

Question	Answer	Marks	AO Element	Notes	Guidance
1	B - Catalysts increase the energy of the reacting particles.	1			
2	gradient / slope is greater for strontium ora	1			
3	11 (cm ³)	1			
4	speeds up reaction / increases rate (of reaction)	1			
5	(gas) syringe or measuring cylinder correctly labelled	1			
	(gas) tube leading from closed apparatus to flask or from inverted measuring cylinder with mouth underwater to flask	1			
	workable apparatus and apparatus airtight / no gaps in apparatus	1			COND

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6	44–48 (seconds)	1			
7	increased (rate) / faster (rate) / quicker	1			
8	initial gradient less than the original line AND starting at 0–0	1			
	ends up at same final volume	1			
9	41 (cm ³)	1			
10(a)	measuring cylinder	1			
10(b)	measure the volume of gas given off / measure volume of carbon dioxide produced OR measure time taken (1) (measure volume) over a given time(s) OR (measure time) to produce given volume(s) of gas (1)	2			

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11	decreases rate / decreases it / makes it slower	1			
12(a)	methane	1			
12(b)	speeds up the reaction / increases the rate of reaction	1			
13	increasing the concentration of the <u>acid</u> (1) increasing the temperature (1) using <u>magnesium</u> powder / using smaller pieces of <u>magnesium</u> (1)	3			
14(a)	54 (cm ³)	1			
14(b)	S on any portion of the graph above 2.0 min and below 3.8 min	1			
14(c)	steeper gradient starting at 0,0 (1) ends up at same volume (70 cm ³) (1)	1			
14(d)	decreases rate / goes slower	1			

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14(e)	increases rate / goes faster	1			
15(a)	decreases (rate)	1			
15(b)	increases (rate)	1			
16	line in shape of upward curve (1) line below the curve for all temperatures (1)	2			
17(a)	carbon dioxide released / gas released	1			
17(b)	2.2 (g)	1			
17(c)	initial gradient of line steeper and starts at 250–0 (1) levels out at 247.8g (1)	2			
17(d)	20 °C → 0.16 40 °C → 0.64 30 °C → 0.32	1			
18	11.5 (cm ³ / min)	1			
19	volume of gas (1) time (1)	2			

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20	any two from: • increase concentration of hydrochloric acid • decrease particle size of calcium carbonate / increase surface area of calcium carbonate • (add) catalyst	2			
					[Total: 40]