

PART- 6-(a) CLASS- XII- SUBJECT- Chemistry -

St: ARNOLD' English Medium, School - meghnagar (m.p)

Sub: unit - SURFACE CHEMISTRY -

Dt: 12.05.2020

Note - Dear student this lesson is very easy and cover 6 mm because having no numerical

First of all my question is that - what is surface chemistry?

surface chemistry is a branch of chemistry in which we study about nature of surface of solid and enthalpy changes"

- Example like -
- action of catalyst and enzyme
 - Action of colloids etc.

mainly two terms involved in surface chemistry -

- Adsorption
- absorption

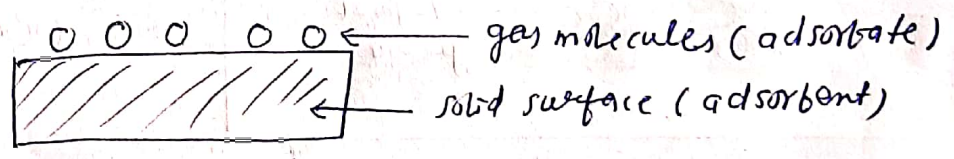
* sorption means - action

* Ad- means - outside the ~~surface~~ surface

* ab- means - inside the surface.

ADSORPTION - when the concentration of gases or liquids is higher at the surface of a solid, this phenomenon is called adsorption"

- The substance which gets adsorbed on the surface is called Adsorbate and surface is called adsorbent"

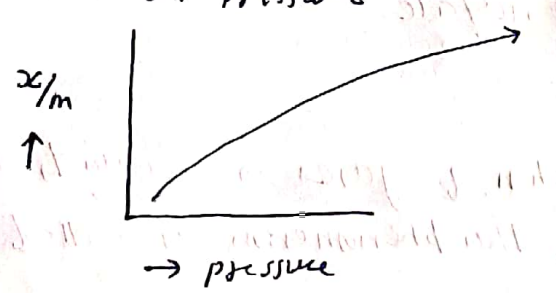
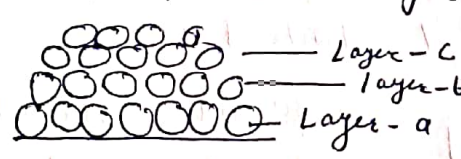
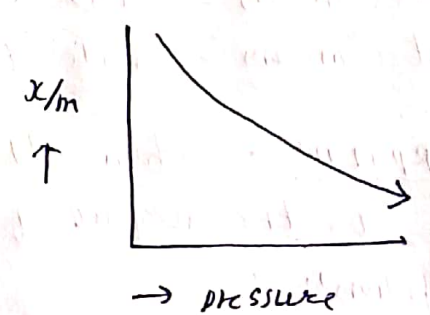
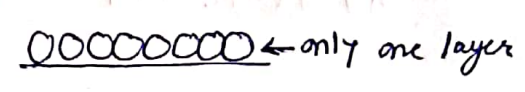


S.No	Adsorption	absorption
①	Adsorption starts at a fast rate and gradually slows down	absorption takes place at a uniform speed.
②	It is a surface phenomenon	It is a bulk phenomenon.
③	Adsorbate can easily separate from adsorbent.	particles cannot separate easily
④	eg: A chalk stick coated with grease grease and dipped in sugar	eg: A chalk stick dipped in ink.

* Removal of gas molecules from rigid surface (adsorbent) is called **DESORPTION**. (2)

Types of adsorption

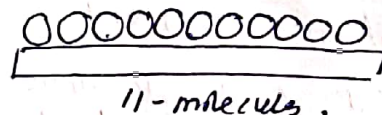
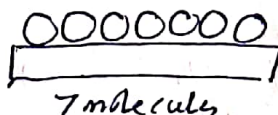
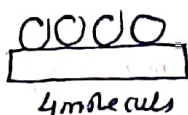
Two types of adsorption — 1: physical 2: chemical.

physical adsorption	Chemical adsorption.
① It is due to presence of van-der-Waals forces. ② It is not specific in nature ③ It is reversible in nature ④ Enthalpy of adsorption is low ($20-40 \text{ kJ mol}^{-1}$) ⑤ Rate of adsorption increase with increase in pressure  ⑥ It forms multimolecular layers 	It is due to presence of chemical forces. It is specific in nature. It is irreversible in nature Enthalpy of adsorption is very high ($200-400 \text{ kJ mol}^{-1}$) Rate of adsorption decreases with pressure.  It forms unimolecular layer. 

