Cambridge Assessment International Education

Cambridge O Level

PHYSICS **5054/31**

Paper 3 Practical Test **October/November 2023**

MARK SCHEME

Maximum Mark: 30

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 October/November 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level 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)	Apply pressure / squeeze the bulb / soft end (of the pipette to push air out) ;	**1**
	put (open end) into water and remove pressure / release the end ;	**1**
	until water is level with 1 ml / cm^3 mark	**1**
1(b)(i)	at least two measurements of time seen, to 0.1 s or better ;	**1**
	times averaged and average time, *t,* in the range from 0.75 to 1.25 s ;	**1**
1(b)(ii)	Distance travelled = diameter of plate recorded or = 2 × radius of plate ;	**1**
	calculation of speed using their values (cm / s) ;	**1**
1(c)(i)	Any **two** from ;; difficult to place droplet in centre of plate difficult to hold ruler steady parallax error when reading both ends of rule the speed of the wave is too fast reaction time affects the the time measurement / times are very small the water / plate is not of uniform depth / is difficult to measure using the ruler	**2**
1(c)(ii)	Any **one** from ; mark the centre of the plate clamp the rule / ruler in place / rest ruler on the plate use a larger plate to reduce effect of error due to reaction time ensure eye is vertically above scale in rule (to avoid parallax) how to use technology (e.g. video) to improve timing use a plate with uniform depth / use vernier calipers to measure the depth.	**1**

Question	Answer	Marks
2(a)	Column headings: column headings with correct units	**1**
	trend of measured voltages: five voltage measurements all with V increasing as L decreases and none are zero ;	**1**
	calculation: values of I (V / 10) and 1 / I calculated correctly ;	**1**
	consistency: all values of I and V recorded to consistent d.p down their columns ;	**1**
2(b)(i)	axes: correct orientation and labelled, (1 / I on y-axis, L on x-axis) plotted using suitable scale ;	**1**
	plotting points: all points in the table plotted, to accuracy of ½ small square of grid and plot size maximum of ½ small square in diameter ;	**1**
2(b)(ii)	best straight line: sensible placement of a single, neat, thin, straight line even distribution of points either side of the best straight line	**1**
2(b)(iii)	gradient, G: Clear indication on the graph of the two sets of coordinates used to calculate G, correct substitution of two sets of (x, y) coordinates into the formula $\Delta y / \Delta x$, using two points on the BSL which are separated by at least half the length of the drawn BSL ;	**1**
	intercept, c: read directly from the graph to ½ small square of grid ; **or** use coordinates of a point on the line to substitute into $y = mx + c$	**1**
2(c)	value for R_w in range 13 ± 4.0 (Ω) and working seen, correct substitution using **their** G and **c** from **(b)(iii)** into equation $R_w = \frac{1000\ G}{c}$;	**1**

Question	Answer	Marks
3(a)(i)	masses on edge / vertical and touching the scale ;	**1**
	and any **two** from: ;; ball between and touching both masses difference in scale readings indicated set square to arrange masses perpendicular to scale / to ensure masses are vertical	**2**
3(a)(ii)	D value recorded: 15 ± 1 (mm) ;	**1**
3(b)(i)	d_1 < less than or equal to their D, to nearest mm ;	**1**
3(b)(ii)	correct calculation of A_1 using candidate's d_1 value ; (i.e using value from **(b)(ii)**)	**1**
3(c)(i)	x and y recorded in m to nearest mm ;	**1**
3(c)(ii)	correct substitution shown of y and x ;	**1**
3(c)(iii)	$d_2 > d_1$ **and** $A_2 > A_1$ with correct calculation of A_2 using candidate's value ;	**1**
3(d)(i)	both calculations correct, and no units ;	**1**
	values of k to 2 s.f. or 3 s.f. ;	**1**
3(d)(ii)	comparison, with numbers stated, **with** appropriate conclusion ;	**1**

Question	Answer	Marks
3(e)	**one** clay-related factor from: ; time that the force is applied temperature (of room or clay) type of modelling clay / hardness / malleability of clay **one** force related factor from: ; force used diameter / size / mass of ball / weight of ball / same ball used (glass or wooden) weight of wooden strip same *x* and *y* values time that the force is applied	**2**

Question	Answer	Marks
4	**method** **MP1**: use a protractor to measure θ ; **MP2**: Vary *D* **or** *W* **and** measure θ ; **MP3**: More than 2 different values (of *D* or W) used ;	**3**
	controlled variable / keep constant **MP4: one** from: ; If D varied, W constant If W varied, D constant Use same: metal strip / strip made from the same metal / strip with same thickness ;	**1**
	table **MP5:** ; columns for chosen variable (D or W) and angle θ , with units for both quantities ;	**1**
	conclusion **MP6:** ; plot a **graph** of θ against the chosen variable (D or W) **or** compare the change in θ to see if it depends on the change in the chosen variable.	**1**