UNIT 2: CHEMICAL BONDING, APPLICATION OF CHEMICAL REACTIONS AND ORGANIC CHEMISTRY
FOUNDATION 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

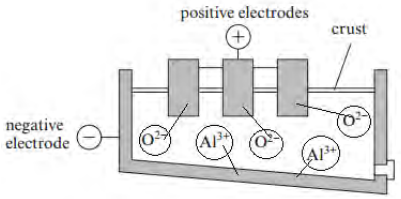
A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide 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)		Displacement	1			1		
		(ii)		More than 80.6g ☐ equal to 80.6g ☑ less than 80.6g ☐ If correct box ticked award (1) for any of following Atoms are not created or destroyed Same atoms present before and after Atoms are re-arranged during reaction Nothing has entered or left the beaker	1			1		1
		(iii)		Sodium Magnesium Copper All three correct for (1)			1	1		
	(b)			43 (2) Accept 42.9 / 42.85 If answer is incorrect award (1) for 12 g increase		2		2	2	
				Question 1 total	**2**	**2**	**1**	**5**	**2**	**1**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		 Both Al^{3+} ions shown going to the negative electrode **and** all three O^{2-} ions shown going to the positive electrode	1			1		
		(ii)		$\boxed{2}\ Al_2O_3 \longrightarrow \boxed{4}\ Al + \boxed{3}\ O_2$		1		1	1	
		(iii)		<u>Large amounts</u> of electricity needed	1			1		
	(b)	(i)		Cathode	1			1		
		(ii)		Lighted splint → goes 'pop'	1			1		1
		(iii)		32	1			1	1	
				Question 2 total	**5**	**1**	**0**	**6**	**2**	**1**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Significantly different to the other two readings at that temperature			1	1		1
	(b)			All points plotted correctly (2) Any 3 or 4 points correct (1) Ignore any curve drawn		2		2	2	
	(c)			Rate / volume collected increases as temperature increases up to an optimum temperature then decreases (1) Optimum temperature at around 40 °C (1) Award (2) for rate increases as temperature increases up to around 40 °C then decreases		2		2		
	(d)			Glucose → carbon dioxide + ethanol (2) If equation is incorrect award (1) for correct reactant **or** products	2			2		
	(e)			Enzyme	1			1		
				Question 3 total	**3**	**4**	**1**	**8**	**2**	**1**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		Green precipitate (1) White precipitate (1)		2		2		2
		(ii)		Sodium carbonate (2) If compound is incorrect award (1) for sodium **or** carbonate			2	2		2
	(b)	(i)		Damp red litmus paper (1) Accept damp pH paper Must be correct for second mark to be awarded Turns blue (1) Accept blue/purple for pH paper	2			2		2
		(ii)	I	Neutralisation	1			1		
			II	NH_4Cl Accept $NH_4^+ Cl^-$		1		1		
				Question 4 total	**3**	**3**	**2**	**8**	**0**	**6**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			C_3H_8 (1) Any value between −41 °C and 19 °C (1) Liquid (1)		1	 1 1	 3	 1	
	(b)	(i)		Heat	1			1		
		(ii)		Cover with damp cloth / fire proof mat / fire blanket / sand (1) Accept carbon dioxide fire extinguisher Removes oxygen (1) Second mark may be awarded without correct method	 1	1		 2		 1
	(c)	(i)		3320 (2) If answer is incorrect award (1) for (4 × 460)		2		2	2	
		(ii)		680 Error carried forward from (i)		1		1	1	
				Question 5 total	**2**	**5**	**2**	**9**	**4**	**1**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		**D** and **E** (1) both needed **C** and **G** (1) both needed **F** (1)	1 1 1			3		
		(ii)		**D** or **E** (1) It is an unsaturated compound / contains a double bond between carbon atoms (1)	 1	1		2		
	(b)			26		1		1	1	
				Question 6 total	**4**	**2**	**0**	**6**	**1**	**0**

