

COLLOIDS

**B.Sc.-II Chemistry(H/S)
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Lecture-04**



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COLLOIDS

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COLLOIDS

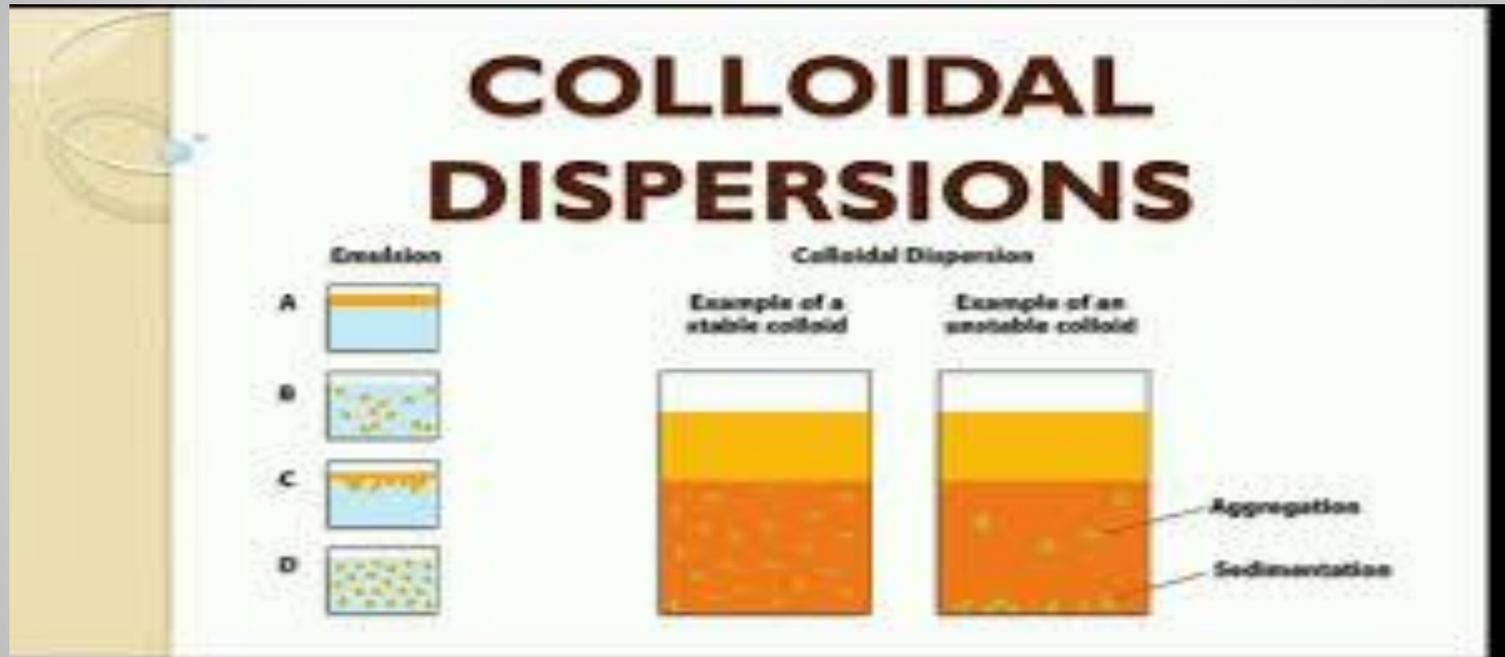
Key point about colloids

- It dissolves but donot lose identity
- Heterogeneous and generally multiphase
- A non-crystalline substance consisting of large molecules or ultramicroscopic particles of one substance dispersed through a second substance.
- Size is in between 1-1000nm
- Colloids include gels, sols, and emulsions
- The particles do not settle, and cannot be separated out by ordinary filtering or centrifuging like those in a suspension.
- In chemistry, a colloid is a mixture in which one substance of microscopically dispersed insoluble or soluble particles is suspended throughout another substance.
- Sometimes the dispersed substance alone is called the colloid
- The term colloidal suspension refers unambiguously to the overall mixture

