REACTION RATE

Calculating reaction rate

$$rate\ of\ reaction = \frac{moles\ of\ products/reactants}{time}$$

= ....$mol.s^{-1}$

$$rate\ of\ reaction = \frac{volume\ of\ products}{time}$$

= ....$cm^3.min^{-1}$

$$rate\ of\ reaction = \frac{concentration\ of\ products/reactants}{time}$$

= ....$mol.dm^{-3}.s^{-1}$

Reaction rate is also calculated by calculating the slope of the graph at a specific point.

COLLISION THEORY

More effective collisions per unit of time.
Molecules must have the correct orientation.

FACTORS INFLUENCING REACTION RATE

FACTOR	RULE	REASON
CONCENTRATION OF (reactants)	Increase in concentration Increase the rate	Amount of mole of (reactants) increases $C \propto n$ $V \rightarrow$ constant
TEMPERATURE OF reaction	Increase in temperature Increase in rate Every 10˚C – double the rate	Kinetic energy of molecules increase $T \alpha E_{k ave}$
CATALYST	Adding a catalyst Increase the rate	Lowers activation energy Give an alternative path
SURFACE AREA	Increase the surface area Increase the rate	Amount of moles of reaction increases
NATURE OF (reagents)	The stronger the bonding forces the slower the rate	During the reaction bonds must be broken and formed

FACTORS INFLUENCING CHEMICAL EQUILIBRIUM

CHANGE IN STATE	SHIFT IN EQUILIBRIUM
CONCENTRATION OF (reagents) INCREASES	In the direction of using the reagents (Throw in left equilibrium to right)
PRESSURE INCREASES (Gasses only p α 1/V)	In the direction of smallest amount of mole/gas
TEMPERATURE INCREASES	In direction of endothermic reaction ($\Delta H > 0$)
CATALYST IS ADDED	NO CHANGE in equilibrium (You can just get products faster, but not more)

LE CHATELIER'S PRINCIPLE

1. Identify the disturbance
2. According to Le Chatelier's principle the system will react to ..... + reason out of above table)
3. Forward / Reverse reaction is favoured
4. Right / Left

EQUILIBRIUM CONSTANT (K_C)

- For the reaction aA(g) + bB(g) → cC(g) + dD(g), $K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$
- Only gases (g) and solutions (aq) appear in the K_c expression – no solids (s) and pure liquids (ℓ)
- The equilibrium constant does not have a unit.
- Large K_c values: Reactions in which the concentration of products are high in comparison to that of reactants.
- Small K_c values: Reactions in which the concentration of products are low in comparison to that of reactants.
- **Only temperature can change the K_c value. Therefore the K_c value for a reaction is given at a specific temperature.**