GCE A LEVEL MARKING SCHEME

SUMMER 2025

A LEVEL
CHEMISTRY – UNIT 5
1410U50-1

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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.

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GCE A LEVEL CHEMISTRY UNIT 5

PRACTICAL EXAMINATION

SUMMER 2025 MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks
Examiners must mark in red ink.
The mark total should be entered onto the grid on the front cover.

Marking rules
All work should be seen to have been marked.
Crossed out responses not replaced should be marked.

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

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EXPERIMENTAL TASK

Skill	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
Teacher-awarded marks	working safely (1) making up a solution (1)	2			2		2
Results Part A – recording	appropriate table with titles and units included (1) readings recorded to 0.05 cm^3 (1) concordant titres selected (1) mean titre calculated (1)	2	2		4	1	4
Results Part A – accuracy	based on comparison with teacher results standardising sodium hydroxide ± 0.2 cm^3 (3) ± 0.4 cm^3 (2) ± 0.6 cm^3 (1) ethanedioic acid with sodium hydroxide ± 0.3 cm^3 (3) ± 0.5 cm^3 (2) ± 0.7 cm^3 (1)		6		6		6

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Skill	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
Results Part B – observations	**Test 1** tube 1 – no observable change (1) accept 'turns brown' tube 2 – white precipitate forms (1) tube 3 – effervescence / fizzing seen (1) **Test 2** tube 1 – purple solution turns colourless (1) tube 2 – white precipitate forms (1) tube 3 – effervescence / fizzing seen (1)		3		3		3
Analysis Part A (i)	moles of HCl (1) [NaOH] (1) ecf possible		2		2	1	
Analysis Part A (ii)	moles of NaOH (1) moles of $(COOH)_2$ in 25 cm^3 (1) moles of $(COOH)_2$ in 250 cm^3 (1) ecf possible		3		3	2	

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Skill	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
Analysis Part A (iii)	relative formula mass of $(COOH)_2.xH_2O$ (1) mass of water in formula x = 2.0 (1) ecf possible			2	2		
Analysis Part A (iv)	any reference to hydrogen bonding (1) simple description of interactions between ethanedioic acid and water (1) credit possible from diagram			2	2		

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Skill	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
Analysis Part B (v)	**Test 1** tube 1 no reaction with acidified manganate(VII) ⇨ no alkene remains / all the alkene has reacted / only halogenoalkane is present (1) accept other sensible answers based on candidate observations – must include reference to a homologous series/functional group e.g. turns brown ⇨ alkene remains (because reaction has happened) turns brown ⇨ no alkene remains <u>because it didn't turn colourless</u> purple solution turns colourless ⇨ alkene remains / has not reacted tube 2 white precipitate forms ⇨ some halogenoalkane remains / not all the halogenoalkane has reacted (1) tube 3 effervescence ⇨ some carboxylic acid has formed (1)			3	3		3

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Skill	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
	Test 2 tube 1 purple solution turns colourless ⇨ some alkene remains / not all the alkene has reacted / the alkene has not reacted (1) tube 2 white precipitate forms ⇨ some halogenoalkane remains / not all the halogenoalkane has reacted (1) tube 3 effervescence ⇨ some carboxylic acid has formed (1)						

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Skill	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
Analysis Part B (vi)	**Test 1 (and Test 2)** tube 1 award (1) for either of following • absorption at 1620-1670 gets weaker / disappears • absorption at 650-800 appears / gets stronger tube 2 award (1) for either of following • absorption at 650-800 gets weaker / disappears • (broad) absorption at 3200-3550 appears / gets stronger tube 3 award (1) for any of following • absorption at 1650-1750 appears / gets stronger • (broad) absorption at 2500-3200 appears / gets stronger • (broad) absorption becomes broader / extends to 2500 must refer to wavenumber and how the absorption changes if no other credit award (1) for three relevant wavenumbers with no reference to how the absorption changes			3	3		
	Total	**4**	**16**	**10**	**30**	**4**	**18**

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PRACTICAL METHODS AND ANALYSIS TASK

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1				**Set 1** add NaOH(aq) dropwise (1) award (2) for **all** three observations award (1) for any **two** observations **A** / $FeCl_2$ dark green precipitate forms (insoluble in excess NaOH) **B** / $FeCl_3$ red-brown precipitate forms (insoluble in excess NaOH) **C** / $CrCl_3$ grey-green precipitate forms, dissolves in excess NaOH to give a dark green solution award (1) for any correct equation / ionic equation e.g. $FeCl_2 + 2NaOH \rightarrow Fe(OH)_2 + 2NaCl$ $FeCl_3 + 3NaOH \rightarrow Fe(OH)_3 + 3NaCl$ $CrCl_3 + 3NaOH \rightarrow Cr(OH)_3 + 3NaCl$ $Cr(OH)_3 + 3NaOH \rightarrow Na_3[Cr(OH)_6]$		2	2			3

