GCE AS MARKING SCHEME

SUMMER 2025

AS
CHEMISTRY – UNIT 1
2410U10-1

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.

GCE AS CHEMISTRY UNIT 1

THE LANGUAGE OF CHEMISTRY, STRUCTURE OF MATTER AND SIMPLE REACTIONS

SUMMER 2025 MARK SCHEME

GENERAL INSTRUCTIONS

Extended response questions

A level of response mark scheme is applied. The complete response should be read in order to establish the most appropriate band. Award the higher mark if there is a good match with content and communication criteria. Award the lower mark if either content or communication barely meets the criteria.

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.

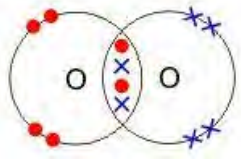
Marking abbreviations

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

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

SECTION A

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1					1			1		
2				award (1) for any of following Na^+ ion is smaller (than Cs^+ ion) Cs^+ ion is larger (than Na^+ ion) Na^+ ion different size (to Cs^+ ion)	1			1		
3				lower … lower	1			1		
4				XCl		1		1		
5				5	1			1		
6	(a)			Ba / barium	1			1		
	(b)			Ba / barium	1			1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7				$Mg(HCO_3)_2$	1			1		
8				$n(N_2O) = \frac{66.0}{44.0} = 1.5$ (1) number of nitrogen atoms = $1.5 \times 2 \times 6.02 \times 10^{23}$ $= 1.81 \times 10^{24}$ (1) ecf possible		2		2	1	
				Section A total	**7**	**3**	**0**	**10**	**1**	**0**

SECTION B

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)	(i)	I	**A** electron gun (1) **B** (electro)magnet (1)	2			2		
			II	award (1) for either of following ensures ions are not slowed down by particles in air prevents ions from colliding with air/other particles	1			1		
		(ii)		award (1) for correctly labelled axes y-axis ⇨ percentage abundance x-axis ⇨ m/z award (1) for suitable scale e.g. each large square on y-axis 10% do not accept scale with 0 marked on x-axis award (1) for lines of correct height	1	2		3	1	
	(b)	(i)	I	radon is breathed in (because it is a gas) (1) alpha particles (enter lungs and) are highly ionising / cause cell mutation (1)	2			2		
			II	11.4 days		1		1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		$^{218}Po \xrightarrow{\alpha} Pb \xrightarrow{\beta} Bi \xrightarrow{\beta} {}^{214}Po$ award (2) for all three correct award (1) for two correct or for two β and one α in wrong order		2		2		
	(c)			$n(AgCl) = \frac{0.8490}{143.5} = 5.916 \times 10^{-3}$ mol (1) $n(RaCl_2) = 2.958 \times 10^{-3}$ mol (1) $M_r(RaCl_2) = \frac{0.8779}{2.958 \times 10^{-3}} = 296.8$ (1) $A_r(Ra) = 225.8$ (1) must be given to 4 sig figs ecf possible		1 2	1	4	3	
				Question 9 total	**6**	**8**	**1**	**15**	**4**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
10	(a)	(i)		award (1) for both masses $SrCl_2$ after heating 0.97 H_2O removed 0.65		1		1		
		(ii)		$n(SrCl_2) = \frac{0.97}{158.6}$ = 0.0061 (1) $n(H_2O) = \frac{0.62}{18.02}$ = 0.0344 (1) x = 6 (1) ecf possible		3		3	2	2
		(iii)		$\frac{0.01}{1.59}$ × 100 = 0.6%		1		1	1	
	(b)	(i)		value of x decreases (1) award (1) for sensible reason e.g. not all water lost (since flame not hot enough) mass of water removed decreases soot forms on bottom of crucible so apparent mass of water removed decreases			2	2		2
		(ii)		value of x increases (1) award (1) for sensible reason e.g. apparent mass of water removed increases (due to crystals being lost)			2	2		2

