GCSE MARKING SCHEME

SUMMER 2025

GCSE
CHEMISTRY - UNIT 1

3410U10-1
3410UA0-1

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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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GCSE CHEMISTRY UNIT 1

CHEMICAL SUBSTANCES, REACTIONS AND ESSENTIAL RESOURCES

SUMMER 2025 MARK SCHEME

GENERAL INSTRUCTIONS

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 statements.

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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FOUNDATION TIER ONLY QUESTIONS

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			5 ☐ 6 ☐ 7 ✓	1			1		
	(b)			1 ☐ 2 ☐ 3 ✓		1		1		
	(c)			green ✓ orange ☐ blue ☐	1			1		1

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)		element ☐ compound ☑ mixture ☐		1		1		
		(ii)		red ☐ yellow ☑ green ☐	1			1		1
	(e)			**NaBr** **SBr** **nabr** **NaB**		1		1		
				Question 1 total	**3**	**3**	**0**	**6**	**0**	**2**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			carbon dioxide ☐ ✓ oxygen ☐ hydrogen ☐ (1) carbon dioxide ☐ oxygen ☐ (1) hydrogen ☐ ✓			2	2		2
	(b)	(i)		oxygen (1) water and carbon dioxide (1) either order	2			2		
		(ii)		photosynthesis sedimentation respiration combustion	2			2		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		 carbon atom must be between oxygen atoms and all atoms touching		1		1		
		(ii)		CH_4 accept H_4C in this question only do not penalise superscript 4 or large 4		1		1		
				Question 2 total	**4**	**2**	**2**	**8**	**0**	**2**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			halogens ☐ noble gases ☐ alkali metals ✓	1			1		
	(b)	(i)		rubidium / Rb			1	1		
		(ii)		liquid			1	1		
		(iii)		25 °C ☐ 64 °C ✓ 106 °C ☐			1	1		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		KO KO_2 K_2O (circled) K_2O_2		1		1		
		(ii)	I	$2K + 2H_2O \rightarrow$ [2] $KOH + H_2$		1		1		
			II	potassium floats ☐ potassium melts ☐ fizzing ☑ potassium disappears ☐		1		1		1
				Question 3 total	**1**	**3**	**3**	**7**	**0**	**1**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		**test tube** **measuring cylinder** **beaker** **evaporating dish**	1			1		1
		(ii)		35		1		1		1
		(iii)		particles (1) collisions (1)	2			2		2
		(iv)		award (1) for any of following • increase temperature (of acid) / heat it • use smaller pieces (of calcium carbonate) • use powdered / crushed calcium carbonate • use calcium carbonate with greater surface area			1	1		1
	(b)			0.4 (2) if incorrect award (1) for either of following 24 $\frac{48}{120}$		2		2	2	2
	(c)			100 (2) if incorrect award (1) for clear indication of the number of each atom present e.g. 40 + 12 + (3 × 16) 1 Ca + 1 C + 3 O		2		2	2	

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			$CaCO_3 + \boxed{2}\ HCl \longrightarrow CaCl_2 + CO_2 + H_2O$ award (2) for correct equation if incorrect award (1) for correct formula for calcium chloride		2		2		
	(e)			award (1) for any of following • noise (pollution) • dust (pollution) • traffic (in rural areas) • ruins landscape / views • destroys habitats	1			1		
	(f)	(i)		calcium oxide		1		1		
		(ii)		water / H_2O		1		1		1
				Question 4 total	**4**	**9**	**1**	**14**	**4**	**8**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		33 accept 32		1		1	1	
		(ii)		award (1) each for any **two** of following • volume <u>of water</u> • type / concentration <u>of soap</u> (solution) • shaking time / number of times shaken / vigour of shaking do not accept volume of soap solution			2	2		2
		(iii)		award (2) for all four bars drawn correctly award (1) for any two bars drawn correctly mark height only – tolerance ±½ small square		2		2	2	
		(iv)		Wrexham (1) most soap (solution needed to create a lather) (1) neutral answers – more soap / highest bar		2		2		2
	(b)			calcium / magnesium accept Ca / Mg – ignore any charges included	1			1		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			makes boilers more efficient ☐ reduces the risk of heart disease ✓ strengthens bones ✓ less detergent is needed to wash dishes ☐ prevents limescale forming ☐ award (1) for each correct benefit if more than two ticks penalise 1 mark for each in correct tick	2			2		
				Question 5 total	**3**	**5**	**2**	**10**	**3**	**4**