Factors affecting Adsorption of gases by solids

The following factor —

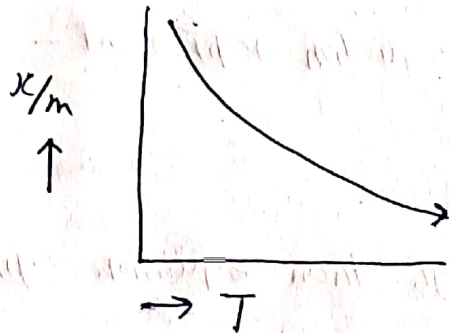
① Nature and surface area of the adsorbent — It has been observed that larger the surface area of adsorbent, the greater is the amount of gas adsorbed.



eg. Charcoal and silicagel are good adsorbent as they possess a large surface area due to porous ~~stare~~ structure. ③

② Nature of the gases adsorbed:- The gases which are more easily liquefiable (liquified) - NH_3 , SO_2 , HCl are adsorbed more easily than the stable gases - H_2 , O_2 etc.

③ Temperature - According to Le-Chatelier principle - adsorption will increase on decreasing temperature.

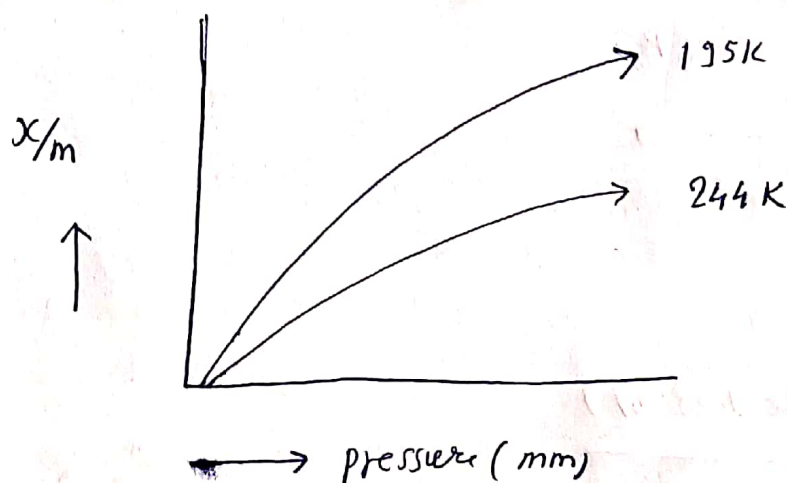


x/m = extent of adsorption.

Physical and chemical adsorption both of Exothermic process

④ effect of pressure:- It has been observed that the extent of the gas adsorbed by per unit mass of the adsorbent (x/m) depends upon the pressure of the gas.

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



FREUNDLICH (1909) gave a empirical relationship between the Quantity of a gas (x/m) and applied pressure -

