OCR GCSE GATEWAY CHEMISTRY A · J248

CHEMISTRY



MARK SCHEME

M4 GRAPHS

SCORE	PERCENTAGE
/55	%

STEMUP

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Question			Answer/Indicative content	Marks	Guidance
1		i	0.49 / 0.5 (g) (1)	1	
		ii	2.9 / 3.0 (minutes) (1)	1	allow just '3' minutes
		iii	curve for small chips is **steeper** / ora (1)	1	**assume unqualified answer refers to small marble chips** **allow** for a given time more gas with smaller chips (1) **allow** reaction finishes in shorter time / reaction finishes before the large chips / curve ends first / reaction stops sooner (1) **ignore** references to reaction finishes in a faster / quicker time **allow** numbers quoted from the graph but they must be correct to within ±½ square
			Total	3	
2		i	15 (cm^3) (1)	1	
		ii	20 (cm^3) (1)	1	
			Total	2	
3	a	i	any answer in the range 21.5 – 22.5 (cm^3) (1)	1	
		ii	20 (cm^3) (1)	1	
	b	i	$\frac{30 \times 0.3}{1000}$ (1)	1	**allow** 0.030 × 0.3 **allow** $30 \times 10^{-3} \times 0.3$ **allow** other substitution and rearrangement of moles = conc × volume e.g. "0.009/0.30 = 0.03dm^3 = 30cm^3, and 0.009 × 30 = 0.3"

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Question			Answer/Indicative content	Marks	Guidance
		ii	0.45 (mol / dm^3) (2) **but if answer incorrect then** $\frac{0.009 \times 1000}{20}$ **or** $\frac{0.009}{20 \times 10^{-3}}$ **or** $\frac{0.009}{0.020}$ (1)	2	**allow** ecf from (a)(ii) i.e. $\frac{0.009 \times 1000}{\text{volume}}$ **or** $\frac{0.009}{\text{volume} \times 10^{-3}}$ **or** $\frac{0.009}{\text{volume in } cm^3}$
			Total	5	
4		i	2.9 / 3.0 (minutes) (1)	1	**allow** just '3' (minutes) (1)
		ii	curve for small chips is **steeper** / ora (1)	1	**assume unqualified answer refers to small marble chips** **allow** for a given time more gas with smaller chips (1) **allow** reaction finishes in shorter time / reaction finishes before the large chips / curve ends first / reaction stops sooner (1) **ignore** references to reaction finishes in a faster / quicker time **allow** numbers quoted from the graph but they must be correct to within ±½ square eg the curve for small chips finishes at 3 minutes but the curve for large chips finishes at 5 minutes
			Total	2	

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Question			Answer/Indicative content	Marks	Guidance
5			idea that Julie is correct because the ozone hole area is increasing and decreasing even though the world use of CFCs has (generally) declined (1) idea that Phil is incorrect because the (graph shows that) the hole in the ozone layer is bigger in 2015 than in 1989 / ora (1)	2	**allow** idea that Julie is correct because the ozone hole area increases after the world use of CFCs has (generally) declined (1)
			Total	2	
6	a	i	40(°C) (1)	1	
		ii	solubility decreases as temperature increases / ora (1)	1	assume unqualified answer refers to temperature increasing
		iii	yes (no marks) idea that 1 kg can dissolve 2.5 g (1) so 3 kg can dissolve 3 × 2.5 (g) (1)	2	if no = 0 marks for the question **no** marks for 7.5 kg on its own – marks are for the working out
	b		quoting a solubility for carbon dioxide from any temperature (1) and show it is less than the solubility of sulfur dioxide at the same temperature (1)	2	**allow** much larger y-axis scale (1) **allow** the (solubility) values for sulfur dioxide are greater than the values for carbon dioxide at all temperatures (2)
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
7	a	i	25 – 27 (°C) (1)	1	
		ii	yes (no marks) idea that 1 kg can dissolve 2.5 g (1) so 3 kg can dissolve 3 × 2.5 (g) (1)	2	if no = 0 marks for the question no marks for 7.5 kg on its own – marks are for the working out
	b	i	quoting a solubility for carbon dioxide at a particular temperature and the solubility of sulfur dioxide at the same temperature (1) divide solubility of sulfur dioxide by solubility of carbon dioxide to get a number bigger than 50 / AW	2	the solubilities quoted must be within ±5 for sulfur dioxide and ±0.5 for carbon dioxide **allow** showing that 50 x CO_2 solubility is less than that of SO_2 **allow** at 0 °C (solubility of) SO_2 is 69 times that of CO_2 = 2 marks **allow** at 10 °C (solubility of) SO_2 is 68 times that of CO_2 = 2 marks **allow** at 40 °C (solubility of) SO_2 is 60 times that of CO_2 = 2 marks
		ii	20 – 40 (g) (1)	1	
		iii	more gas dissolves (in Arctic Ocean) (1)	1	**allow** more gas dissolves (in cold water) **allow** solubility of gas is more (in Arctic) **allow** ora
			Total	7	