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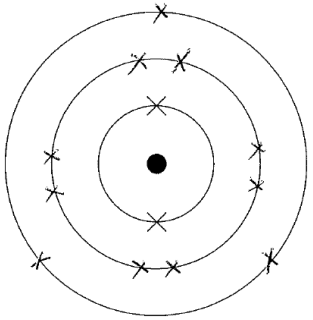
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		award (1) for both answers in correct order protons neutrons		1		1		
		(ii)		11		1		1		
		(iii)		award (1) for reference to equal numbers of protons and electrons / five protons and five electrons award (1) for any of following • protons are positive and electrons are negative • positive and negative charges cancel each other out • same number of positive and negative particles mark independently	1	1		2		
	(b)			 accept dots or crosses		1		1		
				Question 6 total	**1**	**4**	**0**	**5**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			**Indicative content** • some of the dyes must be soluble in water / the solvent • as the water moves up the paper, the soluble dyes move with it • more soluble dyes move further (because they bond more tightly to the water molecules) • this means that the dyes separate vertically above the starting point • insoluble dyes are left on the start line • ink spot must be above the water level • if ink spot is below the water level the dyes dissolve directly into the water rather than travel up the paper	4		2	6		2
				5-6 marks Good explanation linking movement of dyes to solubility; clear understanding of why ink spot must be above water level *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.* **3-4 marks** Basic explanation with reference to dyes moving different distances; reference to solubility; error in diagram **B** clearly described *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.* **1-2 marks** Simple reference to dyes moving; reference to too much water in diagram **B** *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.* **0 marks** No attempt made or no response worthy of credit						

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)			0.45 (2) accept answer in the range 0.44-0.46 if incorrect award (1) for distance travelled in the range 4.4-4.6cm ecf possible from incorrectly measured distance		2		2	2	2
	(c)			ethanol and water have different boiling points / ethanol has a lower boiling point than water (1) award (1) for any of following • ethanol boils over / evaporates first • ethanol goes into the condenser first / condenses first • ethanol goes into the condenser and drips into flask • ethanol goes into condenser and leaves water behind	2			2		2
				Question 7 total	**6**	**2**	**2**	**10**	**2**	**6**

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COMMON QUESTIONS

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8/1	(a)	(i)		**C** and **D** both needed			1	1		
		(ii)		**A**			1	1		
	(b)			element name and one use needed helium / He party balloons / weather balloons / airships / welding / tracers / freezing eggs/sperm neutral answer – balloons	1			1		
	(c)			award (1) each for any **two** of following • malleable / can be beaten into shape • ductile / can be drawn into wire • sonorous • shiny • good electrical conductor • good thermal conductor • high melting point / boiling point • high density award (1) for 'good conductor' if no reference to electrical/thermal		2		2		2
				Question 8/1 total	**1**	**2**	**2**	**5**	**0**	**2**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9/2	(a)	(i)		award (1) for either of following pairs **1** and **4** **5** and **6**			1	1		
		(ii)		plates move towards each other (1) award (1) for any answer that **links two details** e.g. • **denser/oceanic** plate pushes **under the other** • one plate pushes **under the other** and **melts** / **sinks into the mantle** • one plate pushes **under the other** causing **earthquakes / mountains / volcanoes** neutral answer – one plate pushes under the other	2			2		
	(b)	(i)		award (1) each for any **two** of following • similar rocks / rock formations on different continents • similar fossils on different continents • 'jigsaw' fit of continents / coastlines e.g. South America 'fits' into the coastline of west Africa • glacial striations on rocks near equator • coal found near poles do not accept similar animals / plants on different continents	2			2		
		(ii)		award (1) for **any** of following • he could not explain how the continents had moved • no one understood how the continents had moved • convection currents / plate tectonics were not understood	1			1		
				Question 9/2 total	**5**	**0**	**1**	**6**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
10/3	(a)	(i)		110 megalitres ☐ 550 megalitres ☐ 11 000 megalitres ✓			1	1	1	
		(ii)		less pollutants to contaminate / go into the groundwater			1	1		
		(iii)		sodium hydroxide, NaOH ☐ silver nitrate, $AgNO_3$ ✓ potassium nitrate, KNO_3 ☐			1	1		1
	(b)			filtration to remove small / smaller insoluble particles (1) chlorination to kill bacteria / viruses / microbes / microorganisms / to sterilise water (1)	2			2		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		award (1) for **any** of following • to reduce tooth decay / DMFT • to reduce cavities • to reduce need for fillings • to strengthen teeth neutral answers – improve dental health / good for teeth	1			1		
		(ii)		award (1) for **any** of following • lack of choice / mass medication • too much can cause fluorosis / cause white specks on teeth / discolour teeth (yellow or brown) / • links to (stomach/bone) cancers • unnecessary as fluoride is present in toothpaste / mouthwash • links to infertility neutral answers – reference to tooth decay / toxicity	1			1		
		(iii)		24 (2) accept 24.5 / 24.47 / 24.468 if incorrect award (1) for any of following • 23 × 2 / 46 (in working) • 12 / 12.2 / 12.23 / 12.234 (final answer) • 25 / 24.4 / 24.46 (incorrect rounding of final answer)		2		2	2	
				Question 10/3 total	**4**	**2**	**3**	**9**	**3**	**1**

