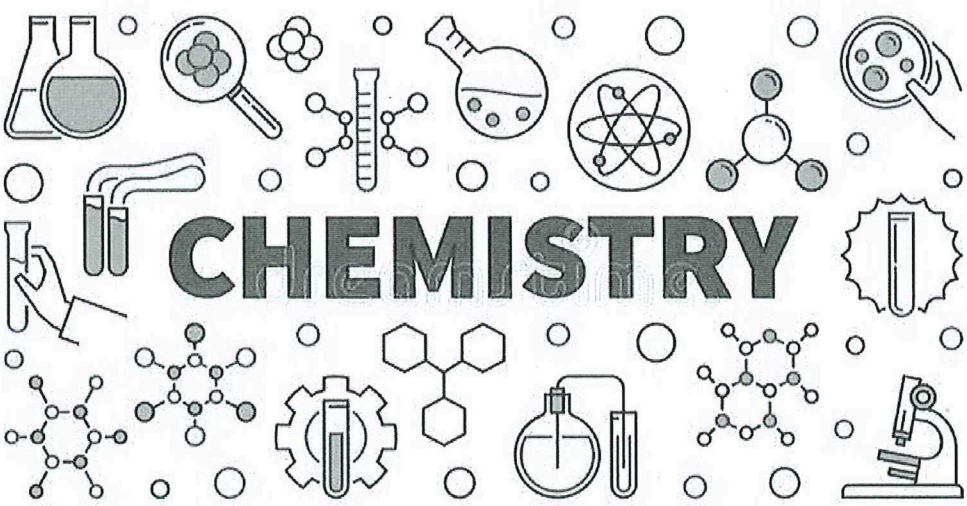

WJEC Chemistry 2

Dual Award – Higher Tier

2.2 Mark Scheme

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		**Agree** because we are not told / do not know that the carbonate is in excess (1) there may not be enough to neutralise all of the acid (1) OR **Disagree** because the carbonate will be in excess (1) so all of the acid will all be used up / neutralised (1) **no credit** if no choice is made and the answer does not mention agreeing or disagreeing	2			2		2
		(ii)		$K_2CO_3 + 2HCl \rightarrow 2KCl + CO_2 + H_2O$ reactants (1) products (1) balancing (1) balancing mark can only be awarded if both the reactants and products are correct		3		3	1	

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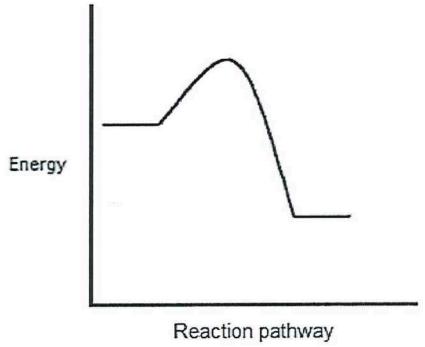
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		will overshoot / go past the point of neutralisation / endpoint 'too much acid' is a neutral answer	1			1		1
		(ii)		$H^+ + OH^- \rightarrow H_2O$ (1) charges on ions **must** be present H^+ comes from the (sulfuric) acid and OH^- comes from the (potassium) hydroxide / alkali (1) 'one comes from the acid and the other from the alkali' and 'they come from the acid and alkali' are neutral answers	2			2		
		(iii)			1			1		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		both will give a lilac flame / same colour flame (because both contain the potassium ions / K^+ / potassium)			1	1		1
		(ii)		add silver nitrate solution / $AgNO_3(aq)$ (1) potassium chloride gives a (white) **precipitate** whereas potassium sulfate gives no precipitate / only the chloride gives a (white) **precipitate** (1) OR add barium chloride solution / $BaCl_2(aq)$ (1) potassium sulfate gives a (white) **precipitate** whereas potassium chloride gives no precipitate / only the sulfate gives a (white) **precipitate** (1)		1	1	2		2
				Question 4 total	**6**	**4**	**2**	**12**	**1**	**6**