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				Set 2 add sulfuric acid / any soluble sulfate or soluble carbonate solution (1) award (1) for **both** observations **D** / LiCl no observable change **E** / $BaCl_2$ white precipitate forms award (1) for any correct equation / ionic equation e.g. $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$ $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$ $BaCl_2 + Na_2CO_3 \rightarrow BaCO_3 + 2NaCl$		2	1			2
				Set 3 add sodium iodide / any soluble iodide solution (1) award (1) for **both** observations **F** / Br_2 colour change / brown (purple) solution forms **G** / I_2 no observable change award (1) for correct equation / ionic equation $2NaI + Br_2 \rightarrow 2NaBr + I_2$ accept alternative method e.g. reaction with phenol		2	1	10		2
				Question 1 total	**0**	**6**	**4**	**10**	**0**	**7**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)	I	n(Sr) = $\frac{200 \times 4.18 \times 3.3}{430\,000}$ = 0.00642 (1) mass = 0.00642 × 87.6 = 0.562 (1) ecf possible			2	2	2	1
			II	$\frac{0.1 \times 2}{3.3} \times 100$ = 6.1% (1)		1		1	1	1
		(ii)		n(HCl) = 0.0950 × $\frac{17.10}{1000}$ = 0.00162 (1) n(OH^-) = 0.00162 in 25 cm^3 ⇨ n(OH^-) = 0.0130 in 200 cm^3 (1) n(Sr^{2+}) = $\frac{0.0130}{2}$ = 0.00650 ⇨ mass = 0.00650 × 87.7 = 0.570 (1) ecf possible		3		3	2	2
		(iii)		method 2 / titration no mark for identifying method award (1) for any sensible reasoning e.g. • greater precision in measuring equipment (in titration) • potential heat losses in thermochemistry method (with ΔT less than theoretical value)			1	1		1
	(b)			volume of gas used to find number of <u>moles of hydrogen</u> (using the ideal gas equation) and hence <u>moles/mass of strontium</u>			1	1		
				Question 2 total	**0**	**4**	**4**	**8**	**5**	**5**

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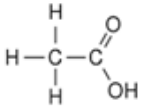
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			2 	1			1		
	(b)	(i)		n(acid) = $\frac{2.99}{138.06}$ = 0.0216 mol (1) mass of anhydride = 0.0216 × 102.06 = 2.20 g (1) volume of anhydride = $\frac{2.20}{1.08}$ = 2.04 cm^3 (1) ecf possible		2	1	3	2	1
		(ii)		full conversion would give 0.0216 mol of aspirin theoretical mass of aspirin = 0.0216 × 180.08 = 3.89 g (1) yield = $\frac{2.78}{3.89}$ × 100 = 71.5% (1) ecf possible		2		2	1	
	(c)			<u>hydrolysis</u> of the ester group vinegar-like smell ⇨ ethanoic acid formed (1) purple colour with aqueous $FeCl_3$ ⇨ phenolic —OH in 2-hydroxybenzenecarboxylic acid reacts with $FeCl_3$ (1) must refer to hydrolysis for both marks to be awarded			2	2		2

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			award (1) for any of following • reaction produces corrosive/toxic HCl gas • environmental consequences as a result of formation of HCl gas • reaction using ethanoic anhydride produces ethanoic acid as a by-product which can be used in other industries • ethanoyl chloride is more expensive • ethanoyl chloride is easily hydrolysed	1			1		
	(e)	(i)		reagent **and** observation needed sodium carbonate or sodium hydrogencarbonate ⇨ effervescence / bubbles of colourless gas		1		1		1
		(ii)		award (1) for any of following tests – reagent **and** observation needed in all cases Tollens' reagent / ammoniacal silver nitrate ⇨ silver mirror Fehling's (Benedict) solution ⇨ red colour / precipitate 2,4-DNPH ⇨ yellow-orange solid / precipitate acidified dichromate(VI) ⇨ solution goes from orange to green			1	1		1
		(iii)		aspirin ⇨ 3 signals compound **A** ⇨ 4 signals both needed for (1)			1	1		
				Question 3 total	**2**	**5**	**5**	**12**	**3**	**5**

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A2 UNIT 5: PRACTICAL EXAMINATION

SUMMARY OF ASSESSMENT OBJECTIVES

	QUESTION	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
Experimental Task	TOTAL	4	16	10	30	4	18
Practical Methods and Analysis Task	1	0	6	4	10	0	7
	2	0	4	4	8	5	5
	3	2	5	5	12	3	5
		6	31	23	60	12	35

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