

2. Collision Theory

a) What is "collision theory"?

reaction rates depend on collisions between the reactant particles

b) What factors affect collisions between reactants?

i) Temperature

increase temp. = increase speed of reactants
higher speed = more collisions

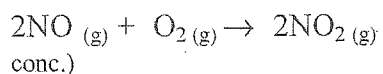
Therefore, if increase temp, you increase the rate!

ii) Pressure (affects gas reactants only)

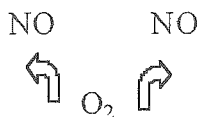
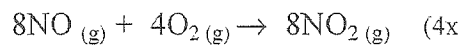
increase pressure = more collisions because less volume

Therefore, if increase pressure, you increase the rate!

iii) Concentration



vs.



2 possible collisions



32 possible collisions!

Increase concentration = more collisions
Therefore increase concentration, you increase the rate!

iv) Surface Area

A greater surface area = more reactants can collide

Therefore increase surface area, you increase the rate!

v) Phase

① Aqueous ions > Gases and Liquids > Solids

Fastest rate ————— slowest rate

② Homogeneous reactions are faster than Heterogeneous reactions

two gases
two substances dissolved (aq)
two liquids that are miscible

solid and gas
liquid and gas
solid and liquid
two liquids that are immiscible

More mixing = more collisions = increase in rate of reaction!

vi) Bonds

Breaking reactant bonds and reforming product bonds takes time.

A reaction with less bonds to break and/or form will have a faster rate of reaction.

A reaction with weaker bonds to break will have a faster rate of reaction. (this is usually impossible to predict, so ignore)

See Hebden (page 7) for examples of how bonds can affect rate.