



GCE A LEVEL MARKING SCHEME

SUMMER 2025

**A LEVEL
PHYSICS – UNIT 5
1420U50-1**

About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

WJEC GCE A LEVEL PHYSICS
UNIT 5 – PRACTICAL EXAMINATION
SUMMER 2025 MARK SCHEME
GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (except for the extended response question).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statement.

Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao	=	correct answer only
ecf	=	error carried forward
bod	=	benefit of doubt

EXPERIMENTAL TASK MARK SCHEME

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
	(a)	(i)	Equation re-arranged as $\ln T = n \ln x + \ln k$ [or other log] (1) $\ln T$ on the y -axis and $\ln x$ on the x -axis [or with log] OR compare with $y = mx + c$ (1) Trial readings recorded in this section – minimum of 1 pair (1) Repeat readings taken and minimum range of 50.0 cm stated / implied (1) Accept 0 – 50 cm Minimum of 5 oscillations for each length (1) Method to measure T e.g. small {amplitude / angle} or timing using centre of oscillation / fiducial point / parallax / measure at eye level (1) Don't accept reference to angles being greater than 20° Treat any reference to measuring the length as neutral		1 1 1 1	1 1	6	2	6
		(ii)	Teacher assessed – No significant risk. Accept risk of clamp stand falling over.	1			1		1
	(b)		Clear headings and units for all columns; accept $\ln(x/\text{cm})$ or $\ln(T/\text{s})$ for log values (1) Minimum of 5 sets of readings with repeats (1) T mean for 1 oscillation calculated correctly (1) Both log columns calculated correctly to a minimum of 2 d.p. (1) No sig fig penalty Resolution of stopwatch $\pm 0.01 \text{ s}$ and ruler $\pm 0.001 \text{ m}$ or $\pm 0.1 \text{ cm}$ (1) unit mark	1 1	1 1 1		5	3	5
	(c)	(i)	Both axes labelled correctly (ecf) (1) accept any orientation Suitable scales chosen so that data points occupy at least $\frac{1}{2}$ of each axis and not involving awkward factors e.g. 3 for both axes (1) All points plotted correctly to within $\pm \frac{1}{2}$ small square division ecf (1) Correct line of best fit ecf (1)	1	1 1 1		4	3	4

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
		(ii)	Large triangle used (should be close to the extremities of the line) or two suitable points clearly shown on the graph (1) Gradient correctly calculated ecf (1) n calculated to be 0.50 ± 0.06 (1) No sig fig penalty	1		1 1	3	2	3
		(iii)	Compare n with 0.5 or $\frac{1}{2}$ and comparison to own value			1	1	1	1
	(d)	(i)	Outer diameter measured using calliper at least once. The reading does not need to be correct – Teacher assessed (1) Mean outer diameter calculated correctly using a minimum of 2 readings and with sig figs consistent with raw data (1) unit mark Absolute uncertainty determined correctly (1) no sig fig penalty	1		1 1	3	2	3
		(ii)	Diameter = 37.1 ± 0.1 mm or % uncertainty in their measured value of diameter calculated correctly (1) Conclusion correctly determined and consistent with first mark e.g. within manufacturer's range of values (1)			2	2	1	2
			Question total	6	10	9	25	14	25