COLLOIDS

- **Colloids** are common in everyday life.
- Some **examples** include whipped cream, mayonnaise, milk, butter, gelatin, jelly, muddy water, plaster, colored glass, and paper, Gold+ water, clay+ water
- Every **colloid** consists of two parts: **colloidal** particles and the dispersing medium
- The dispersed-phase particles have a diameter between approximately 1 and 1000 nanometers.
- Such particles are normally easily visible in an optical microscope, although at the smaller size range ($r < 250$ nm), an ultramicroscope or an electron microscope may be required.
- Homogeneous mixtures with a dispersed phase in this size range may be called *colloidal aerosols*, *colloidal emulsions*, *colloidal foams*, *colloidal dispersions*, or *hydrosols*. The dispersed-phase particles or droplets are affected largely by the surface chemistry present in the colloid.

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Components in colloid solution

1. **Dispersed phase**
2. **Dispersion medium**

Eg: protien(dispersed phase)+ water(dispersion medium)

Example:

If water is used as the dispersion medium, **lyophilic sols** are called **hydrophilic sols**.

Examples of lyophilic colloid:

Starch, gum, gelatin, RBC, egg albumin etc are liquid loving.

Examples of lyophobic colloids:

Smoke is **colloids** of solid in gas and metal sulphides are liquid hating.

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Types of colloid

1. **Lyophilic colloids (Solvent loving)**
2. **Lyophobic colloids (Solvent hating)**

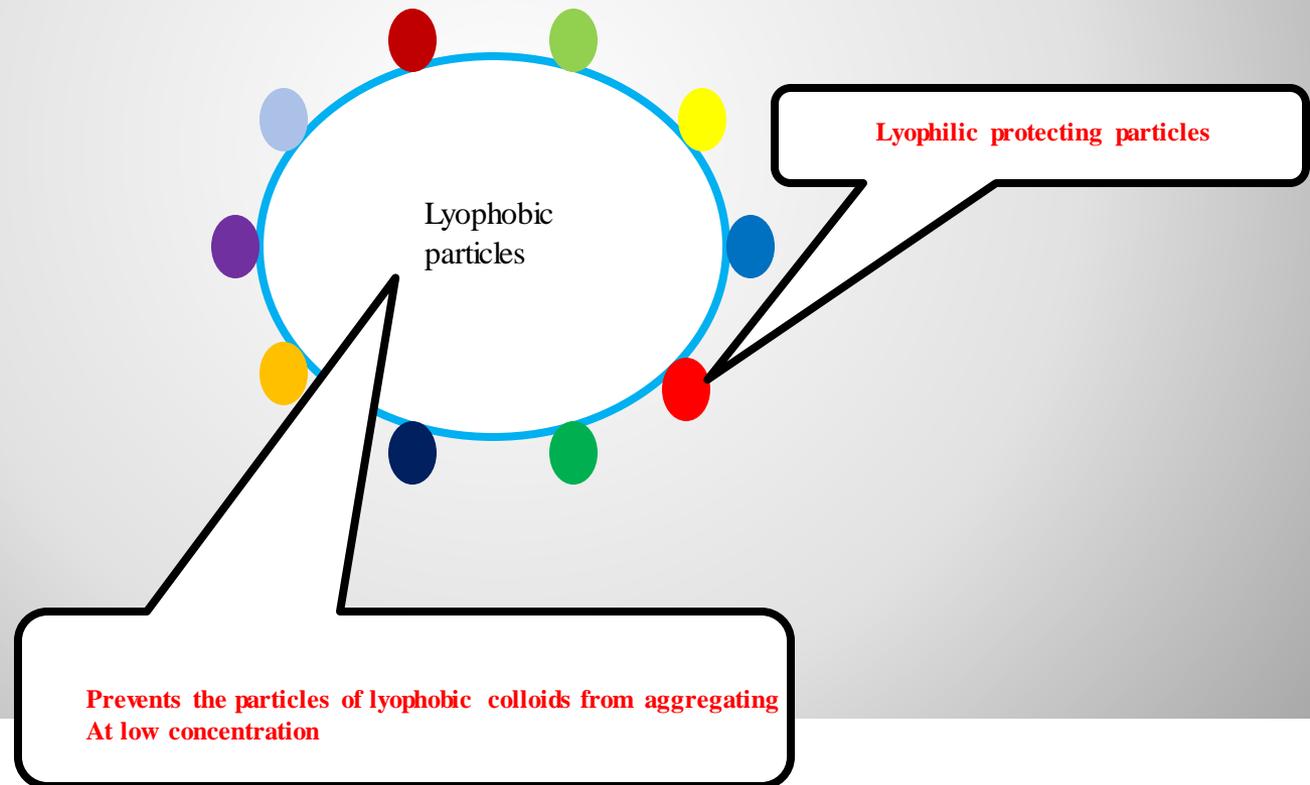
1. All particles **in a lyophobic sol** have the same charge.

