g / cm^3	**B1**
1(a)(iii)	1.26 (kg)	**B1**
1(b)	W = mg in any form	**C1**
	0.25 × 10	**C1**
	2.5 (N)	**A1**
	Both lines have 2.5 (N)	**B1**

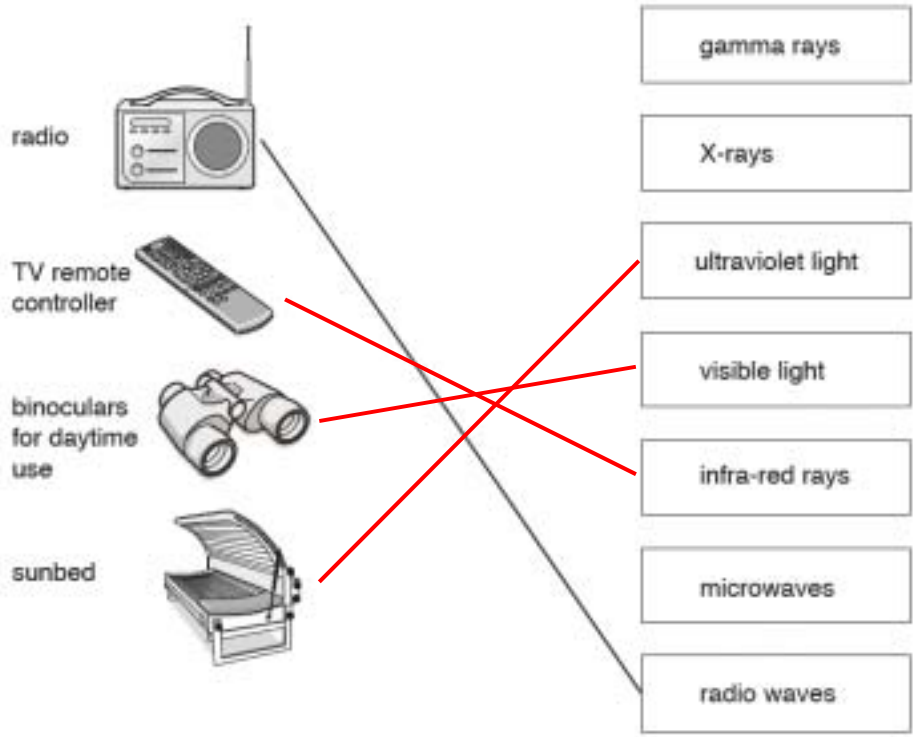
Question	Answer	Marks
2(a)	<u>moment</u>	**B1**
2(b)(i)	(sum of) clockwise moment(s) = (sum of) anticlockwise moment(s)	**C1**
	1.2 × 400 = 0.3 × F	**C1**
	1600 (N)	**A1**
2(b)(ii)	use a longer lever **OR** pivot closer to log / force F	**B1**

Question	Answer	Marks
3(a)	67 (cm)	**C1**
	(67 ÷ 5 =) 13.4 (cm)	**A1**
3(b)	C 1st ; A 2nd;	**B1**
	D 4th; E 5th	**B1**
3(c)	speed = distance ÷ time in any form OR (t =) distance ÷ speed	**C1**
	11 ÷ 16	**C1**
	0.69 (s)	**A1**

Question	Answer	Marks
4(a)(i)	Pressure = force ÷ area in any form	**C1**
	50 ÷ 1.8	**C1**
	28 (N / cm^2)	**A1**
4(a)(ii)	In range 13 500 to 15 000 (N / cm^2)	**B1**
4(b)(i)	(mercury) <u>barometer</u>	**B1**
4(b)(ii)	vacuum **OR** nothing	**B1**
4(b)(iii)	a value less than 760 mm (Hg) and > 0 mm (Hg)	**B1**

Question	Answer	Marks
5(a)(i)	It will be used up / cannot be replaced (easily) owtte	**B1**
5(a)(ii)	nuclear AND oil	**B1**
5(b)	**Advantages– any two from** easy to store less atmospheric pollution than other fossil fuels cheaper than other fossil fuels concentrated energy source large reserves can respond to demand reliable **Disadvantages – any two from** (produces / releases) carbon dioxide (waste gases produce) acid rain (waste gases produced) contribute to global warming non-renewable danger of explosion danger of carbon monoxide poisoning long pipelines needed (from some gas fields)	**B4**

Question	Answer	Marks
6(a)	0 AND 100 correctly labelled	**M1**
	36	**A1**
6(b)(i)	Melting	**B1**
	Any one of: molecules gain energy molecule (begin to) break (some) bonds arrangement becomes irregular or arrangement changes	**B1**
6(b)(ii)	boiling	**B1**
	Any one of: molecules break (all) bonds molecules move (more) freely molecules become widely separated or far apart	**B1**

Question	Answer	Marks
7(a)		**B1**
		B1
		B1
7(b)(i)	infrared **OR** microwaves **OR** radio waves	**B1**
7(b)(ii)	speed	**B1**

Question	Answer	Marks
8(a)(i)	electrons in 1st space	**B1**
	cloth in 2nd space	**B1**
8(a)(ii)	negative	**B1**
8(a)(iii)	like charges repel (each other)	**B1**
8(b)(i)	ring around copper	**B1**
8(b)(ii)	(earth wire must be good electrical) conductor	**B1**

Question	Answer	Marks
9(a)	(position) R	**B1**
9(b)	V = IR in any form	**C1**
	(R =) 6.0 ÷ 0.5 OR 6.0 = 0.5 × R	**C1**
	(R=) 12	**A1**
	Ω or ohms	**B1**
9(c)	both lamps have correct p.d. OR voltage (across them)	**B1**
	if one lamp fails the other is still lit	**B1**

Question	Answer	Marks
10(a)	thermistor	**B1**
10(b)(i)	low (brightness) OR off	**M1**
	pd or voltage (across lamp) is zero or almost zero	**A1**
10(b)(ii)	(brightness / it) increases	**B1**
	p.d. / voltage (across lamp) increases	**B1**
10(b)(iii)	lamp blows / fuses (when p.d. too high)	**B1**

Question	Answer	Marks
11(a)	(diagram) A	**B1**
11(b)(i)	connect coil to (centre zero) meter	**B1**
	move magnet in OR / AND out of coil	**B1**
	(observe) deflection on meter	**B1**
11(b)(ii)	**any two from:** use stronger magnet move magnet faster more turns on coil OR use more than 100 turns	**B2**
11(c)	(generator produces) alternating current OR direction of current keeps changing	**B1**

Question	Answer	Marks
12(a)	positive	**B1**
	positive	**B1**
	negative	**B1**
12(b)(i)	88	**B1**
12(b)(ii)	138	**B1**
12(b)(iii)	$^{223}_{88}Ra$	**B1**
12(c)	3 half lives (until 1.0 mg remains)	**C1**
	$(3 \times 1600) = 4800$ (years)	**A1**