Question	Answer	Marks	AO Element	Notes	Guidance
1(a)	to left / towards reactants / in reverse direction	**1**			
1(b)	increase / faster (1) increase / faster (1)	**2**			
2(a)	any **one** from: increase surface area (of cobalt) powder the metal add a catalyst	**1**			
2(b)	(particles) have more energy / (particles) move faster (1) more collisions per second / greater collision rate (1) more of the colliding molecules have sufficient energy (activation energy) to react (1)	**3**			
3	B	**1**			
4(a)(i)	rate at t_2 less than at t_1 or the rate decreases	**1**			
	rate at t_3 zero / reaction stopped	**1**			

Question	Answer	Marks	AO Element	Notes	Guidance
4(a)(ii)	rate at t_2 less than at t_1 because **concentration** of hydrogen peroxide is less at t_2 or **concentration** of hydrogen peroxide is decreasing.	**1**			
	(rate at t_3 zero / reaction stopped because) hydrogen peroxide is used up	**1**			
4(b)(i)	steeper and must come from the origin	**1**			
	final volumes the same	**1**			
4(b)(ii)	Any **two** from: steeper curve because of a faster rate faster rate because of increased surface area same amount / volume / mass / no of mol of hydrogen peroxide ecf for M1 for a shallower curve because of slower rate.	**2**			
4(c)	filter (and rinse / wash)	**1**			
	dry manganese(IV) oxide	**1**			

Question	Answer	Marks	AO Element	Notes	Guidance
	weigh / measure mass manganese(IV) oxide after reaction	**1**			
	the mass should be 0.1 g **or** unchanged.	**1**			
4(d)(i)	number of moles of O_2 formed = 0.096 / 24 = 0.004	**1**			
4(d)(ii)	number of moles of H_2O_2 in 40 cm^3 of solution = 0.004 × 2 = 0.008	**1**			
4(d)(iii)	concentration of the hydrogen peroxide in mol / dm^3 = 0.008 / 0.04 = 0.2	**1**			
					[Total: 23]