

**UNIT 5: (Double Award) CHEMISTRY 2
HIGHER TIER****MARK SCHEME****GENERAL INSTRUCTIONS**Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the 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.

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

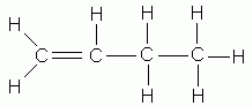
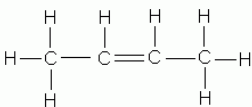

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

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

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)	cathode / negative electrode (1) Al ³⁺ ions attracted to opposite charge / negative charge (1) Do not accept Al for Al ³⁺ Opposites attract gains no credit	2			2		
		(ii)	2Al ₂ O ₃ → 4Al + 3O ₂ (3) If equation not correct award (1) for each of following Al ₂ O ₃ on reactant side Al and O ₂ on product side		3		3	2	
		(iii)	Either of following Carbon electrodes used up (1) linked to carbon dioxide emission (1) Burning coal/gas to form electricity (1) linked to carbon dioxide emission (1) No credit for carbon dioxide emission alone	2			2		
	(b)		Any of following properties and uses for (1) Low density ... overhead power cables Good heat conductor saucepans Non-toxic ... drinks can Corrosion resistant window frames No credit for use relating to aluminium as a good electrical conductor	1			1		
			Question 1 total	5	3	0	8	2	0

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			12600 (2) If answer is incorrect award (1) for $100 \times 4.2 \times 30$		2		2	2	2
	(b)			Any two of following for (1) each Same distance between beaker/can and flame Same beaker/can used Beaker/can bottom is cleaned after each alcohol is burned Same spirit burner/ size flame/ size wick			2	2		2
	(c)	(i)		Similarity: same rank order (1) Difference: theoretical values > experimental values (1)			2	2		2
		(ii)		Heat loss to surroundings			1	1		1
				Question 2 total	0	2	5	7	2	7

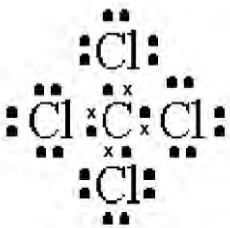
Question		Marking details		Marks Available							
				AO1	AO2	AO3	Total	Maths	Prac		
3	(a)			C ₁₀ H ₂₂			1		1		
	(b)			 (1)							
				 (1)		2		2			
	(c)			 (1)							
				C=C bond opens (1) ethene molecules join together to form one polymer (1)	3			3			
				Question 3 total	3	3	0	6	0	0	

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Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)		80% increase in recycling of plastic compared with 43% increase in recycling of paper (2) If answer is incorrect award (1) for calculation of actual increase for both i.e. 42 to 60 for paper and 5 to 9 for plastic			2	2	2	
	(b)		1.23×10^{11} (2) Accept 123×10^9 If answer is incorrect award (1) for calculation of number of un-recycled plastic bottles in any 2 of the 3 years 2006 - 48×10^9 2005 - 41×10^9 2004 - 34×10^9		2		2	2	
	(c)		Any two of following for (1) Labour / transport costs for collecting Labour / machine costs for sorting / washing Plant costs for melting Sum of costs is greater than cost of producing new plastic bottles (1)	2			2		
			Question 4 total	2	2	2	6	4	0

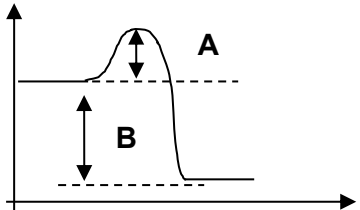
Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)		Copper(II) oxide / copper(II) carbonate named as reactant (1) Add excess to neutralise / remove all the acid (1) Filter to remove excess solid / reagent (1) Heat to evaporate some of solution and leave to cool and crystallise or Concentrate solution and leave to cool and crystallise or Leave solution to evaporate over time and crystallise (1)	3	1		4		4
	(b)		For copper(II) oxide $\text{CuO} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O}$ (2) If equation not correct award (1) for correct reactants or products or For copper(II) carbonate $\text{CuCO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O} + \text{CO}_2$ (2) If equation not correct award (1) for correct reactants or products		2		2	1	
			Question 5 total	3	3	0	6	1	4

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Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	<p>Electron transfer – calcium atom loses two outer shell electrons with one going to the outer shell of each of two chlorine atoms (1)</p> <p>Ion formation – one Ca^{2+} ion and two Cl^- ions formed showing octet around each chloride ion (1)</p>		2		2		
		(ii)	<p>Any two of following – property (1) and explanation (1)</p> <p>Soluble in water (1) ions break apart (1)</p> <p>High melting point/boiling point (1) large amount of energy required to overcome the strong attraction between ions (1)</p> <p>Conducts electricity when molten / dissolved (1) charged ions are free to move (1)</p>	4			4		
	(b)		<p>Shared pair of electrons between carbon and each of four chlorine atoms (1)</p> <p>Octet of electrons around carbon and all four chlorines (1)</p> 		2		2		
			Question 6 total	4	4	0	8	0	0

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			Higher than 25°C (1) Accept numerical value between 26-30°C			1			
				Less time for heat to be lost to be lost to surroundings (1)		1		2		2
	(b)			Graph peak at 40 cm ³ (1) Acid of half concentration therefore twice the volume needed (1)			2		2	
				Maximum temperature slightly below 25°C (20-24°C) (1) Same amount of heat generated by reaction but greater volume of liquid (1)			2	4		4
	(c)			H ⁺ (aq) + OH ⁻ (aq) → H ₂ O(l) (2) If state symbols missing or incorrect award (1) for correct reactants and products	2			2		
				Question 7 total	2	1	5	8	2	6

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Question				Marking details	Marks Available						
					AO1	AO2	AO3	Total	Maths	Prac	
8	(a)			614 (2) If answer is incorrect award (1) for indication of energy needed to break other bonds e.g. $4(413) + 193$		2		2	2		
	(b)			347 (2) If answer is incorrect award (1) for indication of energy released in forming other bonds e.g. $4(413) + 2(276)$		2		2	2		
	(c)			 <p>Both needed for (1)</p>	1			1			
Question 8 total					1	4	0	5	4	0	

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total	Maths	Prac
9	<p>Indicative content</p> <ul style="list-style-type: none"> • Coke burns in hot air heating furnace and producing carbon dioxide • Coke also reacts with carbon dioxide producing carbon monoxide (reducing agent) • Carbon monoxide reduces iron(III) oxide in the iron ore to molten iron which falls to bottom of furnace • Limestone containing calcium carbonate thermally decomposes to form calcium oxide which is a base • Calcium oxide reacts with acidic impurities in the iron ore to form liquid slag which floats on top of molten iron <p>Use of suitable formulae and equations</p> <p>5–6 marks: Description of all five steps; use of redox reaction/reduction; liquid products; minimum two chemical equations, including that of the reduction of iron(III) oxide <i>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.</i></p> <p>3–4 marks: Reference to purpose of iron ore, coke and limestone; description of reduction reaction and at least one other; at least one chemical equation <i>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.</i></p> <p>1–2 marks: Reference to purpose of at least two raw materials; description of at least one reaction; reasonable attempt at one chemical equation <i>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.</i></p> <p>0 marks: No attempt made or no response worthy of credit.</p>	4	2		6		
	Question 9 total	4	2	0	6	0	0

HIGHER TIER**SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES**

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	5	3	0	8	2	0
2	0	2	5	7	2	7
3	3	3	0	6	0	0
4	2	2	2	6	4	0
5	3	3	0	6	1	4
6	4	4	0	8	0	0
7	2	1	5	8	2	6
8	1	4	0	5	4	0
9	4	2	0	6	0	0
TOTAL	24	24	12	60	15	17