Crash Course for NEET 2020

KEY NOTES ON Surface Chemistry

Biomentors Classes Online, Mumbai

NCERT Based - Very Important Points

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Differences between Physisorption and Chemisorption

Physisorption (भौतिक अधिशोषण) (Vander Waal's adsorption)	**Chemisorption (रासायनिक अधिशोषण)** (Langmuir adsorption)
Low heat of adsorption usually in range of 20-40 *kJ/mol* भौतिक अधिशोषण की उष्मा 20-40 *kJ/mol* होती है	High heat of adsorption in the range of 80-240 *kJ/mol* रासायनिक अधिशोषण की उष्मा 80-240*kJ/mol* होती है
Force of attraction are ***Vander Waal's forces***. आकर्षण के बल वन्डरवाल बल हैं	Forces of attraction are ***chemical bond forces*** आकर्षण के बल रासायनिक बंध बल है
It is reversible यह उत्क्रमीय है	It is irreversible यह अनुत्क्रमीय है
It is usually takes place at ***low temperature*** and decreases with increasing temperature. भौतिक अधिशोषण की मात्रा काम ताप व अधिक दाब के साथ बढ़ती है	It takes place at ***high temperature***. यह उच्च तापमान पर होता है।
It is related to the case of liquefication of the gas. यह गैस के द्रवीकरण के मामले से संबंधित है।	It is not related. यह गैस के द्रवीकरण के मामले से संबंधित नहीं है।
It forms ***multi layers of molecules*** यह अणुओं की बहुपरतीय निर्माण करता है।	It forms ***mono layer of molecues*** यह अणु की एक ही परत बनाता है

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It does not require any activation energy. इसके लिए किसी सक्रियण ऊर्जा की आवश्यकता नहीं होती है।	It requires high *activation energy*. इसके लिए उच्च सक्रियण ऊर्जा की आवश्यकता होती है।
High pressure is favourable. Decrease of pressure causes ***desorption*** उच्च दबाव अनुकूल है। दबाव में कमी के कारण विशोषण होता है	High pressure is favourable. Decrease of pressure does not cause desorption. उच्च दबाव अनुकूल है। दबाव में कमी से विशोषण नहीं होता है।
It is not very specific. यह बहुत विशिष्ट नहीं है।	It is highly specific. यह बेहद विशिष्ट है

Features of three types of solutions

Property (गुण)	**Suspension (निलंबन)**	**Colloid solution (कोलॉइडल विलयन)**	**True solution (वास्तविक विलयन)**
Nature (प्रकृति)	Heterogeneous (विषमांगी)	Heterogeneous (विषमांगी)	Homogeneous (समांगी)
Particle size (कण आकार)	> 100 *nm*	1 *nm* – 100 *nm*	< 1 *nm*
Separation by (द्वारा पृथक्करण) (i) Ordinary filtration (सामान्य फ़िल्टर) (ii) Ultra- filtration (अतिसूक्ष्म फ़िल्टर)	 Possible Possible	 Not possible Possible	 Not possible Not possible
Settling of particles (नीचे बैठ जाना)	Settle under gravity (गुरुत्वाकर्षण के द्वारा निचे बैठ जाना)	Settle only on centrifugation(	Do not settle (नीचे नहीं बैठता)
Appearance	Opaque	Generally transparent (आम तौर पर पारदर्शी)	Transparent (पारदर्शी)

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Tyndall effect (टिण्डल प्रभाव)	Shows	Shows	Does not show
Diffusion of particles (कणों का विसरण)	Does not diffuse	Diffuses slowly	Diffuses rapidly
Brownian movement (ब्राउनी गति)	May show	Shows	Negligible

Different types of colloidal system

विभिन्न प्रकार के कोलॉइडी निकाय

Dispersed phase परिक्षिप्त प्रावस्था	**Dispersion Medium परिक्षेपण माध्यम**	**Colloidal System कोलॉइडी निकाय**	**Examples उदहारण**
Liquid (द्रव)	Gas (गैस)	Aerosol of liquids (द्रव का ऐरोसॉल)	Fogs, clouds, mists, fine insecticide sprays (बादल, कोहरा , कुहासा आदि)
Solid (ठोस)	Gas (गैस)	Aerosol of solids ठोस का ऐरो सॉल	Smoke, volcanic dust, haze (धुआँ , धूल का तूफान , ज्वालामुखी का लावा)
Gas (गैस)	Liquid (द्रव)	Foam or froth (झाग या फेन)	Soap lather. Lemonade froth, foam, whipped cream, soda water (साबुन की झाग, शेविंग क्रीम)
Liquid (द्रव)	Liquid (द्रव)	Emulsions (पायस)	Milk, emulsified oils, medicines (दूध, जल में तेल, तेल में जल, औषधि आदि)
Solid (ठोस)	Liquid (द्रव)	Sols (सॉल)	Most paints, starch in water, proteins, gold sol, arsenic sulphide sol, ink

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			(रंग , जल में स्टार्च, प्रोटीन, गोल्ड सॉल, आर्सेनिक सल्फाइड सॉल,)
Gas (गैस)	Solid (ठोस)	Solid foam (ठोस फेन)	Pumice stone, styrene rubber, foam rubber (झावा पत्थर, स्टाईरीन, फोम , रबर फोम आदि)
Liquid (द्रव)	Solid (ठोस)	Gels (जैल)	Cheese, butter, boot polish, jelly, curd (जैली, पनीर, मक्खन, सभी सब्जिया या फल, बूट पॉलिश, आदि)
Solid (ठोस)	Solid (ठोस)	Solid sols (coloured glass) (ठोस सॉल)	Ruby glass, some gem stones and alloys (रूबी कॉच, मोती कीमती रत्न और मिश्र धातुएं)