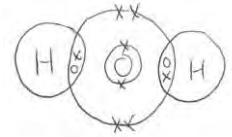
Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		25 ± 1 cm^3			1	1	1	
		(ii)		1.5 °C		1		1	1	
	(b)			Acid **A** because temperature rise is greater / it produces more heat			1	1		
	(c)			Add indicator to sodium hydroxide solution / solution in cup (1) Add acid slowly (from burette) (1) Indicator changes colour sharply at point of neutralisation (1)	3			3		3
				Question 7 total	**3**	**1**	**2**	**6**	**2**	**3**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)			'No sunscreen' and 'zinc oxide' are both reference substances ✓			1	1		
	(b)			How does the protection for each sunscreen compare with the others? ✓			1	1		
	(c)			To make the samples the same thickness ✓			1	1		1
	(d)			Result set 2 (1) The zinc oxide spot has stayed white because it blocks sunlight (1) The no sunscreen spot has gone black because sunlight has been absorbed by the paper (1)			3	3		3
				Question 8 total	**0**	**0**	**6**	**6**	**0**	**4**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
9				***Indicative content*** • Examples of objects made from plastic which were previously made from traditional materials e.g. drain pipes made of iron, bottles made of glass, window frames made of wood • Key properties required for these uses • Additional properties of plastics which make them a better choice than traditional materials for these uses e.g. plastic drain pipes do not rust and don't need to be painted, plastic bottles do not break easily, plastic window frames don't rot and don't need to be painted **5–6 marks** A comprehensive list of objects previously made from three different traditional materials; key properties identified and a range of additional advantageous properties given *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** A minimum of two objects previously made from two different traditional materials; key properties identified and an additional advantageous property given in at least one case *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.*	4	2		6		

				1–2 marks One or two objects previously made from a traditional material; advantage of plastic over traditional material stated *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 9 total	**4**	**2**	**0**	**6**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
10	(a)	(i)		$2SO_2 + O_2 \rightleftharpoons 2SO_3$ (3) If equation not correct award (1) for each of following SO_2 and O_2 on reactant side SO_3 on product side		3		3	1	
		(ii)		30 % (2) If answer is incorrect award (1) for 86 or 56 read from graph		2		2	2	
		(iii)		$SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$ (2) If equation not correct award (1) for either of following SO_3 and H_2SO_4 oleum formula based on incorrect reactant hydrogen, sulfur and oxygen atoms only e.g. $H_2S_2O_6$ if sulfuric acid given as H_2SO_3		2		2	1	
	(b)			Copper(II) sulfate turns from <u>blue to white</u> (1) Any one of the following for (1) Crystals become powdery / crumbly Loses its crystalline appearance Dehydrating agent (1)	3			3		3
				Question 10 total	**3**	**7**	**0**	**10**	**4**	**3**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
11	(a)	(i)		Correct transfer of both outer shell potassium electrons to the oxygen atom (1)		1		1		
		(ii)		All four electronic configurations and charges correct (2) Any two correct (1) potassium ions (2,8,8) K^+ oxide ions (2,8) O^{2-}		2		2		
	(b)			 Diagram shows shared pair of electrons between oxygen and both hydrogen atoms (1) Octet of electrons around oxygen atom and only two around both hydrogen atoms (1)		2		2		
	(c)			**C** (1) Conducts electricity in its solid form (1)			2	2		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
11	(d)			Award (1) each for up to three of following properties **with explanation** Conducts electricity – **free electrons carrying the charge** Malleable / can be hammered into shape / bent into shape – **layers of ions can slide over each other** Ductile / can be drawn into a wire – **layers of ions can slide over each other** High density – **ions are tightly packed** High melting / boiling point – **ions are tightly packed** If no creditworthy explanations given award (1) for two correct properties	3			3		
				Question 11 total	**3**	**5**	**2**	**10**	**0**	**0**

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SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	2	2	1	5	2	1
2	5	1	0	6	2	1
3	3	4	1	8	2	1
4	3	3	2	8	0	6
5	2	5	2	9	4	1
6	4	2	0	6	1	0
7	3	1	2	6	2	3
8	0	0	6	6	0	4
9	4	2	0	6	0	0
10	3	7	0	10	4	3
11	3	5	2	10	0	0
TOTAL	32	32	16	80	17	20