According to Freundlich -

$$\frac{x}{m} \propto p \quad (\text{at constant temperature})$$

$$\frac{x}{m} = K \cdot p \quad (\text{where 'K' is a constant})$$

If the pressure is very low then equation expressed -

$$\frac{x}{m} = K p^1$$

If the pressure is very high then equation represent -

$$\frac{x}{m} = K p^0$$

If the pressure is neither low nor high then equation expressed -

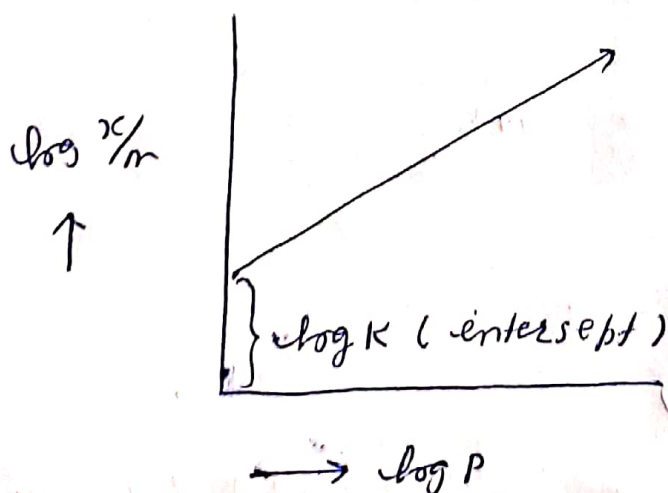
$$\frac{x}{m} = K p^{1/n} \quad \text{--- (1) } (\because \text{here 'n' is also constant})$$

By taking logarithm on above equation -

$$\log \frac{x}{m} = \log K p^{1/n}$$

$$\boxed{\log \frac{x}{m} = \log K + \frac{1}{n} \log p} \quad \text{This is Freundlich equation.}$$

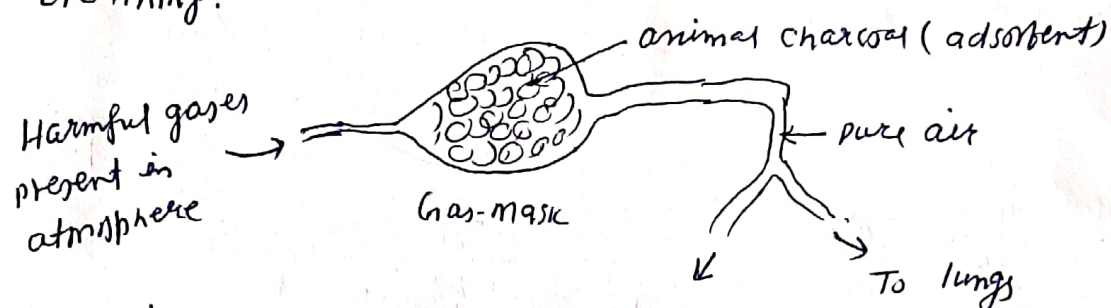
If a graph is plotted between $\log \frac{x}{m}$ and $\log p$, a straight line will be obtained, with a slope equal to $\frac{1}{n}$ and intercept equal to $\log K$.



Applications of Adsorption—

[1] In decolouring the sugar:- Most of the sugar is obtained from the cane-sugar, and it is deep brown in colour. The ~~orange~~ coloured sugar solution is decolourised by treating it with animal charcoal. The Charcoal adsorbed the undesirable colours.

[2] In gas mask— All gas masks are devices containing an adsorbent which adsorbed poisonous gas (NH_3 , CH_4 , CHCl_3 etc) and thus provide pure air for breathing.



[3] In Chromatography— Chromatography is a highly advanced technique. It is based on principle of Adsorption. In this technique the adsorption substances mainly used as silica gel, magnesia.

[4] In softing of water:- Hard water; soft by the ion-exchange method. In this method - ion-exchanges are used as adsorbent.

[5] Role of adsorption in catalytic-reactions:- Finely divided nickel used as a catalyst in the hydrogenation of oils.

— HOME-WORK- ASSIGNMENT —

- Q1 Define the term— 1. Adsorption 2. Adsorbent 3 Adsorbate ?
- Q2- write three difference between— adsorption and absorption ?
- Q3- write six- difference between— Physical and Chemical adsorption.
- Q4. Derived— Frundlich- equation isotherm ?
- Q5. what factors are affect the process of— ADSORPTION ?
- Q6. write four important application of adsorption ?

☞ If student feel any problem about - part-6(a); than direct contact— 9424071223 by what-app or video-calling.