Kinetics

rate of reaction

factors

Analysis

Chemical methods of analysis

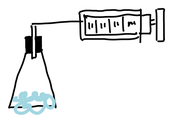
- interfere with reaction being studied

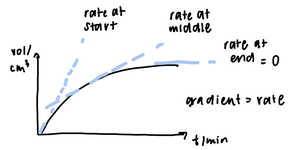
$CH_3COOC_2H_5 + NADH \rightarrow CH_3COONa + C_2H_5OH$

↓ put in cold water
titration
conc-time graph

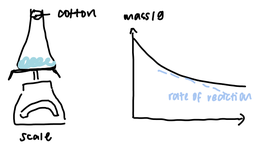
Physical methods for analysis

1) measuring volume of gas evolved





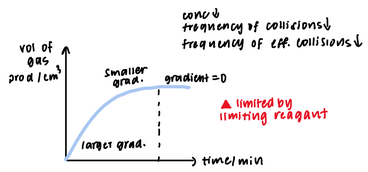
2) measuring rate of loss of mass of reaction vessel



3) colour intensity

4) pH level

- explain why rate of reaction is different for different reactions



Collision Theory

- quantitatively explain how chemical reactions occur and why reaction rates differ for different reactions
- For chemical reactions to occur, there must be effective collisions between reacting particles

Effective collision

1) collide in correct orientation

2) reacting particles need sufficient energy to overcome the activation energy of the chemical reaction

↳ collide with sufficient energy higher than activation energy

↑ freq of collision
↑ ine particles E
(more fastor)

effective collision → reaction

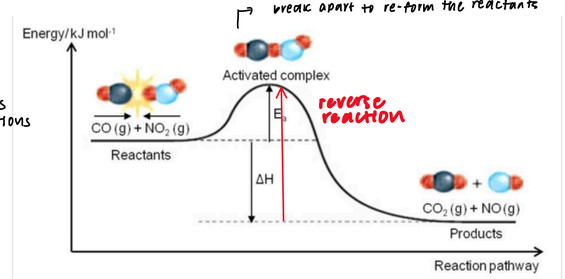
activation energy

min amt of E that reacting particles must form the activated complex and lead to a reaction

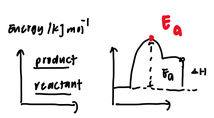
Energy profile diagram

temporary, unstable arrangement of atoms that may form products / may break apart to re-form the reactants

traces progress of reactions



higher # of collisions → higher rate of reaction



does not tell us the rate

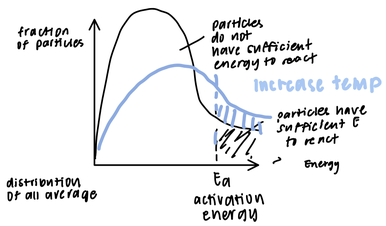
factors

1) increased frequency of collisions
2) increase fraction of collisions that have enough E to overcome activation E (effective collisions)

1) Temperature

larger KE → move faster → more collisions

Maxwell-Boltzmann distribution



Temp ↑ AV KE ↑
greater fraction of reacting particles that have energies greater than E_a

2) particle size (solid)

micro > nano
increases accessible area for collision

3) pressure (gas)

- particles are closer
- collide more frequently

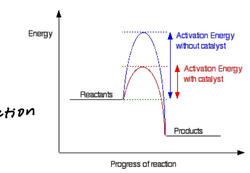
4) concentration (solutions)

- particles will collide more frequently (as there are more)
- irreversible → rate at the end of reactions = 0

* not proportional

5) catalyst

- chemical substance that increases the rate of reaction and remains chemically unchanged at the end of reaction



- greater fraction of reaction particles have E > E_a