

SURFACE CHEMISTRY

Questions carrying 1 mark

1. What is collodion?
2. Define Electrophoresis.
3. What is peptisation?
4. Name two industrial process in which in which heterogeneous catalysis employed.
5. Why is it necessary to remove CO when ammonia is obtained from Haber's process?
6. Why are substances like Pt and Pd often used for carrying out electrolysis of aq. Solutions?
7. Which one of this will be better reagent to coagulate blood a) FeCl_3 b) NaCl c) CaCl_2 ?
8. Which will adsorb more gas, a lump of charcoal or its powder and why?
9. Name the type of colloid of cheese.
10. Define Brownian movement.

Answer key

1. The colloidal sol of 4% cellulose nitrate in mixture of ethyl alcohol and ether.
2. The movement of colloidal particles under the influence of an electric field.
3. Conversion of a freshly prepared precipitate into colloidal sol by the addition of electrolyte.
4. Haber's process and Contact process
5. Because CO act as poison.
6. Pt and Pd electrodes form inert electrodes, that's why they are not attacked by the ions of electrolyte.
7. FeCl_3 because of greater valence of iron according to Hardy Schulz rule
8. Powdered form of charcoal, because of greater surface area.
9. Gel
10. It involves the motion of colloidal particles in zigzag path.

Questions carrying 2 marks

1. Differentiate between lyophilic and lyophobic colloids.
2. Why is adsorption always exothermic in nature?
3. What is demulsification? Name two demulsifying agent.
4. What do you understand by the term activity and selectivity?
5. Give reasons for the following
 - a) Cottrell's smoke precipitator is fitted at the mouth of the chimney used in factories.
 - b) Colloidal gold is used for intermuscular injection.
6. Why is it essential to wash the precipitate with water before estimating it quantitatively?
7. Comment on the statement that "colloid is not a substance but state of a substance."
8. Why is the ester hydrolysis slow in the beginning and becomes faster after some time?

Answer Key

1. a) Lyophilic sols are easily prepared by directly mixing with the liquid dispersion medium but lyophobic sols cannot be prepared directly by mixing with liquid. b)

lyophilic sols are stable and are not easily coagulated but lyophobic sols can be easily precipitated by the addition of suitable electrolyte.

2. When a gas is adsorbed on the surface of a solid, its entropy decreases and ΔS becomes negative. Now $\Delta G = \Delta H - T\Delta S$ and for the process to be spontaneous, free energy change must be negative. As $T\Delta S$ is negative i.e. $-T\Delta S$ is positive and for free energy change to be negative enthalpy change should be negative hence reaction should be exothermic always.
3. The process of separation of constituent liquid of an emulsion is called demulsification. It can be done by either centrifuging or boiling.
4. Activity of a catalyst means its capacity to increase the speed of a chemical reaction
Selectivity of a catalyst means its ability to direct a particular reaction to form particular products.
5. a) It neutralise the charge on carbon particles which get precipitated and thus gases entering into chimney are free from carbon particles.
b) This is done because Gold particles have large surface area and easily assimilated to the blood which is colloidal.
6. Some amount of the electrolytes mixed to form the precipitate remains adsorbed on the surface of the particles of the precipitate. Hence, it is essential to wash the precipitate with water to remove the sticking electrolytes or any other impurity before estimating it quantitatively.
7. The given statement is true. This is because the same substance may exist as colloid under certain conditions and as a crystalloid under certain conditions for e.g. NaCl in water behave as crystalloid but in benzene as a colloid. It is the size of solute particle which matters i.e. the state in which the substance exists. If it lies in the range of 1nm to 1000nm its a colloid.
8. $\text{RCOOR}' + \text{H}_2\text{O} \rightleftharpoons \text{RCOOH} + \text{R}'\text{OH}$
The acid produced in above reaction act as auto catalyst for the reaction. Hence the reaction becomes faster after some time.

Questions carrying 3 marks

1. What is the difference between multimolecular and macromolecular colloids? Give one example of each.
2. Explain the terms coagulation, dialysis and Tyndall effect.
3. Explain the following terms alcosol, aerosol and hydrosol.
4. Give specific term to show the effect of the following process.
 - a) Ferric hydroxide is mixed with arsenic sulphide sol
 - b) Ferric chloride solution is mixed with freshly prepared precipitate of ferric hydroxide.
 - c) H_2S is passed through arsenic oxide solution.
5. What is emulsion and what are the types with example each?

Answer key

1. Multimolecular colloids are formed by the aggregation of large number of molecules (for e.g. S_8). Macromolecular colloids are due to large size of molecule themselves (e.g. starch) so large that their size lies in the colloidal range.

2. Coagulation is the process of aggregation of colloidal particles so as to change them into large sized particles which ultimately settles as precipitate.
Dialysis is the process of separating the particles of colloids from those of crystalloids by diffusion of the mixture through parchment membrane.
Scattering of light through colloidal solution by the colloid particles is called Tyndall effect
3. Alcosol is colloidal dispersion having alcohol as dispersion medium e.g. collodion .Aerosol is colloidal dispersion of a liquid in gas for e.g. fog. Hydrosol is colloidal dispersion of a solid in liquid e.g. starch sol or egg albumin sol.
4. a) Coagulation b) Peptisation c) Double decomposition
5. Emulsion; It is a colloid dispersion in which both the dispersed phase and dispersion medium are liquids. their types are O/W i.e. oil in water emulsion W/O water in oil emulsion
 - a) O/W in which oil is the dispersed phase and water as dispersion medium for e.g. milk vanishing cream
 - b) W/O in which water is the dispersed phase and oil as dispersion medium for e.g. butter and cold cream.