

CHEMISTRY STUDY MATERIALS FOR CLASS 12 (NCERT BASED KEY POINTS OF CHAPTER – 05)

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Surface Chemistry (Key Points)

ASSERTION -REASON TYPE

A statement of assertion is followed by a statement of reason.

Mark the correct choice from the options given below:

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Both assertion and reason are false.

1. Assertion : A colloidal sol scatters light but a true solution does not.

Reason : The particles in a colloidal sol move slowly than in a true solution.

(Ans - b)

2. Assertion : Activation energy for both the forward and backward reactions is lowered to the same extent by a catalyst.

Reason : A reaction cannot become fast by itself unless a catalyst is added.

(Ans - c)

3. Assertion : Hydrolysis of ester is an example of auto - catalytic reaction.

Reason : A catalyst speeds up the process without participating in the mechanism.

(Ans - c)

4. Assertion : Hydrated ferric oxide can be easily coagulated by sodium phosphate in comparison to KCl.

Reason : Phosphate ions has higher negative charge than chloride ions. Hence,

they are more effective for coagulation. (Ans - a)

5. Assertion : During preparation of ice - cream, gelatin is added in it.

Reason : Ice -creams are emulsions which get stabilised by gelatin as it acts as an emulsifying agent. (Ans - a)

One - word Answer

1. Which phenomenon is responsible for formation of delta?

(Ans - Coagulation)

2. Name a cheap material useful for causing artificial rain ?

(Ans - Electrified sand)

SHORT ANSWER QUESTIONS (2 marks each)

Q1). Explain what is observed

(i) **When a beam of light is passed through a colloidal soln.**

(ii) **Electric current is passed through a colloidal soln.**

A1). (i) Scattering of light by the colloidal particles takes place and the path of light becomes visible. This is known as Tyndall effect.

(ii) On passing an electric current, colloidal particles move towards the oppositely charged electrodes where they lose their charge and get coagulated. This process is called electrophoresis.

Q2). Explain: (i) Electrophoresis (ii) Coagulation

A2). (i) The phenomenon involving the migration (movement) of colloidal particles under the influence of electric field towards the oppositely charged electrode

(ii) The process of conversion of sol into precipitate, usually done by addition of suitable electrolytes. If the coagulated particles float on the surface of dispersion medium, the coagulation is known as flocculation.

Q3). What are micelles? Give an example of a micellar system.

A3. Micelles are produced by the aggregation of a large number of ions in concentrated sol.

eg: soap, synthetic detergents..

Q4). (i) Why is ferric chloride preferred over potassium chloride in the case of a cut leading to bleeding?

(ii) Why is desorption important for a substance to act as a good catalyst?

A4. (i) Blood is +vely charged colloid. One molecule of ferric chloride produces 3 –ve chloride ions while one molecule of potassium chloride produces one –ve chloride ion.

Greater the –ve charge, faster the coagulation.

(ii) After the reaction is over between the adsorbed reactants, the process of desorption must take place to remove the product molecules and create space for other reactant molecules to adsorb on the catalyst surface

Q5) Differentiate between lyophilic colloids and lyophobic colloids?

A 5.

Lyophilic colloids	Lyophobic colloids
These are easily formed by direct mixing	These are easily formed by special methods.
articles of colloids are not easily visible even under ultra microscope.	articles of colloids are easily visible under ultra microscope.
These are very stable.	These are unstable.

Properties of colloids:

Optical properties: Tyndall effect: Due to scattering of light by colloidal particles by which the beam of light becomes visible.

Brownian movement: Zig-zag movement of colloidal particles due to collision between particles of DP & DM, responsible for stability of colloids.

Electrophoresis: Movement of colloidal particles under influence of electric field.

Electro-osmosis: molecules of dispersion medium allow dot move under influence of electric field.

Coagulation or flocculation: Process of settling of colloidal particles into precipitates or float on surface addition of electrolytes.

HardySchulzlaw: Coagulating power of an electrolyte increases rapidly with the increase in the valency of cation or anion.

For negatively charged sol, the coagulating powers of electrolytes are:



For positively charged, then the coagulating power of electrolytes follow the following order:



Emulsion: liquid-liquid colloidal system..e.g. milk, Na soaps, vanishing cream, etc

. Types of emulsions:

Oil in water: when oil is the dispersed phase and water is the dispersion medium, e.g. milk.

Water in oil: when water is the dispersed phase and oil is the dispersed medium, e.g. butter,

Applications of colloids:

- | | | |
|---------------------------|-----------------------------|------------------------|
| (a) Rubber plating | (b) Sewage disposal | (c) Smoke screen |
| (d) Purification of water | (e) Cleaning action of soap | (f) In medicine |
| (g) Photography | (h) Artificial rain | (i) Formation of delta |

FREQUENTLY ASKED QUESTIONS

Very short answer type questions (1 mark each)

Q1. What is the sign of ΔH and ΔS for adsorption of bromine on charcoal?

Ans. Both ΔH and ΔS are negative.

Q2. Why are substances like platinum and palladium often used for carrying out electrolysis of aqueous solutions?

A2. Platinum and palladium are inert materials & are not attacked by the ions of the electrolyte or the products of electrolysis therefore used as electrodes for carrying out the electrolysis.