Particles **in the lyophilic sol** absorb H^+ and OH^- ions from the medium.

2. All Particles **in a lyophobic sol** absorb ions from the medium.

Particles **in a lyophilic sol** may or may not migrate towards the electrode

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Lyophilic colloids

- The dispersed phase particles have more affinity (or love) for the dispersion medium.
- These sols are **reversible**.
- Lyophilic colloids are prepared by shaking or warming the substance with solvent
- Lyophilic colloids are **stable**.

Examples include gum, gelatin, starch, proteins and rubber etc.

Lyophobic Colloids

- The dispersed phase particles have no affinity (or love) for the dispersion medium.
- These sols are **irreversible**.
- Lyophobic colloids are prepared by mechanical agitation, which is required because of high interfacial energy of the dispersed particles.
- Lyophobic colloids are thermodynamically **unstable**.
- Their dispersed particles have a tendency to aggregation or coalescence

Examples : solutions of metals such as gold and silver, metal hydroxides and metal sulphides

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	Property	Lyophobic sol (Suspensoid)	Lyophillic sol (Emulsoid)
1.	Preparation	Can not be prepared easily Special methods are required	Can be easily prepared by Shaking or warming the Substance with solvent
2.	Stability	are less stable	are more stable
3.	Reversibility	are irreversible	are reversible
4.	viscosity	viscosity is nearly same as that of the solvent	viscosity is much higher than that of solvent
5.	Surface tension	Surface tension is almost same as that of solvent	surface tension is usually low
6.	Hydration or solvation	These are less solvated as the particles have less affinity for the solvent	These are highly solvated as the particles have great affinity for solvent
7.	Charge	The particles carry a characteristic charge either positive or negative	The particles have little charge or no charge at all
8.	Visibility	Particles can be seen under microscope	Particles can not be seen under microscope
9.	Coagulation or precipitation	Precipitated by low concentration of electrolytes	Precipitated by high concentration of electrolytes
10.	Tyndal effect	More Scattering	Less Scattering
11.	Migration in electric field	migrate towards anode or cathode as these particles carry charge	mayor may not migrate carry charge
12.	General Example	Mostly of Inorganic nature	Mostly of organic nature

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Coagulation .

