Chemistry Worksheets Class 12 on Chapter 5 Surface Chemistry with Answers - Set 5

Q1. Which of the following metal sols cannot be prepared by Bredig's arc method?

a.) Silver
b.) Potassium
c.) Gold
d.) Platinum

Correct Answer– (b.) Potassium

Q2. Which of the following is an emulsion?

a.) Ruby
b.) Sponge
c.) Milk
d.) Jellies

Correct Answer– (c.) Milk

Q3. A smoke precipitator works on the principle of:

a.) Distribution law
b.) Neutralization of charge on colloids
c.) Le Chaterlier's principle
d.) Addition of electrolytes

Correct Answer– (b.) Neutralization of charge on colloids.

Q4. Which of the following ats a negative catalyst?

a.) Lead tetraethyl as an antiknock compound
b.) Glycerol in the decomposition of H_2O_2.
c.) Ethanol in the oxidation of chloroform
d.) None of the above

Correct Answer– (a.) Lead tetraethyl as an antiknock compound, (b.) Glycerol in the decomposition of H_2O_2, (c.) Ethanol in the oxidation of chloroform

Q5. Soap solution is colloidal in nature and remove the dust particles by which of the following process?

a.) Emulsification
b.) Adsorption
c.) Stripping
d.) Distillation

Correct Answer– (a.) Emulsification and (b.) Adsorption

Q6. Write one similarity between physisorption and chemisorption.

Answer. Physisorption is non-specific in nature. It involves Waal interaction between adsorbate and adsorbent. Chemisorption is highly specific in nature as it involves chemical bond formation between adsorbate and adsorbent. Both are having similarities in heat releasing. Physisorption and Chemisorption both are exothermic phenomena.

Q7. What is the difference between oil/water (O/W) type and water/oil (W/O) type emulsions? Give an example of each type.

Answer. Oil-in-water emulsions in which oil is the dispersed phase and water is the dispersion medium. Milk, for example, is an emulsion of liquid fat dispersed in water.
Water-in-oil emulsions in which water is the dispersed phase and oil is the dispersion medium. For example, cod liver oil is an oil emulsion, in which water is the dispersed phase and oil is the dispersion medium.
Two applications of emulsion are:

- Emulsification is the process by which fats are digested in the intestines.
- Several oily drugs are prepared as emulsions.

Q8. Explain the following :
(a) Same substance can act both as colloids and crystalloids.
(b) Artificial rain is caused by spraying salt over clouds.

Answer. (i) The size of the solute particles determines whether the substance is colloid or crystalloid. When the size of the solute particles ranges from 1 to 1000 nm, the system behaves as a colloid.
(ii) By spraying salt over clouds, the colloidal water particles in the clouds are neutralised and coagulated into larger water drops, resulting in artificial rain.

Q9. Write the dispersed phase and dispersion medium of the following colloidal systems:
(i) Smoke
(ii) Milk

Answer. (i) Smoke: Dispersed Phase → Solid; Dispersed medium → Gas.

(ii) Milk: Dispersed Phase → Fat (Liquid); Dispersed medium Liquid

Q10. Give reasons for the following observations :
(i) Leather gets hardened after tanning.
(ii) Lyophilic sol is more stable than lyophobic sol.
(iii) It is necessary to remove CO when ammonia is prepared by Haber's process.

Answer. (i) Animal skin (hide) is colloidal in nature and contains positively charged colloidal particles. When a hide is soaked in tanning solution, mutual coagulation occurs, and the leather hardens.
(ii) The stability of a lyophilic solution is determined by two factors: the presence of a charge and colloid particle solvation. The presence of a charge, on the other hand, is responsible for the stability of the lyophobic solution. As a result of the extensive solvation, lyophilic solutions are more stable than lyophobic solutions.
(iii) CO must be removed when ammonia is prepared using Haber's process because CO acts as a poison in this process and reduces the activity of the iron catalyst used in the process.

Q11. What happens when an emulsion is centrifuged?

Answer. De-emulsification occurs when an emulsion is centrifuged. De-emulsification is the breakdown of an emulsion into its constituents (disperse phase and dispersion medium).

Q12. Define sorption.

Answer. Sorption is defined as the phenomenon in which one substance get attached to another. Sorbate is the substance that gets attached while the sorbent is the substance on which the sorbate gets attached to. An example of sorption is sponge dipped in water.

Q13. Write the characteristics of Chemisorption.

Answer. Th characteristics of Chemisorption are:
(a) In Chemisorption, which is highly specific in nature, the adsorbate and adsorbent are joined together by chemical bonds that can be covalent or ionic in nature.
(b) A high activation energy is required, as is a high temperature.
(c) Chemisorption increases with surface area, resulting in a greater number of active sites.

Q14. Action of soap is due to emulsification and micelle formation. Comment.

Answer. Soap's cleansing action is caused by emulsification and micelle formation. Soaps are essentially sodium and potassium salts of long chain fatty acids $R\text{-}COO^{-}Na^{+}$. The end of the molecule to which the sodium is attached is polar, whereas the alkyl end is non-polar. As a result, a soap molecule has both a hydrophilic (polar) and a hydrophobic (non-polar) component.

