GCE AS MARKING SCHEME

SUMMER 2025

AS
CHEMISTRY – COMPONENT 1
B410U10-1

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

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

SUMMER 2025 MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks
Examiners must mark in red ink.
One tick must equate to one mark, apart from extended response questions where a level of response mark scheme is applied.
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.

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				the ability of an atom to attract the bonding pair of electrons in a covalent bond	1			1		
2				burn samples of both (on a damp splint / wire loop) in a blue / colourless flame (1) sodium chloride gives a yellow flame **and** potassium chloride gives a lilac flame – both needed (1)	2			2		2
3				atomic number increases by one **and** mass number stays the same – both needed	1			1		
4				only Lyman series has n=1 electron transitions	1			1		
5				P $\frac{49.3}{31}$ = 1.59 O $\frac{51.7}{16}$ = 3.17 (1) PO_2 (1)		2		2		
6				$2Fe + 3F_2 \rightarrow 2FeF_3$		1		1		
7	(a)			(metals contain) delocalised electrons which can carry a current	1			1		
	(b)			award (1) for any of following high melting temperature hard malleable ductile good thermal conductor	1			1		
				Section A total	**7**	**3**	**0**	**10**	**0**	**2**

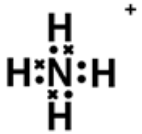
SECTION B

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)			mixture becomes more brown / darker (1) equilibrium position moves to the side with more gas moles (1)	1	1		2		
	(b)			$K_c = \frac{[N_2O_4]}{[NO_2]^2}$ (1) $mol^{-1}\ dm^3$ (1)		2		2		
	(c)			if value of K_c is higher then there are more products (1) mixture becomes less brown / paler (1)			2	2		
				Question 8 total	**1**	**3**	**2**	**6**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)			$^{135}\mathrm{Nd}$ accept $^{135}_{60}\mathrm{Nd}$ / neodymium-135		1		1		
	(b)			time taken for the mass of an isotope to decay to half of its original value	1			1		
	(c)	(i)		0.08 (1) no ecf possible if incorrect mass used $\frac{0.005}{0.08} \times 100 = 6.25\%$ (1)		1	1	2	1	1
		(ii)		appropriate labelled axes and scales (1) all points plotted correctly (± 1 small square) (1) smooth decay curve (1)	2	1		3	2	
		(iii)		horizontal line across from 2.7 on grid (1) value in the range 45-55 (1)	1		1	2	1	
	(d)			$\frac{[(50 \times 4.345) + (52 \times 83.79) + (53 \times 9.501) + (54 \times 2.365)]}{100}$ (1) 52.06 (1) ecf possible for error in calculation		2		2	1	
				Question 9 total	**4**	**5**	**2**	**11**	**5**	**1**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
10	(a)			$Mg + 2H^+ \rightarrow Mg^{2+} + H_2$		1		1		
	(b)	(i)		0.200 mol of H^+ required (1) $V = \frac{0.200}{4.20} = 0.0476\ dm^3$ (1) $V = 47.6\ cm^3$ (1) **must** be to **3** sig figs		2	1	3	2	1
		(ii)		burette	1			1		1
		(iii)		1.20×10^{23}	1			1		
	(c)			$n(H_2) = \frac{30 \times 10^{-3}}{24.5} = 1.22 \times 10^{-3}$ (1) 1:1 ratio of magnesium to hydrogen mass of magnesium = $1.22 \times 10^{-3} \times 24.3 = 2.98 \times 10^{-2}$ g (1)		2		2	2	
	(d)			$pH = -\log[H^+]$ $pH = -0.623$	1	1		2	2	
	(e)			award (1) for any value in the range 2-6 award (1) for either of following ethanoic acid is a weak acid (so it will have a higher pH than hydrochloric acid) weak acid is only partially dissociated (so concentration of H^+ is much lower than 4.20 mol dm^{-3})			2	2		
				Question 10 total	**3**	**6**	**3**	**12**	**6**	**2**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
11	(a)			23.65 cm^3		1		1	1	1
	(b)			n(HCl) = 1.00 × 0.02365 = 0.02365 (1) n(OH^-) = 0.011825 (1) [OH^-] = $\frac{0.011825}{0.025}$ = 0.473 mol dm^{-3} (1)		3		3	2	3
	(c)			n(OH^-) in 250 cm^3 of solution = 0.473 × $\frac{250}{1000}$ = 0.11825 mol (1) M_r = $\frac{20.25}{0.11825}$ = 171.25 (1) A_r of metal = 171.25 – (2 × 17.01) = 137.23 (1) hence metal must be barium (1)			4	4	3	2
	(d)			magnesium hydroxide is insoluble			1	1		1
				Question 11 total	**0**	**4**	**5**	**9**	**6**	**7**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
12	(a)			$1s^2\ 2s^2\ 2p^3$	1			1		
	(b)			increases (1) due to increasing nuclear charge / number of protons (1)	2			2		
	(c)	(i)		electron is being removed from a positive ion (greater attraction)	1			1		
		(ii)		award (1) for either of following electron being removed is an s electron (and closer to the nucleus) electron is being removed from a closer / lower sub-shell		1		1		
	(d)			nitrogen has van der Waals forces between the molecules (1) ammonia has hydrogen bonding (and van der Waals forces) between the molecules (1) hydrogen bonding is stronger than van der Waals forces so more energy is needed to separate the ammonia molecules (1)	3			3		
	(e)	(i)		three N—H covalent bonds (1) one co-ordinate / dative covalent bond (with nitrogen atom providing both electrons) (1) award (1) for appropriate diagram e.g.  first two marks may be credited for labelling/annotation of diagram		3		3		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		ammonium ion has four bonding pairs ⇨ tetrahedral (1) amide ion has two bonding pairs and two lone pairs ⇨ V-shaped / bent (1) lone pairs cause greater repulsion than bonding pairs so there is a smaller bond angle in the amide ion (105°) than there is in the ammonium ion (109°) (1)		1	1 1	3		
		(iii)		$2Na + 2NH_3 \rightarrow 2NaNH_2 + H_2$		1		1		
		(iv)		giant ionic (1) award (1) for either of following properties water soluble conducts electricity when molten or dissolved	1		1	2		1
				Question 12 total	**8**	**6**	**3**	**17**	**0**	**1**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
13	(a)	(i)		+5	1			1		
		(ii)		$2KClO_3 \rightarrow 2KCl + 3O_2$		1		1		
		(iii)		$n(O_2) = n(KClO_3) \times 1.5$ $\frac{1.35}{122.6} \times 1.5 = 0.0165$ mol (1) $V = \frac{nRT}{p}$ (1) $V = \frac{0.0165 \times 8.31 \times 650}{1.01 \times 10^5} = 8.83 \times 10^{-4}$ m^3 (1) ecf possible from incorrect equation in part (ii)		3		3	3	
		(iv)		heat (and weigh) until constant mass	1			1		1
	(b)			award (1) for correct test description dip each strip into (conc) chlorine water accept put a drop of water on each strip and place in a gas jar containing chlorine gas award (2) for three correct results strip that stays colourless is potassium chloride strip that turns orange is potassium bromide strip that turns brown is potassium iodide award (1) for any one correct result		2	1	3		3

