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Topic 6 AQA Chemistry- Rate and extent of chemical change

- Triple Science Content only in purple
- Triple Science and Higher Content Only in blue

Calculating rates of reactions - There are 2 equations you can use:

Rate of reaction = amount of reactant used / Time

Rate of reaction = amount of product formed / Time

- Quantity of reactant or product measured in **Grams (g) or Cm3 (Volume)**

- Units: **g/s or cm_3/s**

Factors which affect the rates of chemical reactions -

- **Factors:**

- Concentration - Increased concentration increases rate of reaction **as there are more particles**

- Pressure- Increased pressure increases rate of reaction as there are **more molecules in a given volume.**

- Surface area - Increased surface area **increases rate of reaction**

- Temperature - Increased temperature increases rate of reaction **as particles have more energy**

- Catalysts- Provides an **alternative pathway route for a reaction**, with a **lower activation energy**, increasing the rate of reaction when it is used. **Do not get used or changed up by the reaction** (stay the same).

***Collision theory* - IMPORTANT for reactions to occur:**

Collision theory: a reaction occurs when **reacting particles collide** with each other and with sufficient energy and correct orientation

Activation energy: the **minimum amount** of energy that particles must have to react

- Increasing the concentration, the pressure, and the surface area, increases the **frequency of collisions and so increases the rate of reaction.**
- Increasing the temperature increases the frequency of collisions as particles have **more energy** and so increases the rate of reaction.

Catalysts

Catalysts- speed up chemical reactions without being changed or used up during the reaction.

Provides an **alternative pathway** route for a reaction, with **a lower activation energy**, increasing the rate of reaction when it is used.

In the body, enzymes are **biological catalysts.**

Reversible reactions and Dynamic Equilibrium-

Reversible reactions - forwards and backwards reactions are formed at **a constant rate**, in a **closed system.**

The direction of the reaction/position of equilibrium can be changed by changing the conditions

Symbol $\rightleftharpoons$ instead of $\rightarrow$ to represent a reversible reaction

If a reversible reaction is endothermic one way, it is exothermic in the opposite direction

The effect of changing conditions on equilibrium- Le Chatelier's Principle-

If a system is at equilibrium and a **change** is made to any of the **conditions**, then the system responds to **counteract the change**

The effect of changing concentration when a reaction is in equilibrium-

If concentration of reactants is **increased**, position of equilibrium shifts towards products so more **product is produced.**

if concentration of **products** is increased: position of equilibrium shifts towards reactants so **more reactant is produced.**

The effect of temperature changes on equilibrium

-If the temperature **increases**, the equilibrium shifts towards **the endothermic**

reaction (the questions will tell you whether the forward reaction is endothermic or exothermic, if the forward reaction is **endothermic**, then equilibrium shifts forwards to the **products** vice versa).
-If **temperature decreases**, then equilibrium shifts to the side of **exothermic reaction** e.g backwards reaction is exothermic, so equilibrium shifts to the reactants side.

The effect of pressure changes on equilibrium - only in gaseous reactions-

If the pressure **increases,** equilibrium shifts to the side with **less gas moles** e.g. $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$, left side has 4 moles of gas (1+3) and right has 2 moles of gas, so equilibrium shifts to the right side (products).

If pressure **decreases,** equilibrium shifts to the side with **more gas moles.**