

# Chemistry Topic 6: Rate of reaction

## 1. Keywords

Rate of reaction	Amount of reactant used or product formed ÷ time
Collision theory	Idea that for a reaction to occur the particles have to hit each other with enough energy
Activation energy	The minimum energy needed for a collision to cause a reaction
Catalyst	A substance which speeds up a chemical reaction by lowering the activation energy
Reversible reaction	A chemical reaction that can go in either direction
Equilibrium	When the forwards and backwards reactions happen at the same rate

## 2. Ways to measure the rate of reaction

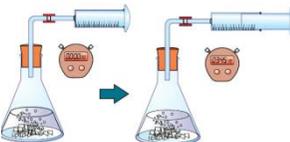
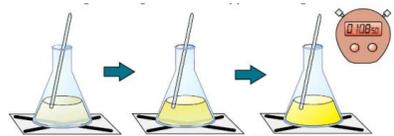
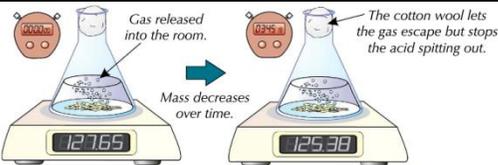
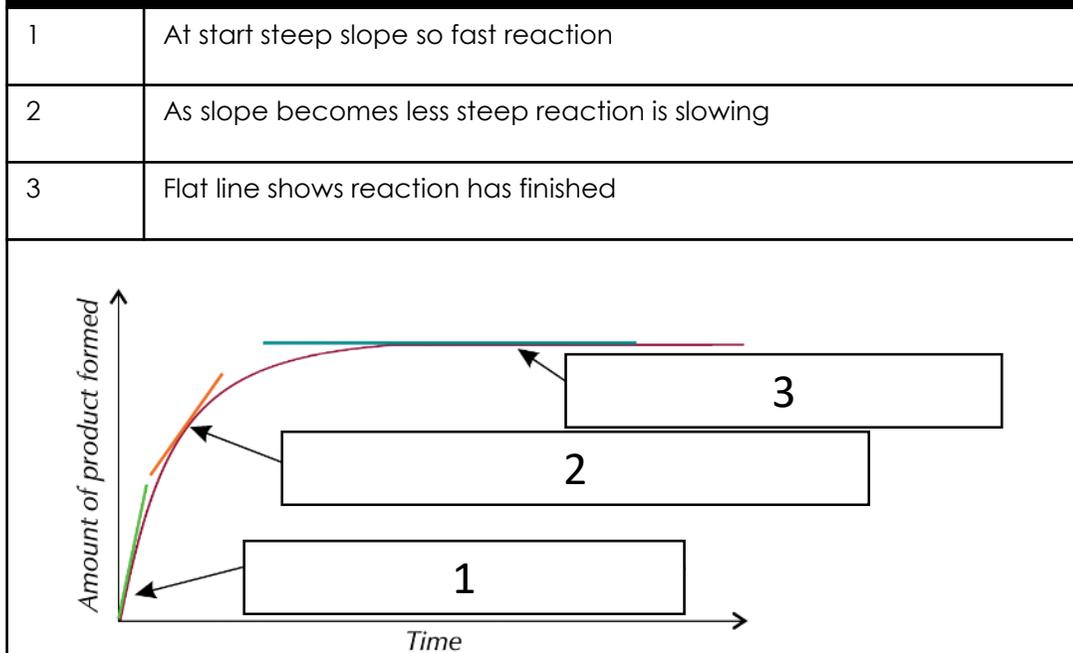
Volume of gas produced	
Formation of a solid product	
Change in mass	

Figure 2: Investigating the rate of the reaction between sodium thiosulfate and hydrochloric acid.

## 3. Calculating rates from graphs



## 4. Factors affecting rate of reaction

Factor	Change	Effect on rate	Reason
Temperature	Increase	Increase	The particles are moving faster so collide more often and with a greater proportion of successful collisions
Concentration	Increase	Increase	There are more particles so collisions are more frequent
Surface area	Increase	Increase	There are more particles available so more collisions
Catalyst	add	increase	The lower activation energy means more particles can successfully collide

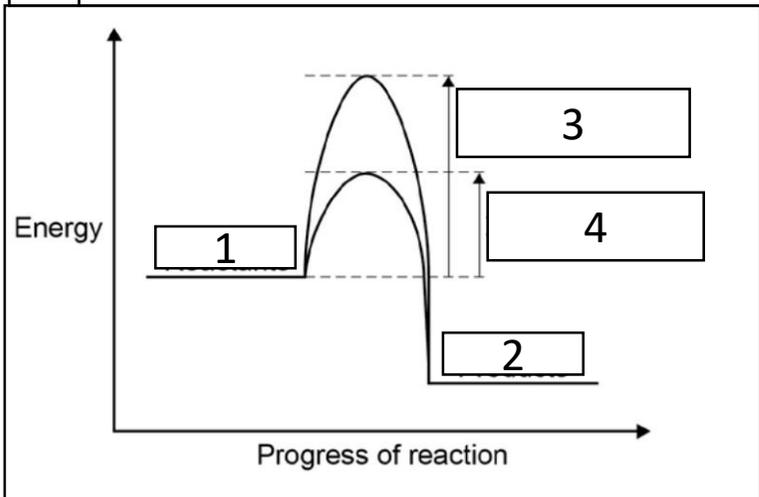
### 5. Catalysts

1 Reactants

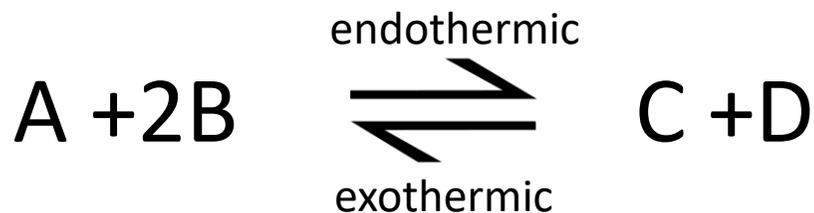
2 Products

3 Activation energy without catalyst

4 Activation energy with catalyst



### 6. The effect of changing conditions on equilibrium (HT ONLY)



Le Chatelier's principle: A reaction at equilibrium will act to oppose any change made to it

Condition	Change	Affect
concentration	Increase A or B	Shifts right to increase the concentration of C+D
	Decrease A or B	Shifts left to increase concentration of A+B
Temperature	Increase	Shifts right in favour of the endothermic reactions making more C+D
	Decrease	Shifts left in favour of the exothermic reactions making more A+B
Pressure	Increase	Shifts right to the side with the fewest moles so makes more of C+D
	Decrease	Shifts left to the side with the most moles so makes more A+B