- **Coagulation** is a process of aggregating together the **colloidal** particles so as to change them into large sized particles which ultimately settle as a precipitate.
- When an electrolyte is added to the **colloidal solution**, the particles of the sol take up the ion which is oppositely charged and thus get neutralised.
- It is the destabilization of **Colloids** by neutralizing the electric charge of the dispersed phase particles, which results in aggregation of the **colloidal** particles.
- In a stable **colloid** system the dispersed particles are electrically (commonly negatively) charged
- The precipitation of colloidal solution through induced aggregation by the addition of suitable electrolyte is called coagulation or flocculation.
- It is expressed I milli-mole per litre

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Coagulation

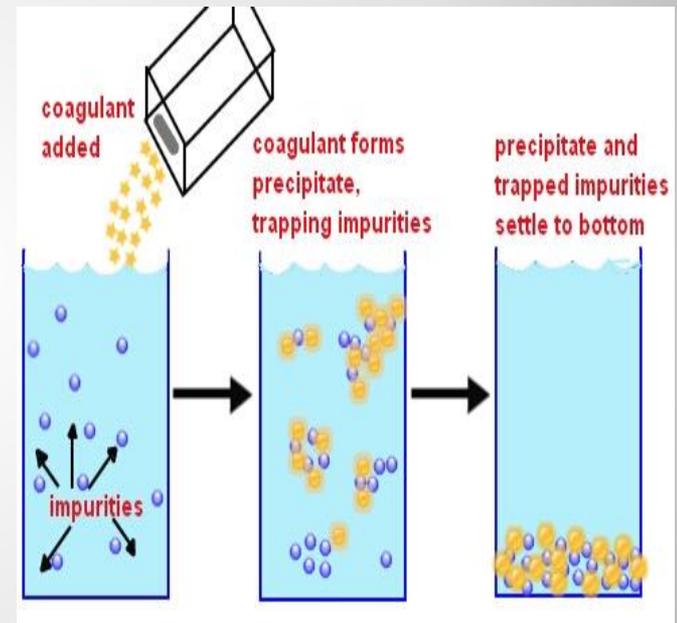
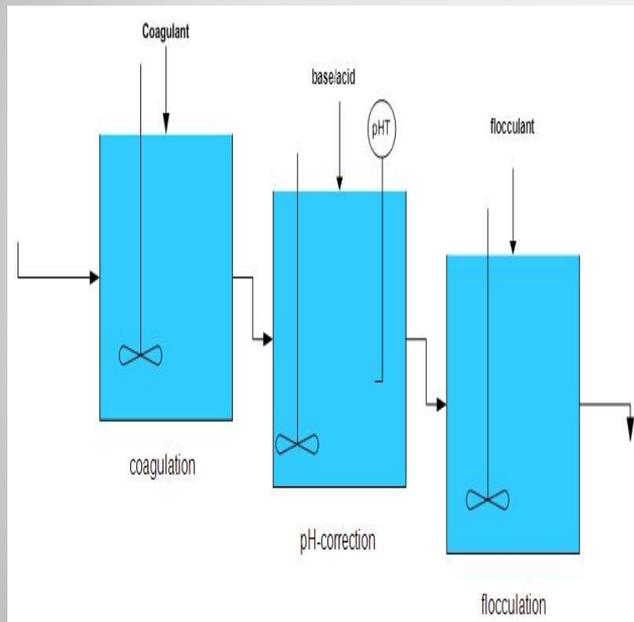
Coagulation is a process of accumulation and settling down of particles within a colloid.

The **coagulation** of the **lyophobic sols** can be carried out by following **methods**.

By electrophoresis: In electrophoresis the colloidal particles move towards oppositely charged electrode. When these come in contact with the electrode for long these are discharged and precipitated

Eg: Coagulation is the breakdown of a colloid by changing the pH or charges in the solution. making yogurt is an **example** of **coagulation** wherein particles in the milk colloid fall out of solution as the result of a change in pH, clumping into a large **coagulate**.

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- The precipitation of colloidal solution through induced aggregation by the addition of suitable electrolyte is called **coagulation** or flocculation. The minimum concentration of an electrolyte required to cause **coagulation** is known as coagulating **value** of sol. It is usually expressed in terms of milli-moles per litre.

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Problem for practice:

Q1 What are the properties of colloids?

Q2 What are the application of colloids?