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HIGHER TIER ONLY QUESTIONS

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			nitrogen	1			1		
	(b)			photosynthesis uses carbon dioxide and produces oxygen (1) respiration (and decomposition) use oxygen and produce carbon dioxide (1) award (1) for any of following • roughly the same amount of carbon dioxide is taken out of the atmosphere (each year) as is returned • roughly the same amount of oxygen is taken out of the atmosphere (each year) as is returned • processes take place at roughly the same rate in order to keep balance	3			3		
	(c)			place a glowing splint in the gas and it will relight neutral answer – blow out the splint, place in the gas and it will relight	1			1		1
				Question 4 total	**5**	**0**	**0**	**5**	**0**	**1**

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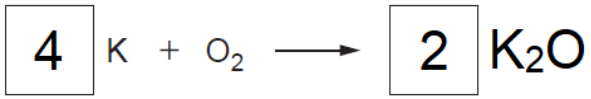
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		award (1) each for any **two** of following • fizzing / bubbles / effervescence neutral answer – gas given off / hydrogen made • moves around on surface / floats and moves around • gets smaller / disappears	2			2		2
		(ii)		award (1) for any of following • add universal indicator and it will turn blue/purple • pH paper will turn blue/purple • (red) litmus paper will turn blue		1		1		1
	(b)			(Group 2 metal atoms) need to lose two electrons (whereas Group 1 metals only need to lose one) (1) more energy is needed / it is more difficult for this to happen (1) neutral answer – reference to number of electrons in outer shell	2			2		
	(c)	(i)		 award (2) for correct equation if incorrect award (1) for correct formula of potassium oxide		2		2		
		(ii)		9×10^{21} accept 0.09×10^{23} or any correct variation		1		1	1	
				Question 5 total	**4**	**4**	**0**	**8**	**1**	**3**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6				**Indicative content** $R_f = \frac{distance\ moved\ by\ dye}{distance\ moved\ by\ solvent}$ dye **A** ⇨ R_f = 0.75 dye **B** ⇨ R_f = 0.50 • as the solvent/water moves up the chromatogram, soluble dyes move with it • soluble dye molecules bond to the solvent/water molecules • more soluble dyes move further up the chromatogram • the more soluble the dye, the further it moves, the higher the R_f value • dye **A** is more soluble than dye **B** so has a higher R_f value	4	2		6	2	2
				5-6 marks Both R_f values calculated correctly; good explanation of link between solubility, distance travelled and R_f value *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.* **3-4 marks** Attempt at calculation of both R_f values; attempt at explanation of link between solubility and R_f value *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.* **1-2 marks** Attempt at R_f calculation; reference to dyes travelling different distances or having different solubilities *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.* **0 marks** No attempt made or no response worthy of credit						
				Question 6 total	**4**	**2**	**0**	**6**	**2**	**2**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			gallium atoms <u>lose 3</u> electrons (1) oxygen atoms <u>gain 2</u> electrons (1) if no other credit award (1) for the following oxygen gains electrons and gallium loses electrons neutral answers atoms lose or gain electrons oxygen has more electrons than protons and gallium has fewer electrons than protons	2			2		
	(b)	(i)		similarity ⇨ they have same number of protons / they both have 31 protons (1) difference ⇨ one has 38 neutrons and the other has 40 neutrons (1) neutral answers same atomic number / different mass number they have different numbers of neutrons one has two more neutrons than the other		2		2		
		(ii)		69.8 (2) accept 70 when correct working shown if incorrect award (1) for any of following 4140 + 2840 6980 69 0.698 do not accept 70 with no working at all shown		2		2	2	
				Question 7 total	**2**	**4**	**0**	**6**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)			award (2) for all five points plotted correctly award (1) for any three points plotted correctly tolerance ±½ small square award (1) for smooth curve		3		3	3	
	(b)			0.015 / 0.0148 / 0.01477 (2) if incorrect award (1) for any of following 0.65 (in working) 0.01 (over truncation of final answer) 0.0147 (incorrect rounding of final answer)			2	2	2	2
	(c)			graph is steep at the start as this is when the reaction is at its fastest / rate is at its highest (1) graph becomes less steep as reaction slows / rate decreases / reactants used up (1)			2	2		2
	(d)			increase concentration (of acid) (1) more particles per unit volume / in the same space (1) more chance of successful collisions / more successful collisions per second (1) or increase temperature (of acid) (1) particles have more energy / more particles have the activation energy (1) more chance of successful collisions / more successful collisions per second (1)		3		3		3
				Question 8 total	**0**	**6**	**4**	**10**	**5**	**7**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)			it turns black / black solid	1			1		1
	(b)			award (1) for either of following • sodium more reactive (than copper) • copper less reactive (than sodium) award (1) for any of following • sodium <u>carbonate</u> more stable • sodium <u>carbonate</u> didn't decompose / didn't react when heated • copper <u>carbonate</u> less stable • copper <u>carbonate</u> decomposed / reacted when heated if no other credit award (1) for 'more reactive metal has more stable carbonate'			2	2		2
	(c)			$CuCO_3 \rightarrow CuO + CO_2$ reactant formula (1) product formula (1) award 1 max if incorrectly balanced		2		2		
				Question 9 total	**1**	**2**	**2**	**5**	**0**	**3**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
10	(a)			calcium/ magnesium ions are exchanged for / replaced by sodium ions (1) must have at least one reference to ions for first mark to be awarded sodium (ions) run out eventually (1)	2			2		
	(b)			award (1) for either of following • add washing soda / sodium carbonate • boil	1			1		1
				Question 10 total	**3**	**0**	**0**	**3**	**0**	**1**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
11	(a)	(i)		potassium bromide (1) potassium carbonate (1)			2	2		2
		(ii)		they would both give the same colour / a lilac flame neutral answer – both contain potassium			1	1		1
	(b)			$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$ reactant formulae (1) product formula (1) state symbols (1) state symbol mark can only be awarded if all formulae are correct		3		3		3
	(c)			78.8 / 79% (2) if incorrect award (1) for 0.26 g of MgO ecf possible from incorrect mass		1	1 2	2	1	
				Question 11 total	**0**	**4**	**4**	**8**	**1**	**6**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
12	(a)	(i)		iodine is produced / chlorine displaces iodine (1) chlorine is more reactive than iodine / elements become less reactive down the group (1) award (1) for either of following • outer shell is further from nucleus (going down the group) / atoms become larger (going down the group) / more shielding (going down the group) • it becomes more difficult to gain an electron (going down the group)	3			3		3
		(ii)		$2KI + Cl_2 \rightarrow 2KCl + I_2$ reactant formulae (1) product formulae (1) balancing (1) balancing mark can only be awarded if all formulae are correct		3		3		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)			21.3 g (3) accept 21 if incorrect credit each correct step in method $M_r(FeCl_3)$ = 162.5 (1) 213 g of Cl_2 needed to produce 325 g of $FeCl_3$ (1) 21.3 g of Cl_2 needed to produce 32.5 g of $FeCl_3$ (1) alternative method $M_r(FeCl_3)$ = 162.5 (1) number of moles of $FeCl_3 = \frac{32.5}{162.5}$ = 0.20 mol ratio of Cl_2 : $FeCl_3$ (from equation) is 3 : 2 ⇨ 0.30 mol of Cl_2 needed to produce 32.5 g of $FeCl_3$ (1) mass of Cl_2 = 0.30 × 71 = 21.3 g (1) ecf possible throughout		3		3	3	
				Question 12 total	**3**	**6**	**0**	**9**	**3**	**3**

