F5 C1
Definition
Rate of reaction is ..amount of reactant used up / amount of product obtain.. per unit time.
A catalyst is a substance that changes the rate of reaction but itself chemically unchange(physical 可以变)

Rate of reaction
-Average rate of reaction
Change in amount of reactant or product / time taken for the change to happen
-Instantaneous rate of reaction
Gradient of the tangent to the curve at the given time

Factors affect rate of reaction
-Concentration
-Total surface area
-Temperature of reaction
-catalyst
-pressure

Catalyst
-positive catalyst = increase rate of reaction
-negative catalyst = decrease rate of reaction
-does not affect the amount of products or the type of products formed
-small amount of catalyst is required
-specific
-transition metal /compound of transition metal

Iron = Haber process(making ammonia)
Vanadium(5) oxide=Contact process(making of sulphuric acid)
Platinum=Ostwald process(making nitric acid)
Nicker=Hydrogenation(making of margarine)
Manganese (4) oxide = $2H_2O_2 \rightarrow 2H_2O + O_2$

Application
-Burning of charcoal
Small pieces of charcoal have a larger total exposed surface area to oxygen.
~Charcoal can burn quickly

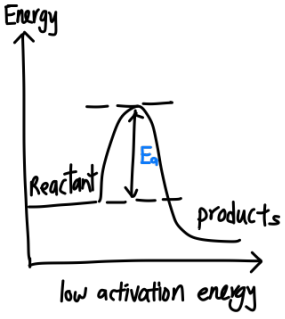
-Storing of food in refrigerator
Refrigerator provides a low temperature environment
~microorganism become inactive -> less tocsin released -> rate of decaying decrease

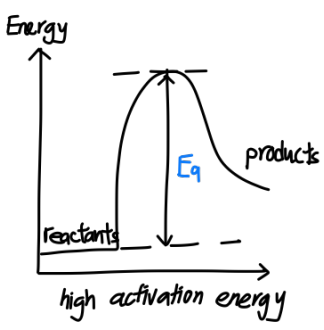
-Cooking of solid food with different size
Smaller pieces of food have a larger total surface area exposed to heat
~More heat is absorb to book the food

The Collision Theory
Reaction happen = correct orientation + enough energy

Energy profile diagram
Activation energy is the different between the peak of the graph and the energy content of the reactant.

Ea = activation energy





Frequency of effective collisions and factors affecting the rate of reaction

*If not sure about the reactant react just write

Frequency of collision between reactant/particles increase

~All the (1) is same , 4 and 5 is repeated

-Total surface area

1.The rate of reaction of experiment 2(powder) is higher than experiment 1.

2.Experiment 2 uses smaller size of (calcium carbonate).

3.Powder calcium carbonate in experiment 2 has a larger total surface area.

4.Frequency of collision between hydrogen ion and carbonate ion in calcium carbonate in experiment 2 is higher.

5.Frequency of effective collision between hydrogen ion and carbonate ion in calcium carbonate in experiment 2 is higher.

-Concentration

1.The rate of reaction of experiment 2 is higher than experiment 1.

2.Concentration of (thiosulphate acid) in experiment 2 is higher.

3.The number of hydrogen ion per unit volume is greater in experiment 2.

4.Frequency of collisions between hydrogen ion and thiosulphate ion($S_2O_3^{2-}$) is higher.

5.Frequency of effective collisions between hydrogen ion and thiosulphate ion is higher.

-Temperature

1.The rate of reaction of experiment 2 is higher than experiment 1.

2.Temperature of (sodium thiosulphate solution) in experiment 2 is higher.

3.The kinetic energy of the particles increases and particles move faster.

4.Frequency of collisions between hydrogen ion and thiosulphate ion is higher in experiment 2.

5.Frequency of effective collisions between hydrogen ion and thiosulphate ion is higher in experiment 2.

-Catalyst

1.The rate of reaction of experiment 2 is higher than experiment 1.

2.Catalyst provides an alternative path with lower activation energy.

3.More collision particles are able to achieve the lower activation energy.

4.Frequency of collisions between hydrogen ion and zinc atom is higher in experiment 2

5.Frequency of effective collisions between hydrogen ion and zinc atom is higher in experiment 2.