When soap is added to water containing dirt, the soap molecules surround the dirt particles in such a way that the hydrophobic parts of the soap molecules attach to the dirt molecule while the hydrophilic parts point away from the dirt molecule. This is referred to as micelle formation. As a result, the polar group dissolves in water, whereas the non-polar group dissolves in dirt particles. Since these micelles are negatively charged, they do not merge and form a stable emulsion.

Q15. How do emulsifying agents stabilise the emulsion?

Answer. Emulsifying agents function as surfactants, lowering the surface tension between the dispersed phase and the dispersion medium. Emulsifiers help to stabilise an emulsion by lowering the interfacial tension between the two liquids that make up the emulsion.
For example- Casein (milk protein), is an emulsifier. It forms a protective layer around dispersed fat molecules in water. This lowers interfacial tension and helps to stabilise the emulsion.
Soap as an emulsifying agent is another example. Each oil droplet is surrounded by a protective film of soap molecules. This lowers interfacial tension and helps to stabilise the emulsion.

Q16. What are the characteristics of the following colloids? Give one example of each.
(i) Multimolecular colloids
(ii) Lyophobic sols
(iii) Emulsions

Answer.
(i) They are formed by the accumulation of a large number of atoms or molecules with diameters less than 1 nm, such as sols of gold, sulphur, and so on.
(ii) Lyophobic sols: These sols are typically formed by inorganic materials such as metals, their sulphides, and so on.
They are irreversible in nature, which means that once precipitated, the colloidal sol cannot be returned by simply adding the dispersion medium.
(iii) Emulsions: An emulsion is a mixture of two or more normally immiscible liquids. Emulsions are classified into two types: oil-in-water (O/W) and water-in-oil (W/O). One liquid (the dispersed phase) is dispersed in the other in an emulsion (the continuous phase). Vinaigrette, milk, and mayonnaise are all examples of emulsions.

Q17. Write a short note on Peptization.

Answer. Peptization is the method of producing stable colloids using an electrolyte to split up and distribute a precipitate into the colloids. Peptization utilizes the charges to produce colloids from the precipitate. The electrolyte used in the process is called a peptizing agent.

Example: When the ferric chloride is added to the precipitate of ferric hydroxide, the hydroxide precipitate transfer to the sol by absorbing ferric ions. In simple words, Fe^{3+} is absorbed on $Fe(OH)_3$ and splits into colloids.

Peptizing agent is added to convert the precipitate into a Colloidal solution because ions either (+ve or –ve) of the peptizing agent (electrolyte)are adsorbed on the particles of the precipitate. They repel and hit each other breaking the particles of the precipitate into colloidal size.
For example, when we add a small volume of very dilute hydrochloric acid solution peptising agent to a fresh precipitate of silver chloride, it leads to the formation of silver chloride colloidal solution.

Q18. Answer the following-
(a) How can we get the following colloidal solutions :
(i) Sulphur in water
(ii) $Fe(OH)_3$ in water
(iii) Gold in water
(b) List two applications of adsorption.

Answer.
(i) Sulphur sol is prepared by the oxidation of H_2S with SO_2.

$$SO_2 + 2H_2S \xrightarrow{oxidation} 3S(sol) + 2H_2O$$

(ii) $Fe(OH)_3$ in water

$$FeCl_3 + 3H_2O \rightarrow Fe(OH)_3 + 3HCl$$

(iii) Gold in water

$$2AuCl_3 + 3SnCl_2 \rightarrow 2Au + 3SnCl_4$$

(b) Applications of Adsorption
1) Air pollution masks: These consist of silica gel or activated charcoal powder, when dust or smoke are paused through them, those particles get adsorbed on the surface of these materials.
2) Separation of noble gases by Dewar's flask process: A mixture of noble gases of Ne, Ar, Kr is passed through Dewar's flask in presence of heated coconut charcoal. Argon and Krypton gels adsorbed leaving Neon.

Q19. What is a protective colloid?

Answer. Lyophilic sols have greater stability than lyophobic sols. This is because lyophilic colloids are extensively solvated, which means that colloidal particles are covered in a sheath of the liquid in which they are dispersed. Lyophilic colloids have the unique ability to protect lyophilic colloids. When a lyophilic solution is added to a lyophobic solution, the lyophilic particles form a layer around the lyophobic particles, protecting them from electrolytes. Lyophilic colloids used for this purpose are called protective colloids.

Q20. Define the following terms giving an example of each :
(i) Associated colloids
(ii) Lyophilic sol
(iii) Adsorption

Answer.

(i) Associated Colloids (Micelles): Associated colloids are colloids that behave as normal strong electrolytes at low concentrations but exhibit colloidal properties at higher concentrations due to aggregated particle formation. Micelles are the aggregated particles that result from this process. Surfactants (surface active agents) such as soaps and synthetic detergents typically form the associated colloids. When these agents are present in solution at a concentration greater than the critical micellization concentration, they form micelles (CMC).

(ii) Lyophilic colloids are formed by gums, starch, and proteins. Lyophilic sol is easily made by directly combining colloid and liquid. They are extremely stable and do not readily precipitate or coagulate. However, very large amounts of electrolytes can cause particles to precipitate.

(iii) Adsorption is the adhesion of atoms, ions, or molecules to a surface from a gas, liquid, or dissolved solids. This process forms an adsorbate film on the adsorbent's surface.