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FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

QUESTION	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	3	3	0	**6**	**0**	**2**
2	4	2	2	**8**	**0**	**2**
3	1	3	3	**7**	**0**	**1**
4	4	9	1	**14**	**4**	**8**
5	3	5	2	**10**	**3**	**4**
6	1	4	0	**5**	**0**	**0**
7	6	2	2	**10**	**2**	**6**
8	1	2	2	**5**	**0**	**2**
9	5	0	1	**6**	**0**	**0**
10	4	2	3	**9**	**3**	**1**
TOTAL	**32**	**32**	**16**	**80**	**12**	**26**

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HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

QUESTION	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	1	2	2	**5**	**0**	**2**
2	5	0	1	**6**	**0**	**0**
3	4	2	3	**9**	**3**	**1**
4	5	0	0	**5**	**0**	**1**
5	4	4	0	**8**	**1**	**3**
6	4	2	0	**6**	**2**	**2**
7	2	4	0	**6**	**2**	**0**
8	0	6	4	**10**	**5**	**7**
9	1	2	2	**5**	**0**	**3**
10	3	0	0	**3**	**0**	**1**
11	0	4	4	**8**	**1**	**6**
12	3	6	0	**9**	**3**	**3**
TOTAL	**32**	**32**	**16**	**80**	**17**	**29**

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