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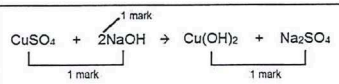
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	*(a)*			0.05 mol (2) award (1) for $\frac{5.23}{106}$ or 0.049 if incorrect answer		2		2	2	2
	(b)	(i)	I	to find out the approximate volume (of acid) needed / to get a rough result so as to save time when carrying out accurate titration	1			1		1
			II	sodium carbonate because less volume of it needed **both** needed			1	1		1
		(ii)		<u>repeat</u> (the titration) <u>without the indicator</u> (1) 25 cm^3 of Na_2CO_3 (1) 27.65 cm^3 of H_2SO_4 (1) [award (1) for same volume of sodium carbonate <u>and</u> mean volume of sulfuric acid] evaporate the water / leave to evaporate / allow to crystallise (1)	4			4		4
	(c)	(i)		 correct reactants (1) correct products (1) correct balancing (1) – only if reactants and products correct ignore state symbols		3		3		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		sulfate – add barium chloride (solution) **and** white precipitate (1) sodium – flame test **and** yellow/orange flame (1) assume **ions** are implied if correct tests and observations given	2			2		
	(d)			Mg^{2+} + CO_3^{2-} → $MgCO_3$ (1 mark) (1 mark) correct reactants (1) correct products (1) ignore state symbols and attempt at balancing		2		2		
				Question 4 total	**7**	**7**	**1**	**15**	**2**	**8**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7/2	(a)	(i)		**A** magnesium / Mg (1) **B** carbon dioxide / CO_2 (1)		2		2		
		(ii)		**C** $CuCl_2$ (1) **D** H_2O (1) neutral answers – names of compounds **C** and **D**		2		2		
	(b)			**2**HCl + **Na_2CO_3** → 2NaCl + H_2O + CO_2 award (1) for correct formula award (1) for balancing mark independently – balancing mark can be awarded even if the formula is incorrect		2		2		
	(c)	(i)		white precipitate / solid (forms)	1			1		1
		(ii)		$Ag^+(aq) + Cl^-(aq) \longrightarrow AgCl(aq)$ ☐ $Ag^-(aq) + Cl^+(aq) \longrightarrow AgCl(aq)$ ☐ $Ag^+(aq) + Cl^-(aq) \longrightarrow AgCl(s)$ ✓ $Ag^+(s) + Cl^-(s) \longrightarrow AgCl(s)$ ☐ $Ag^-(aq) + Cl^+(aq) \longrightarrow AgCl(s)$ ☐			1	1		
				Question 7/2 total	**1**	**6**	**1**	**8**	**0**	**1**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			**Indicative content** **AO1** • Temperature increases as acid is added up to 25 cm^3 • pH decreases from pH 14-8 • As more alkali is neutralised • Maximum temperature at point when **all** alkali is just neutralised / pH is 7 • Additional acid results in no further reaction but temperature decreases (due to addition of cooler solution / returning to room temperature) • pH decreases from pH 6-1 / below 7 **AO2** • Alkali is neutralised as first 25 cm^3 of acid is added • 25 cm^3 is point of complete neutralisation • 25-50 cm^3 acid is in excess	3	3		6		6
				5-6 marks Good understanding of the link between temperature and neutralisation; volumes from the graph used to support the explanation *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** Full description of the temperature change; some understanding of the link between temperature and neutralisation *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** Basic description of the temperature change shown on the graph *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)			$H^+ + OH^- \rightarrow H_2O$ ignore any state symbols and attempt to balance	1			1		
				Question 7 total	**4**	**3**	**0**	**7**	**0**	**6**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		award (1) **each** for **A** and **B** **A** copper(II) nitrate / copper nitrate / $Cu(NO_3)_2$ **B** carbon dioxide / CO_2 award (1) for **both C** and **D** **C** zinc nitrate / $Zn(NO_3)_2$ **D** copper	3			3		3
		(ii)		$Mg + 2HNO_3 \rightarrow Mg(NO_3)_2 + H_2$ award (1) **each** for formulae of <u>products</u> award (1) for balancing only if all formulae are correct		3		3		
		(iii)		displacement	1			1		1
	(b)	(i)		$H^+ + Cl^- \longrightarrow HCl$ ☐ $Ba^{2+} + SO_4^{2-} \longrightarrow BaSO_4$ ✓ $Ba^{2+} + S^{2-} + 4O^{2-} \longrightarrow BaSO_4$ ☐ $2H^+ + 2Cl^- \longrightarrow 2HCl$ ☐ $Ba^{2-} + SO_4^{2+} \longrightarrow BaSO_4$ ☐			1	1		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)	I	flame test – (apple) green (flame)	1			1		1
			II	silver nitrate (solution) – white **precipitate**	1			1		1
				Question 5 total	**6**	**3**	**1**	**10**	**0**	**6**

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