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			**Indicative content** Separation • dissolve mixture in water • add (excess) sodium carbonate solution • filter the mixture • wash the residue with deionised water • test the filtrate with more sodium carbonate solution to check that precipitation is complete; if not add more sodium carbonate solution to the filtrate and refilter • dry the filter paper until constant mass Obtaining quantitative data • weigh original filter paper • weigh dry filter paper and residue • obtain mass of calcium carbonate by subtracting mass of filter paper from mass of residue and paper Calculation moles of calcium carbonate = $\frac{\text{mass } CaCO_3}{M_r(CaCO_3)}$ moles of calcium carbonate = moles of calcium chloride mass of calcium chloride = moles × $M_r(CaCl_2)$ percentage by mass calcium chloride = $\frac{\text{mass } CaCl_2}{5.00} \times 100$	4	2		6		4

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				5-6 marks Describes a method that allows quantitative separation of calcium carbonate and how to calculate the percentage by mass from the data obtained *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 is used accurately throughout.* **3-4 marks** Covers aspects of separation and obtaining data and includes some details of the calculation *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** Suggests a separation method *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 13 total	**6**	**8**	**1**	**15**	**3**	**8**

COMPONENT 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	0	2
8	1	3	2	6	0	0
9	4	5	2	11	5	1
10	3	6	3	12	6	2
11	0	4	5	9	6	7
12	8	6	3	17	0	1
13	6	8	1	15	3	8
Totals	29	35	16	80	20	21