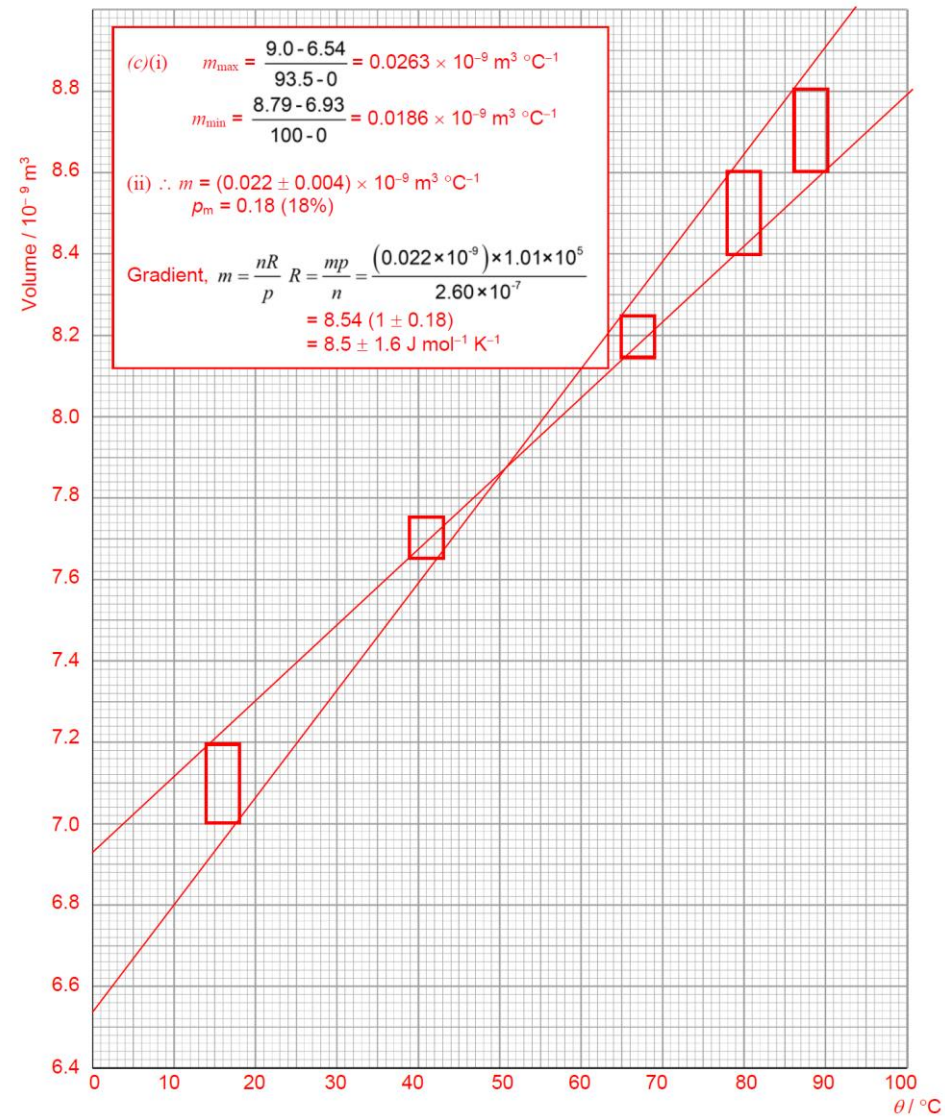
PRACTICAL ANALYSIS TASK

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
1	(a)		Rearrangement $c = \frac{ItV}{m\Delta\theta}$ or by implication (1) $c = 384$ or 380 (1) accept 0.384 Units $\text{J kg}^{-1} \text{ }^{\circ}\text{C}^{-1}$ must be consistent with data used (1) accept K^{-1} for $^{\circ}\text{C}^{-1}$ Overall % uncertainty = $0.8 + 5 + 0.2 + 0.4 + 6.7 = 13[.1]$ (1) Absolute uncertainty = $50 \text{ J kg}^{-1} \text{ }^{\circ}\text{C}^{-1}$ ecf (1) no sig fig penalty Example response $Q = IVt = (0.20 \pm 0.01) \text{ A} \times (12.0 \pm 0.1) \text{ V} \times (600 \pm 1)$ $p_Q = 0.05 + 0.0083 + 0.0017 = 0.06$ $\therefore Q = 1440 \pm 6\% \text{ J}$ $\therefore c = \frac{Q}{m\Delta\theta} = \frac{1440(\pm 6\%)}{0.25(\pm 0.4\%) \times 15(\pm 6.7\%)} = 384 \pm 13\%$ $= 380 \pm 50 \text{ J kg}^{-1} \text{ }^{\circ}\text{C}^{-1}$	1	1 1 1		5	4	4
	(b)		{Improve / better} resolution of {ammeter / voltmeter / thermometer / stopwatch / balance} Don't accept timer			1	1		1

