AQA Chemistry GCSE Exam-style mark scheme

C8 Rates and equilibrium

GCSE Chemistry only

Higher

Question	Answers	Extra information	Mark	AO / Spec ref.
01	Increasing solution temperature = more collisions every second **and** more collisions with enough energy to break bonds. Adding a catalyst = more collisions every second with enough energy to break bonds. Increasing gas pressure = more collisions every second.	If more than three lines are drawn, deduct **1** mark for each incorrect line.	1 1 1	AO1 C6.1.2 WS1.2
02.1	At least **five** points plotted correctly; all points correct; smooth curve avoiding anomalous point.	± half a small square	1 1 1	2 × AO2 1 × AO3 C6.1.2 MS4a, 4c
02.2	Any **one** from: • clock started too late • clock stopped too soon • sodium thiosulfate solution too concentrated • sodium thiosulfate solution warmer.	Accept any other sensible suggestions. Must be an error that leads to an anomalous point that is too low.	1	AO3 C6.1.2 WS3.7
02.3	Rate increases **or** time taken decreases as concentration increases; particles closer together **or** more particles in a given volume; particles collide more frequently/ more collisions in a given time.	Do not accept more collisions or more successful collisions.	1 1 1	AO2 C6.1.3 WS1.2
03	**Level 3:** Detailed and coherent practical method described with most apparatus named **and** both evidences for reversibility.		5–6	AO1 C6.2.2
	Level 2: Some description of practical method **or** named apparatus **and** one piece of evidence for reversibility.		3–4	
	Level 1: Brief description of method **or** named apparatus **or** one piece of evidence for reversibility.		1–2	
	Level 0: No relevant content.		0	

Question	Answers	Extra information	Mark	AO / Spec ref.
	Indicative content: Apparatus: • Bunsen burner • test tube or crucible • pipette or dropper • any other valid apparatus. Method: • heat until colour change • allow to cool • add water (dropwise). Evidence: • white powder becomes blue again when water is added • and energy evolved/test tube gets hot Other creditworthy ideas: • word equation with reversible arrow: hydrated copper sulfate (blue) $\underset{\text{exothermic}}{\overset{\text{endothermic}}{\rightleftharpoons}}$ anhydrous copper sulfate + water (white) • endothermic in forwards direction • exothermic in backwards direction. This indicative content is not exhaustive, other creditworthy responses should be awarded marks as appropriate.			
04.1	Gas syringe **or** inverted measuring cylinder over water; correctly named.	Must be water present in trough if measuring cylinder used.	1 1	AO2 C6.1.2 AT1
04.2	when t = 0–20s		1	AO3 C6.1.1 MS4e
04.3	2.25 cm^3/s	Allow error carried forward from **04.2**; allow **1** mark for evidence of 44 to 46 divided by 20.	1 1	AO2 C6.1.1 MS3c, 4a
04.4	steeper curve same final volume (80 cm^3)		1 1	AO2 C6.1.2 MS4e

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05.1	reversible (reaction)		1	AO1 C6.2.1
05.2	More sulfur trioxide; fewer molecules **or** moles (of gas) on product side so equilibrium shifts right to lower the pressure.	Ignore references to rate.	1 1	AO2 C6.2.7
05.3	Less sulfur trioxide; forward reaction is exothermic so equilibrium shifts left to lower the temperature.	Ignore references to rate.	1 1	AO2 C6.2.6
05.4	Lower activation energy/alternative reaction pathway; resulting in higher proportion of molecules with enough energy to react.	Ignore surface area.	1 1	AO1 C6.1.3 C6.1.4