Types of Adsorption :-

(i). There are mainly 2 types of adsorption of gases on solids :-

i) Physisorption :- If accumulation of gas on the surface of a solid occurs on account of weak van der Wall's forces, the adsorption is termed as physical adsorption or physisorption.

ii) Chemisorption :- When the gas molecules or atoms are held to the solid surface by chemical bonds, the adsorption is termed chemical adsorption or chemisorption.

Characteristics of Physisorption :-

i) Lack of specificty :- A given surface of an adsorbent does not show any preference for a particular gas as the van der Wall's forces are universal.

ii) Nature of adsorbate :- The amount of gas adsorbed by a solid depends on the nature of gas.

iii) Reversible nature :- Physical adsorption of a gas by a solid is generally reversible.

• Solid + Gas $\rightleftharpoons$ Gas/Solid + Heat.

Since the adsorption process is exothermic, the physical adsorption occurs readily at low temperature and decreases with increasing temperature. (Le-Chatelier's principle).

iv) Surface area of adsorbent:- The extent of adsorption increases with the increase of surface area of the adsorbent.

v) Enthalpy of adsorption:- Enthalpy of adsorption is quite low (20-40 KJ mol^{-1}). Due to the attraction between gas molecules and solid surface is only due to weak van der Wall's force.

Characteristics of Chemisorption:-

i) High specificity:- Chemisorption is highly specific.

ii) Irreversibility:- It is irreversible in nature. Chemisorption is also an exothermic process but the process is very slow at low temperatures.

iii) Surface area:- Like physisorption, chemisorption also increases with increase of surface area of the adsorbent.

iv) Enthalpy of adsorption:- Enthalpy of chemisorption is high (80-240 KJ mol^{-1}) as it involves chemical bond formation.

* Adsorption Isotherms

The variation in the amount of gas adsorbed by the adsorbent with pressure at constant temperature can be expressed by means of a curve termed as adsorption isotherm.

Freundlich adsorption isotherm:

He gave an empirical relationship between the quantity of gas adsorbed by unit mass of solid adsorbent and pressure at a particular temperature.

$$\frac{x}{m} = k \cdot p^{1/n} \quad (n > 1) \quad - (1)$$

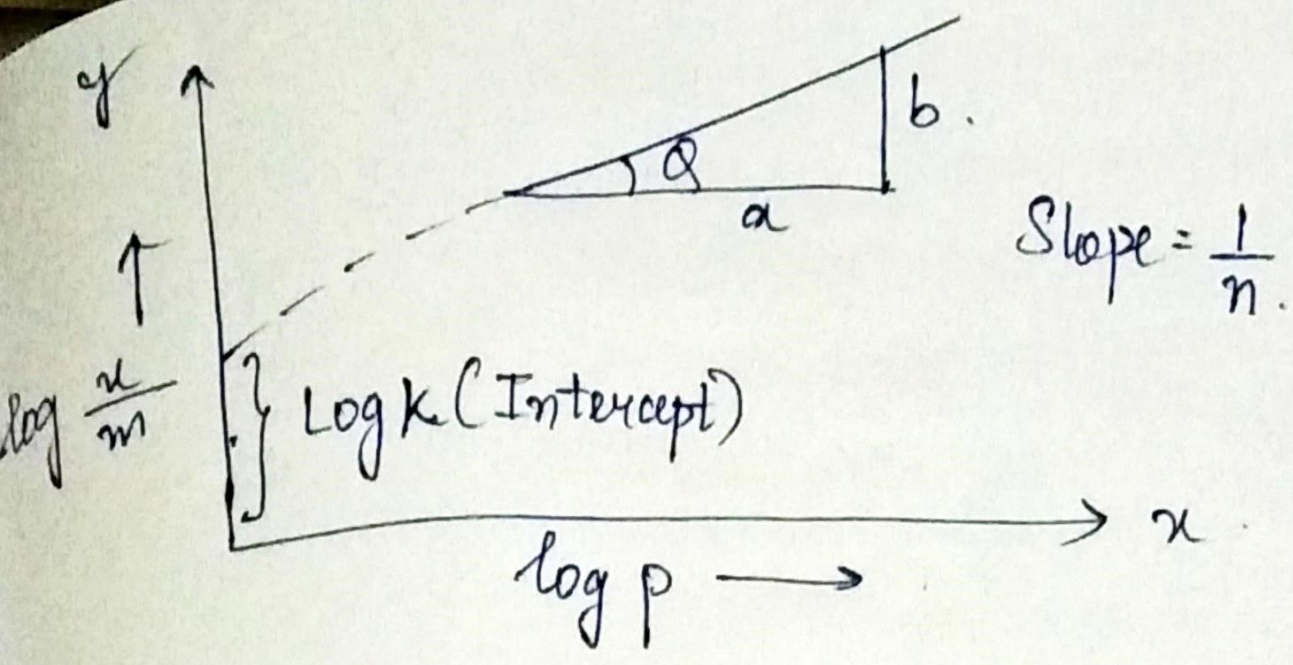
x = mass of gas at

m = mass of adsorbent

P, k, n = are constants which depend on nature of the adsorbent and the gas.

Taking logarithm of eqn (1).

$$\log \frac{x}{m} = \log k + \frac{1}{n} \log P$$



Freundlich isotherm graph.

- When $\frac{1}{n} = 0$, $\frac{x}{m}$ = constant, the adsorption is independent of pressure.
- When $\frac{1}{n} = 1$, $\frac{x}{m} = kp$ i.e $\frac{x}{m} \propto p$, the adsorption varies directly with pressure.