Q3. Why does physisorption decreases with the increase of temperature?

A3. Physisorption is an exothermic process i.e, heat is produced in the process.



According to Le-Chatelier's principle, if we increase the temperature, equilibrium will shift in the backward direction, i.e, gas is released from the adsorbed surface.

Q4). Why is it necessary to remove CO when ammonia is obtained by Haber's process?

A4). CO acts as a poison for the catalyst in the manufacture of ammonia by Haber's process.

Q5) What is the physical states of dispersed phase and dispersion medium of froth?

A5. Dispersed phase is gas, dispersion medium is liquid.

Q 6. What is shape selective catalysis?

A 6. It is the catalytic reaction that depends upon the pore structure of the catalyst and size of the reactant and product molecules.

Q7. Why lyophilic colloids are more stable than lyophobic colloids?

A 7. Due to (i) solvation (ii) charge on the colloidal particles.

Q8) What is the cause of Brownian movement among colloidal particles?

A8 Due to unequal collision between particles of dispersed phase and dispersion medium.

Q9) Write the main reason for the stability of colloidal sols.

A9. Brownian movement/charge on colloidal particles.

Q10) Give an example of micelle system?

A10. Sodium stearate ($C_{17}H_{35}COO^-Na^+$).

Q11) Write down the example of positively charged sol?

A11. Ferric hydroxide sol.

SHORT ANSWER QUESTIONS (3 MARKS EACH)

Q6) Account for the following:

(i) **What is colloidion?**

(ii) **Why do we add alum to purify water?**

(iii) **Of physisorption and chemisorption, which type of adsorption has a higher enthalpy of adsorption?**

A6. (i) It is a 4% sol. of nitrocellulose in a mixture of alcohol and ether.

(ii) Alum coagulates colloidal impurities present in water.

(iii) Chemisorption has higher enthalpy of adsorption on account of formation of chemical bond.

Q7) (i) How can colloidal sol. of sulphur in water be prepared?

(ii) **What is electrophoresis due to?**

(iii) **Why is $Fe(OH)_3$ colloid +vely charged when prepared by adding $FeCl_3$ to hot water?**

A7) (i) It is prepared by oxidation of H_2S by dil. HNO_3 .

(ii) Colloidal particles carry a charge, either +ve or -ve. On passing electricity, they migrate towards the oppositely charged electrode.

(iii) The colloidal sol. of hydrated ferric oxide adsorbs +vely charged Fe^{3+} ion and therefore the colloidal sol. becomes +vely charged.

Q8) How are the following colloids different from each other in respect of dispersion medium and dispersed phase? Give an example each.

(i) An aerosol

(ii) A hydrosol

(iii) An emulsion

A8. (i) An aerosol is a colloidal dispersion of liquid in a gas, eg, fog

(ii) A hydrosol is a colloidal sol. of a solid in water as the dispersion medium, eg, starch sol.

(iii) An emulsion is a colloidal system with dispersed phase as well as dispersion medium as liquids, eg, oil in water.

Q9) Account for the following:

(i) **On the basis of Hardy Schulze rule, explain why the coagulating power of phosphate is higher than chloride?**

(ii) **How does a delta form at the meeting place of sea and river water?**

(iii) **Why is chemisorptions referred to as activated adsorption?**

A9. (i) Minimum quantity of an electrolyte required to cause precipitation of a sol is called its coagulating value. Greater the charge and smaller the amount of electrolyte required for precipitation higher is the coagulating power of electrolyte.

(ii) River water is a colloidal sol. of clay and sea water contains a lot of electrolytes. Coagulation takes place at the meeting place of sea and river water the coagulated clay forms delta.

(iii) Chemisorption involves formation of bonds for which activation energy is required.

LONG ANSWER QUESTIONS

Q10). What is adsorption? How adsorption is classified? How does adsorption of a gas on a solid surface vary with (i) temperature (ii) pressure.

A10. Adsorption is a phenomenon in which concentration of solute is more at the surface and less in the bulk. Adsorption is classified as physisorption & chemisorption.

Physical adsorption of a gas on solid decreases with increase in temperature and increases with increase in pressure.

Chemical adsorption first increases and then decreases with increase in temperature.

Chemical adsorption first increases and then becomes independent of pressure with increase in pressure.

Q11) a. Define: (i) Krafttemperature (ii) Zeta potential (iii) Brownian movement

b. Arrange the following ions in increasing order of flocculating power to precipitate As_2S_3 sol :



c. Give an example of oil in water & water in oil type emulsion.

A11. (i) Kraft temperature- a particular temperature only above which formation of micelles takes place.

(ii) Zeta potential- it is the potential difference between the fixed and diffused layer of opposite charges around the colloidal particles.

(iii) Brownian movement: It is a continuous zig-zag motion of colloidal particles. It is due to the

unbalanced bombardment / collision of the particles by the molecules of dispersion

medium. It depends upon the size of the particles and viscosity of the solution.

b. $[Fe(CN)_6]^{4-} > PO_4^{3-} > SO_4^{2-} > Cl^-$

c. Oil in water: milk and vanishing cream, Water in oil: butter and cold cream.