Distinction between lyophilic and lyophobic sols

Property (गुण)	**Lyophilic sols (suspensoid) (द्रव स्नेही सॉल)**	**Lyophobic sols (Emulsoid) (द्रव विरोधी सॉल)**
Surface tension पृष्ठ तनाव	Lower than that of the medium माध्यम की तुलना में कम है	Same as that of the medium माध्यम के समान ही
Viscosity श्यानता	Much higher than that of the medium माध्यम की तुलना में बहुत अधिक है	Same as that of the medium माध्यम के समान ही
Reversibility उत्क्रमणीयता	Reversible उत्क्रमणीय	Irreversible अनुत्क्रमणीय
Stability स्थिरता	More stable	Less stable
Visibility दृश्यता	Particles can't be detected even under ultramicroscope. अल्ट्रामाइक्रोस्कोप के तहत भी कणों का पता नहीं लगाया जा सकता है	Particles can be detected under ultramicroscope. अल्ट्रामाइक्रोस्कोप के तहत कणों का पता लगाया जा सकता है।

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Migration	Particles may migrate in either direction or do not migrate in an electric field because do not carry any charge. कण किसी भी दिशा में माइग्रेट कर सकते हैं या इलेक्ट्रिक फील्ड में माइग्रेट नहीं कर सकते क्योंकि कोई आवेश नहीं होता है।	Particles migrate either towards cathode or anode in an electric field because they carry charge. कण एक विद्युत क्षेत्र में कैथोड या एनोड की ओर पलायन करते हैं क्योंकि वे उनके आवेश नहीं होता है।
Action of electrolyte विद्युत अपघट्य का प्रभाव	Addition of smaller quantity of electrolyte has little effect विद्युत अपघट्य की कम मात्रा के योग का बहुत कम प्रभाव पड़ता है	Coagulation takes place स्कन्दन होती है
Hydration जल-योजन	Extensive hydration takes place व्यापक जलयोजन होता है	No hydration
Examples उदाहरण	Gum, gelatin, starch, proteins, rubber etc.	Metals like *Ag* and *Au,* hydroxides like $Al(OH)_3$, $Fe(OH)_3$ metal sulphides like AS_2S_3 etc.

The following methods are commonly used for the purification of colloidal solutions.

Dialysis:

I. The process of separating the particles of colloid from those of crystalloid, by means of diffusion through a suitable membrane is called dialysis.

II. It's principle is based upon the fact that colloidal particles cannot pass through a parchment or cellophane membrane while the ions of the electrolyte can pass through it.

III. The impurities slowly diffused out of the bag leaving behind pure colloidal solution

IV. The distilled water is changed frequently to avoid accumulation of the crystalloids otherwise they may start diffusing back into the bag.

V. Dialysis can be used for removing HCl from the ferric hydroxide sol.

Electrodialysis

I. The ordinary process of dialysis is slow.

II. To increase the process of purification, the dialysis is carried out by applying electric field. This process is called ***electrodialysis.***

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III. The important application of electrodialysis process in the artificial kidney machine used for the purification of blood of the patients whose kidneys have failed to work. The artificial kidney machine works on the principle of ***dialysis.***

Ultra – filtration

I. Sol particles directly pass through ordinary filter paper because their pores are larger (more than 1μ or $1000\, m\mu$) than the size of sol particles (less than $200\, m\mu$).

II. If the pores of the ordinary filter paper are made smaller by soaking the filter paper in a solution of gelatin of colloidion and subsequently hardened by soaking in formaldehyde, the treated filter paper may retain colloidal particles and allow the true solution particles to escape. Such filter paper is known as ***ultra - filter*** and the process of separating colloids by using ultra – filters is known as ***ultra – filtration*.**

Catalysis:

Catalysis : Substances which accelerate the rate of a chemical reaction and themselves remain chemically and quantitatively unchanged after the reaction, are known as *catalysts*, and the phenomenon is known as *catalysis* :

Homogeneous Catalysis

The process in which the reactants and the catalyst are in the same phase.
e.g., oxidation of SO_2 to SO_3 by NO as catalyst (lead chamber process), hydrolysis of methyl acetate by HCl, hydrolysis of sugar by H_2SO_4.

Shape-selective Catalysis

The catalytic reaction that depends upon the pore structure of the catalyst and the size of the reactant and product molecules. *e.g.,* Zeolites (have honey–comb like structures).

Heterogeneous Catalysis

The process in which the reactants and the catalyst are in different phases. *e.g.,* oxidation of SO_2 to SO_3 by Pt, manufacture of NH_3 from N_2 and H_2 by Fe (Haber's process), oxidation of NH_3 to NO by Pt (Ostwald's process), hydrogenation of vegetable oils by Ni.

Enzyme Catalysis

Many biochemical reactions are catalysed by complex nitrogeneous organic compounds (proteins or enzymes) which are also called *biochemical catalysts* and the phenomenon is known as *biochemical catalysis*.

Some Enzymatic reactions:

	Enzyme	Source	Enzymatic reaction
1.	Invertase	Yeast	Sucrose → glucose and fructose
2.	Zymase	Yeast	Glucose → ethyl alcohol and carbon dioxide
3.	Diastase	Malt	Starch → maltose
4.	Maltase	Yeast	Maltose → glucose
5.	Urease	Soyabean	Urea → ammonia and carbon dioxide
6.	Pepsin	Stomach	Proteins → Amino acids

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