Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

PHYSICS **0972/62**

Paper 6 Alternative to Practical **May/June 2022**

MARK SCHEME

Maximum Mark: 40

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 2022 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.

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 Calculation specific guidance

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 Guidance for chemical equations

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)	explanation or diagram showing: equal readings either side of the 10 cm mark OR average of readings either side of the mark = 10	**1**
1(b)	71.2 – 50(.0)	**1**
	21.2	**1**
1(c)	axes correctly labelled with quantity AND unit AND the right way round	**1**
	suitable scales (filling ⩾ ½ the grid)	**1**
	five plots correct to ½ small square	**1**
	good line judgement, thin, continuous line	**1**
1(d)	triangle method clearly shown on graph, covering at least ½ of candidate's line between extreme plots	**1**
	G = 1.6–1.9 inclusive	**1**
1(e)	$R = G$	**1**
	R given to 2 or 3 significant figures	**1**

Question	Answer	Marks
2(a)	X marked <u>anywhere</u> in the series circuit	**1**
2(b)(i)	I_1 = 0.24 (A)	**1**
2(b)(ii)	V_1 = 2.2(0) (V)	**1**
2(c)	R_1 = 9.17 / 9.2 (Ω)	**1**

Question	Answer	Marks
2(d)(i)	R_C in parallel with resistors in series	**1**
	voltmeter across candidate's combination AND the rest of the circuit correct	**1**
2(d)(ii)	3.09 with unit Ω seen at least once in **(c) (d)** or **(e)** and not contradicted	**1**
2(e)	R_3 = 7.24 (Ω) to 2 or 3 significant figures	**1**
2(f)(i)	use of a voltmeter and/or an ammeter	**1**
	measure *V* and *I* for each resistor and calculate *R* OR connect each resistor to the same voltage supply and measure the current OR connect resistors in series and measure the voltage across each of them OR connect resistors in parallel and measure the current through them	**1**
2(f)(ii)	check to see if the results are equal / close / within 10%	**1**

Question	Answer	Marks
3(a)(i)	*x* = 7.5 cm, *y* = 2.0 cm and *z* = 5.5 cm	**1**
	all to nearest millimetre	**1**
3(a)(ii)	*u* = 20 and *v* = 55	**1**
3(a)(iii)	*f* = 14.6(6666667) (cm)	**1**
3(b)	working shown	**1**
	f_A calculation correct	**1**

Question	Answer	Marks
3(c)	any **two** from: use darkened room / bright(er) object move **lens** slowly (to find sharpest image) move **lens** back and forth (to find sharpest image) ensure that object, lens and screen are vertical object and (centre of) lens same height (above bench) perpendicular reading/viewing of the ruler scale mark the centre of the lens on its holder	**2**
3(d)(i)	any integer between 5 and 15 (inclusive)	**1**
3(d)(ii)	(a straight line) is a way of taking an average	**1**
	anomalous results can be seen (and repeated or ignored)	**1**

Question	Answer	Marks
4	**method:** **MP1** place disc between heated cylinder and metal cylinder / set up apparatus as shown in diagram	**1**
	MP2 measure the time for lower cylinder to reach a certain temperature (rise) / measure the temperature (rise) reached in a certain time.	**1**
	MP3 repeat with the other discs	**1**
	MP4, MP5 **key variables:** any **two** from: thickness of disc temperature of heated cylinder initial temperature of lower cylinder initial temperature of the disc voltage/current/power of heater time (of heating) (if temperature change is measured) OR temperature change (if time of heating is measured)	**2**
	MP6 **table:** table with columns for (material of) disc, time / temperature difference (depending on MP2) with units in the headings only	**1**
	MP7 **conclusion:** (draw a graph/bar chart to) compare temperatures reached (in a certain time) / heating times (for a given temperature rise) with the material of the insulator – the disc with the lowest (final) temperature (difference) / takes the longest time, is the best insulator	**1**

Additional graph notes:

NOTE: The principle to apply here is 'could I draw a significantly better line, using these points, under examination conditions?' If the answer is definitely 'yes', do not award the mark.

NOTE: – If candidate's scale consists of actual readings at equal intervals this will produce a perfect straight line. The only mark available in this case is the first (axes right way round and labelled) So maximum 1.
– If axes are wrong way round, the other 3 marks are still available.