SURFACE CHEMISTRY

Adsorption by solids from solution

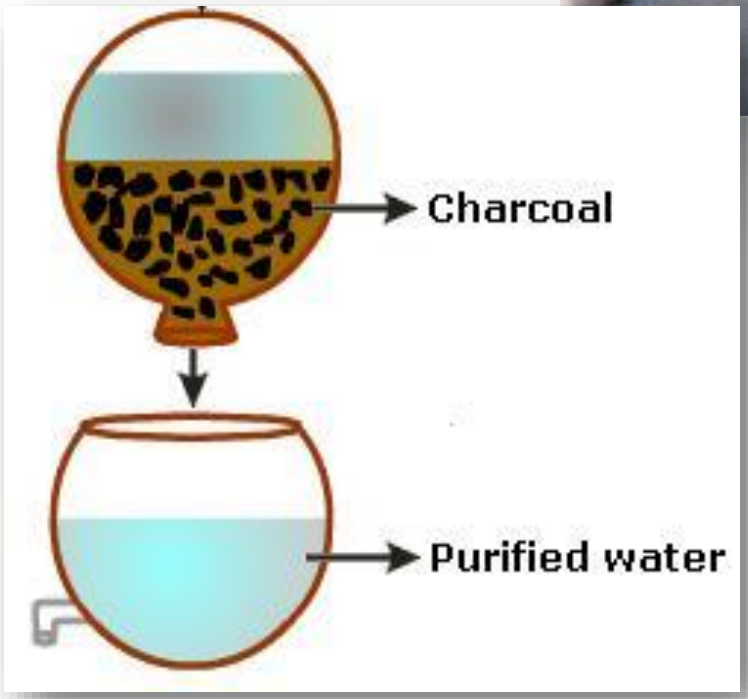
Type of sorption:

- Adsorption
- Absorption

Adsorption:

- The phenomenon of attracting and retaining the molecules of a substance on the surface of a liquid or a solid resulting into a higher concentration of the molecules on the surface is called adsorption.
- The substance thus adsorbed on the surface is called the adsorbate . (oxalic acid)
- the substance on which it is absorbed is known as adsorbent. (charcoal)

