Catalyst :-

A substance which alters the rate of a chemical reaction itself remaining chemically unchanged at the end of the reaction is called catalysts and this processes is called catalysis.

for examples-

(1) $2KClO_3 \xrightarrow{MnO_2} 2KCl + 3O_2$

Here, MnO_2 acts as catalyst.

(2) $2H_2O_2(l) \xrightarrow{Pt} 2H_2O(l) + O_2(g)$

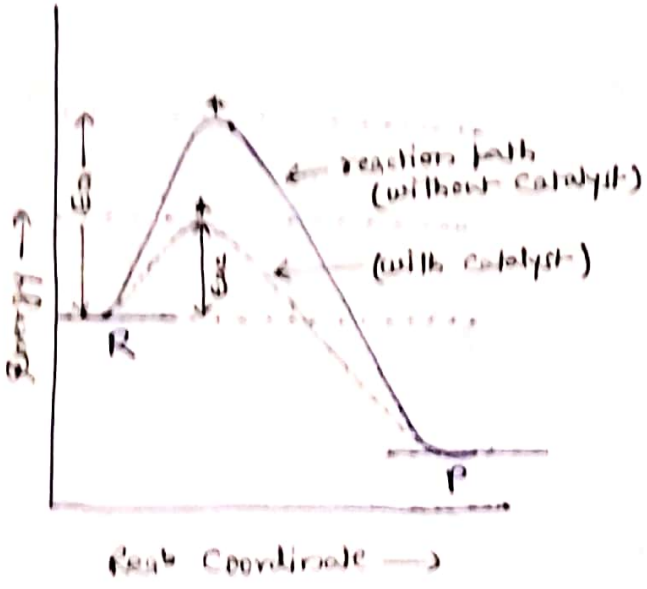
Here, Pt acts as catalyst.

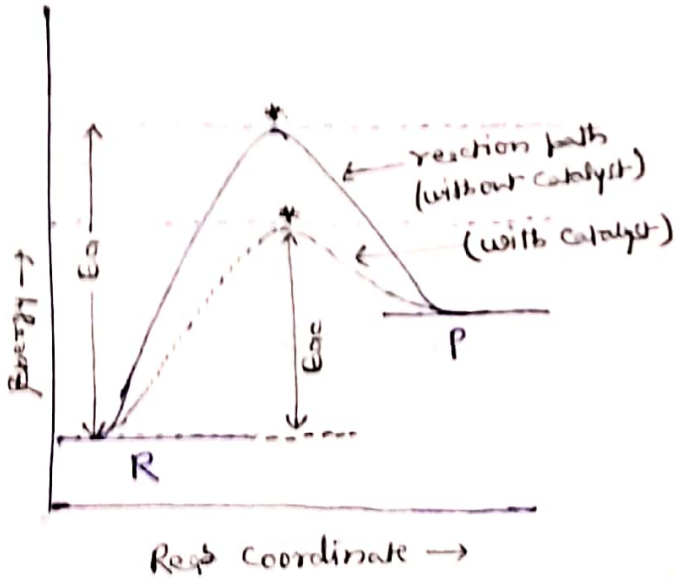
(3) $CO(g) + 3H_2(g) \xrightarrow{Ni} CH_4(g) + H_2O(g)$

Here, Ni acts as catalyst.

*. Effect of Catalyst on Rate of reaction :-

A/c to intermediate complex formation theory, the reactants first combine with the catalyst and form an intermediate complex. The complex formed is short lived and decomposes to yield product and catalyst. In the presence of catalyst the reaction proceeds through a new path of low activation energy. The reactant molecules are to cross a low energy barrier to form the products. More reactant molecules can cross this low energy barrier to form the products. This increases the rate of reaction.





Ea = Activation energy without catalyst

Eac = Activation energy with catalyst.

Types of catalyst :-

(1) Homogeneous catalysts :-

The catalyst in the same phase as the reactants and is evenly distributed throughout, are called Homogeneous catalyst and this process is called Homogeneous catalysis.

This type of catalysis can occur in the gas phase or in the liquid phase.

for examples—

(1) oxidation of sulphurdioxide —

when sulphurdioxide is oxidised into sulphur trioxide, nitric oxide acts as catalyst.

$$2SO_2(g) + O_2(g) \xrightarrow{[NO](g)} 2SO_3(g)$$

Sulphur dioxide — Sulphur trioxide

(2) **Decomposition of acetaldehyde :-**

When acetaldehyde is decomposed with I_2 in to CH_4. I_2 acts as catalyst.

$$CH_3-\overset{O}{\overset{\|}{C}}-H \xrightarrow{[I_2]} CH_4 + CO$$

Acetaldehyde — Methane

(3) **Hydrolysis of Cane Sugar :-**

When cane sugar is hydrolysed, mineral acid (H_2SO_4) acts as catalyst.

$$C_{12}H_{22}O_{11}(l) + H_2O(l) \xrightarrow{H_2SO_4} C_6H_{12}O_6 + C_6H_{12}O_6$$

Glucose — fructose

(4) **Hydrolysis of an Ester :-**

When ethyl acetate (ester) is hydrolysed, acid acts as catalyst.

$$CH_3-\overset{O}{\overset{\|}{C}}-OC_2H_5(l) + H_2O \xrightarrow{H^+/OH^-} CH_3-\overset{O}{\overset{\|}{C}}-OH + C_2H_5OH$$

Ethyl acetate — Acetic acid — Ethanol

(5) **Decomposition of Hydrogen peroxide :-**

When Hydrogen peroxide is decomposed, Iodide ion (I^-) acts as catalyst.

$$2H_2O_2(aq) \xrightarrow{I^-} 2H_2O(l) + O_2$$

Hydrogen peroxide.