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			award (1) each for any two sensible suggestions and (1) each for corresponding explanations e.g. heat to constant mass (1) ⇨ to ensure that all the water has been removed (1) put a lid on the crucible (1) ⇨ to ensure that all the solid stays in the crucible (1) use a greater mass of hydrated solid (1) ⇨ reduces percentage error (1)			4	4		4
				Question 10 total	**0**	**5**	**8**	**13**	**3**	**10**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
11	(a)	(i)		NH_3 has hydrogen bonding (between molecules) whilst PH_3 has van der Waals forces (1) award (1) for either of following hydrogen bonding is stronger (than van der Waals forces) more energy is needed to overcome hydrogen bonding (than van der Waals forces	2			2		
		(ii)		AsH_3 has more electrons than PH_3 (1) more / stronger van der Waals forces in AsH_3 (than in PH_3) (1)	2			2		
	(b)			PH_3 has three bonding pairs and one lone pair of electrons (1) electron pairs adopt position of minimum repulsion / move as far away from one another as possible (1) shape is (trigonal) pyramidal (1) bond angle is less than 109° / less than in a tetrahedral molecule / 107° (because lone pair repels more than bonding pairs) (1)	1 1	1 1		4		
	(c)	(i)		incorrect since although yellow precipitate is silver iodide (1) any precipitate formed due to silver chloride or silver bromide would not be seen clearly (1)	1		1	2		1
		(ii)		disagree since although no change in colour shows that iodide ions are not present there could also be chloride ions (1) (there would be no reaction because) bromine cannot oxidise/displace chloride ions (1)	1		1	2		1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			oxygen loses electrons / oxidation state of oxygen changes from –2 to 0 therefore is oxidised (1) chlorine gains electrons / oxidation state of chlorine changes from 0 to –1 therefore is reduced (1) if no other credit award (1) for either of following oxygen is oxidised and chlorine is reduced correct oxidation states for both elements before and after reaction	2			2		
				Question 11 total	**10**	**2**	**2**	**14**	**0**	**2**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
12	(a)			(giant) ionic (1) contains ions which are free to move in molten state (but not in solid state) (1)	2			2		
	(b)			$4LiH + AlCl_3 \rightarrow LiAlH_4 + 3LiCl$		1		1		
	(c)	(i)		$LiAlH_4 : Al : H_2$ $\frac{1.9}{37.98} : \frac{0.90}{27} : \frac{1.22}{24.5}$ (1) 0.050 : 0.033 : 0.050 (1) 3 : 2 : 3 (1) ecf possible		3		3	2	
		(ii)		$3LiAlH_4 \rightarrow 2Al + 3H_2 + Li_3AlH_6$			1	1		
	(d)			$n(Li) = \frac{0.300}{6.94} = 0.0432$ (1) $n(H_2) = 0.0216$ (1) $V = \frac{0.0216 \times 8.31 \times 288}{1.01 \times 10^5}$ (1) $V = 512\ cm^3$ (1) ecf possible		4		4	3	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(e)	(i)		$K_c = \frac{[H_2]^3\,[CO]}{[CH_4]\,[H_2O]}$ (1) unit ⇨ $mol^2\ dm^{-6}$ (1)		2		2	2	
		(ii)		$[CH_4] = \frac{[H_2]^3\,[CO]}{K_c\,[H_2O]}$ (1) $[CH_4] = 0.61\ mol\ dm^{-3}$ (1) ecf from part (i)		2		2	2	
				Question 12 total	**2**	**12**	**1**	**15**	**9**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
13	(a)			**Indicative content** **Method and measurements** • add powder to HCl, when no more bubbles of gas formed, add indicator to contents of flask • add NaOH to burette using funnel • ensure jet of burette is filled and funnel removed • record initial reading and add NaOH, swirling flask continually, until indicator changes colour • near end-point wash down sides of flask with deionised water and add NaOH drop by drop • record final reading and calculate titre **Use of results** • calculate original moles of acid (0.0125) • calculate moles of HCl in excess (moles of NaOH added) • calculate moles of HCl used in reaction (0.0125 – moles in excess) • calculate moles of $CaCO_3$ used $\left(\frac{\text{moles HCl used}}{2}\right)$ • calculate M_r of $CaCO_3$ $\left(\frac{0.500}{\text{moles of } CaCO_3 \text{ used}}\right)$	2	2	2	6		6

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				5-6 marks Good description of method and use of results *The candidate constructs a relevant, coherent and logically structured method including all key elements of the indicative content. A sustained and substantiated line of reasoning is evident and scientific conventions and vocabulary are used accurately throughout* **3-4 marks** General description of method and basic attempt at use of results OR good description of method OR good use of results *The candidate constructs a coherent account including most of the key elements of the indicative content. Some reasoning is evident in the linking of key points and use of scientific conventions and vocabulary are generally sound.* **1-2 marks** Basic attempt at description of method OR basic use of results *The candidate attempts to link at least two relevant points from the indicative content. Coherence is limited by omission and/or inclusion of irrelevant material. There is some evidence of appropriate use of scientific conventions and vocabulary.* **0 marks** *The candidate does not make any attempt or give an answer worthy of credit.*						

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		acid that fully dissociates in solution	1			1		
		(ii)		second property is incorrect ⇨ pH paper turns orange/yellow (in ethanoic acid) / pH paper doesn't turn red because it's a weak acid (1) third property is correct ⇨ there are the same number of moles of both acids (1)	1		1	2		1
	(c)			n(HCl) = 2 × 0.1 = 0.200 (1) $V = \frac{0.200}{1.60}$ = 0.125 dm^3 V = 125 cm^3 therefore 25 cm^3 of water should be added (1)		2		2	1	2
	(d)			$[H^+] = 10^{-8.1}$ (1) $[H^+] = 7.9 \times 10^{-9}$ mol dm^{-3} (1)		1	1	2	2	
				Question 13 total	**4**	**5**	**4**	**13**	**3**	**9**

UNIT 1: THE LANGUAGE OF CHEMISTRY, STRUCTURE OF MATTER AND SIMPLE REACTIONS

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	Total	Maths	Prac
Section A	7	3	0	**10**	**1**	**0**
9	6	8	1	**15**	**4**	**0**
10	0	5	8	**13**	**3**	**10**
11	10	2	2	**14**	**0**	**2**
12	2	12	1	**15**	**9**	**0**
13	4	5	4	**13**	**3**	**9**
Totals	**29**	**35**	**16**	**80**	**20**	**21**