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Question			Answer/Indicative content	Marks	Guidance
8		i	All points plotted correctly scores 2 mark ✓✓ Straight line of best fit through the points ✓	3 (AO2 × 2.2 1.2)	ALLOW ± ½ square 3 or 4 points plotted correctly scores 1 mark ALLOW correctly drawn line of best fit through incorrectly drawn points; this may be a curve
		ii	0.72 (A) ✓	1 (AO3.1a)	ALLOW answer in the range 0.70 A – 0.74 A / ecf
		iii	FIRST CHECK ANSWER ON ANSWER LINE If answer = 47(g) award 2 marks 5A = 15.5(g) = 15.5 × 3 = 46.5(g) ✓ = 47(g) (2 sig. figs) ✓	2 (AO2.1 1.2)	ALLOW 1.0 A = 3.1 (g) (from graph or table) 10(A) = 31(g) and 5 (A) = 1.55 (g) ✓ 15(A) = 31 + 1.55 = (46.5) 47 (g) ✓
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
9		i	x- axis: mass of copper carbonate (g) **AND** y-axis: mass of copper oxide(g) ✓ Appropriate scale ✓ All points plotted correctly ✓ Line of best fit through the points ✓	4 (AO4 × 2.2) (AO1.2)	**ALLOW** correct formulae, ie $CuCO_3$ and CuO **ALLOW** just copper carbonate (g) **AND** copper oxide(g) **ALLOW** ± ½ square **ALLOW** line that starts at (1, 0.7) and does not go through (0,0) **ALLOW** correctly drawn line of best fit through incorrectly drawn points; this may be a curve
		ii	3.8(0) (g) ✓	1 (AO3.1a)	**ALLOW** ± ½ square **ALLOW** ECF from graph
		iii	Idea that carbon dioxide (gas) escapes ✓	1 AO3.2b)	**ALLOW** idea that a gas is produced / escapes, but **DO NOT ALLOW** incorrectly named gas
			Total	**6**	
10			(Amount of carbon dioxide) increases / AW ✓	1 (AO3.1a)	Must have the trend, not just the start and end amounts
			Total	**1**	

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Question			Answer/Indicative content	Marks	Guidance
11		i	Linear scale on both x and y axes ✓ All points plotted correctly scores 2 marks **BUT** 3 or 4 points plotted correctly scores 1 mark Line of best fit through points ✓	4 (AO3 × 2.2)	**ALLOW** ± ½ square **NB** Check that 7.0×10^{-3} is plotted as 0.7×10^{-2}
		ii	(Rate of reaction) increases ✓	1 (AO3.1a)	
		iii	Idea that acid particles move faster / particles have more energy ✓ Idea of increased collision frequency (between acid and thiosulfate) ✓ Idea of more successful collisions / collisions (between acid and thiosulfate) are more energetic / more particles have the activation energy ✓	3 (AO2.2)	**IGNORE** references to 'faster' collisions **IGNORE** just 'more collisions'
			Total	**8**	

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Question			Answer/Indicative content	Marks	Guidance
12		i	All points plotted correctly scores 2 marks **BUT** 3 or 4 points plotted correctly scores 1 mark Line of best fit through points ✓	3 (AO2×2.2) (AO1.2)	**ALLOW** ± ½ square
		ii	42s ± 2s ✓	1 (AO2.2)	**ALLOW** answer ± 2s of graph
		iii	(Rate of reaction) increases ✓	1 (AO3.1a)	
		iv	**Any two from:** Idea that particles move faster / particles have more energy ✓ Idea of increased collisions (frequency) between acid and thiosulfate ✓ Idea of more successful collisions / collisions between acid and thiosulfate are more energetic ✓	2 (AO2×2.2)	**IGNORE** references to 'faster' collisions
			Total	**7**	

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