Question			Marking details	Marks available																																							
				AO1	AO2	AO3	Total	Maths	Prac																																		
2	(a)		<table><tr><th rowspan="2">Temperature / °C</th><th colspan="4">Volume / 10⁻⁹ m³</th></tr><tr><th>Reading 1</th><th>Reading 2</th><th>Mean</th><th>Uncertainty</th></tr><tr><td>16 ± 2</td><td>7.0</td><td>7.2</td><td>7.1</td><td>0.1</td></tr><tr><td>41 ± 2</td><td>7.7</td><td>7.6</td><td>7.65 or 7.7</td><td>0.05</td></tr><tr><td>67 ± 2</td><td>8.2</td><td>8.1</td><td>8.15 or 8.2</td><td>0.05 or 0.1</td></tr><tr><td>80 ± 2</td><td>8.6</td><td>8.4</td><td>8.5</td><td>0.1</td></tr><tr><td>88 ± 2</td><td>8.8</td><td>8.6</td><td>8.7</td><td>0.1</td></tr></table> Mean column correct (1) Uncertainty in volume all correct (1) Mean given to 2 s.f. and uncertainty given to 1 s.f. (1)	Temperature / °C	Volume / 10 ⁻⁹ m ³				Reading 1	Reading 2	Mean	Uncertainty	16 ± 2	7.0	7.2	7.1	0.1	41 ± 2	7.7	7.6	7.65 or 7.7	0.05	67 ± 2	8.2	8.1	8.15 or 8.2	0.05 or 0.1	80 ± 2	8.6	8.4	8.5	0.1	88 ± 2	8.8	8.6	8.7	0.1						
			Temperature / °C		Volume / 10 ⁻⁹ m ³																																						
Reading 1	Reading 2	Mean		Uncertainty																																							
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80 ± 2	8.6	8.4	8.5	0.1																																							
88 ± 2	8.8	8.6	8.7	0.1																																							
	(b)		Both axes labelled and units included – either orientation (1) All points plotted correctly to within ± ½ small square division ecf and suitable scales chosen so that data points occupy at least ½ of each axis and not involving awkward factors e.g. 3 for both axes (1) Error bars correct (1) Correct lines of best fit (1) Example graph at end of mark scheme	1	1 1 1		4	4	4																																		
	(c)	(i)	Large triangles used (should be close to the extremities of the lines) or two suitable points clearly shown on each graph (1) Minimum gradient correctly calculated i.e. 1.90 × 10 ⁻¹¹ (1) Maximum gradient correctly calculated i.e. 2.50 × 10 ⁻¹¹ (1) Note ignore units and number of significant figures and power of 10 in this part of the question. Allow ecf for incorrect max / min lines		3		3	2	3																																		
		(ii)	Mean gradient correct i.e. (2.2 ± 0.3) × 10 ⁻¹¹ (1) Ignore power of 10 and no unit penalty Percentage uncertainty correct i.e. 14% and expressed to 1 or 2 sig fig ecf (1)		2		2	2	2																																		

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
	(d)		The graph does not cut the axis at (0,0) [even though a straight line] or doubling the temperature (with figures) doesn't double the volume (with figures) Accept there is a y-intercept Example response From the graph, if the temperature doubles from 30 °C to 60 °C, the volume only increases from 7.5 to 8.1 so it doesn't even approximately double.			1	1	1	1
	(e)	(i)	Rearrangement of the equation: $R = \frac{pV}{nT}$ or by implication (1) Use of their mean gradient ecf from (c)(ii) (1) Correct calculation of R i.e. 8.3 [J mol⁻¹ K⁻¹] (range of ± 1.6) (1) no unit penalty Absolute uncertainty calculated correctly and to 1 or 2 s.f. (1) If data taken straight from the table then only the 1st mark can be awarded			4	4	4	4
		(ii)	{Improve / better} resolution {thermometer / ruler} (1) Stir the water or ensure the thermometer and air column are at the same temperature or avoid parallax errors or increase range for temperature <u>smaller</u> intervals used for temperature readings (1) Don't accept insulate the beaker or take repeat readings			2	2		2
Question total				2	15	8	25	20	25

- (b) Plot a suitable graph of volume (on the y-axis) against temperature in °C (on the x-axis) to determine the relationship between volume and temperature. **Include** error bars on your graph where possible. Draw a line of maximum gradient and a line of minimum gradient. [4]



GCE A LEVEL UNIT 5: PRACTICAL EXAMINATION

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
Practical Analysis Task	2	15	8	25	20	25
Experimental Task	6	10	9	25	14	25
TOTAL	8	25	17	50	32	50