purification of sugar or water by charcoal



The variation of the amount adsorbed with concentration

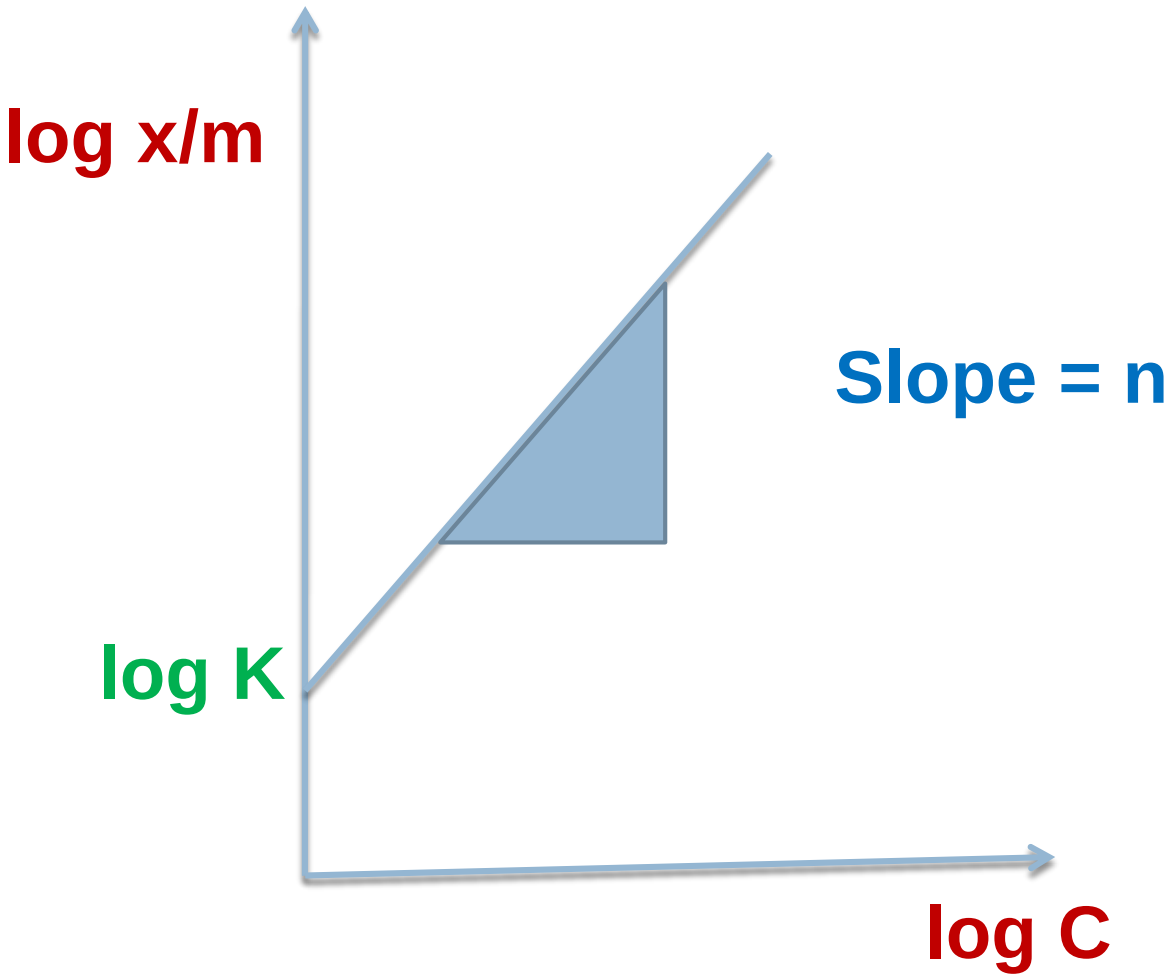
$$x/m = K C^{n}$$

$$\log x/m = n \log C + \log K$$

x = the amount of solute adsorbed per gm adsorbent.

C = the concentration of solute in solution after adsorption.

K , n are constants.


log x/m
Slope = n
log K
log C

Type of Adsorption

1. Physical adsorption (physisorption).
2. Chemical adsorption (chemisorption).

Chemisorption is distinguished qualitatively from physisorption in following ways.

physisorption	Chemisorption
1. The forces referred to as van derwaals forces	It involves the formation of chemical bonds
2- ΔH = 10 – 20 KJ/mol	ΔH = 40 – 200 KJ/mol
3- formation of multilayers	monolayer
4- non-specific, rapidly, reversible	More specific, rapidly or slowly , irreversible
5- the extent of physisorption is smaller at higher temperatures	May not occure at an appreciable rate at low temperatures because it has an activation energy.

The amount of substance adsorbed depend on:

1. The specific nature.
2. The temperature.
3. The concentration.

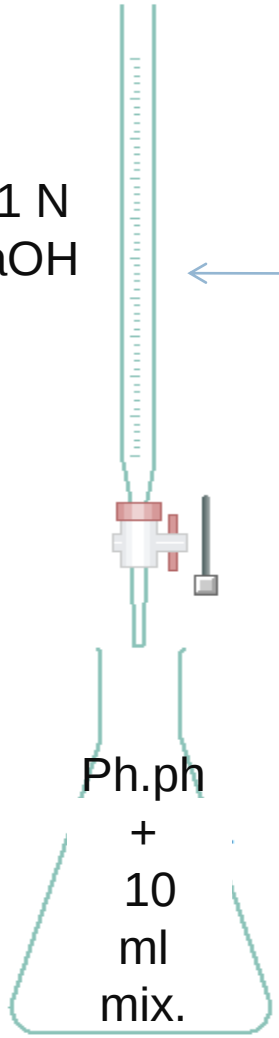
Prepare:

1. 0.5 N Oxalic acid → 500ml
2. 0.1 N NaOH → 500 ml
3.

No. of bottle	1	2	3	4
Oxalic acid	100	75	50	25
H_2O	-	25	50	75

Procedure:

1.



0.1 N NaOH

V1

Ph.ph + 10 ml mix.

Colourless → pink

2. Add to remaining of mixture 1gm of charcoal.
3. Shaking the solution in bottle about ½ hour.
4. Filter the mixture(rejecting the first 5 ml of filtrate).
5. Take 10 ml (filtration mix.) then titration by 0.1 N NaOH ($\longrightarrow$ V2)

Calculation:

- V_1 ml of 0.1 NaOH ≡ 10 ml oxalic acid before adsorption.
- V_2 ml of 0.1 NaOH ≡ 10 ml oxalic acid after adsorption.
- Volume of 0.1 NaOH ≡ oxalic acid adsorbed = V_1-V_2

- X = wt of oxalic acid (adsorbed)/1 gm charcoal =((N × V)$_{NaOH}$ × eq.wt × 10)/1000

(V_1-V_2)

- C = wt of oxalic acid after adsorption/1 gm charcoal =((N × V_2)$_{NaOH}$ × eq.wt × 10)/1000

No. of bottle	V_1	V_2	$V=V_1-V_2$	X wt of oxalic acid (adsorbed	C wt of oxalic acid after adsorption	Log X/m	Log C	m
1								1
2								1
3								1
4								1