

Class: 12
Subject: Chemistry
Topic: Surface
No. of Questions: 27

1. What happens when a colloidal sol of $\text{Fe}(\text{OH})_3$ is mixed with that of As_2O_3 ?
Sol. Their mutual precipitation occurs.
2. What type of solution NaCl form in benzene?
Sol. Colloidal solution
3. What is the difference in the nature of a dilute soap solution and a concentration soap solution?
Sol. Dilute soap solution behave like a true solution whereas concentrated soap solution behave like a colloidal solution.
4. What happens when a freshly prepared $\text{Fe}(\text{OH})_3$ is shaken with a little amount of dilute solution of FeCl_3 ?
Sol. Peptization takes place forming a positively charged colloidal sol of $\text{Fe}(\text{OH})_3$.
5. What happens to a gold sol if gelatin is added to it?
Sol. Gold sol which is lyophobic starts behaving like a lyophilic sol.
6. What is the difference between a colloidal sol, gel and emulsion?
Sol. In a colloidal sol, the dispersed phase is a solid and the dispersion medium is a liquid, in a gel, it is opposite. In an emulsion, both the dispersed phase and dispersion medium are liquids.
7. Why is a colloidal sol stable?
Sol. All the particles in a colloidal sol carry the same charge and hence keep repelling each other and thus do not aggregate together to form bigger particles.

8. What happens when persistent dialysis of a colloidal solution is carried out?

Sol. The stability of a colloidal sol is due to the presence of a small amount of the electrolyte. On persistent dialysis, the electrolyte is completely removed. As a result, the colloidal sol becomes unstable and gets coagulated.

9. What is demulsification? Name two demulsifiers.

Sol. The process of separation of the constituent liquids of an emulsion is called demulsification. Demulsification can be done by centrifuging or boiling.

10. The conductance of an emulsion increases on adding common salt. What type of emulsion is this?

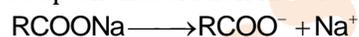
Sol. Oil in water type.

11. Alum is used in cleaning town water supply. Explain.

Sol. The water obtained from natural sources is often contaminated with bacteria and dispersed impurities. Alum is added to such water to destroy bacteria (antibacterial nature) as well as to coagulate undesired impurities (coagulating nature) as to make water fit for drinking purpose.

12. Why hard water consumes more soap?

Sol. Soap on dissolution in water give RCOO^- ions which undergoes to micelle formation



These micelles are responsible for cleaning.

In hard water, RCOO^- ions are used up by Ca^{+2} or Mg^{2+} ions to form insoluble $(\text{RCOO})_2\text{Ca}$ or $(\text{RCOO})_2\text{Mg}$ and thus micelle formation starts only when whole of Ca^{2+} and Mg^{2+} ions are precipitated out by soap.

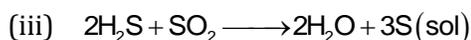
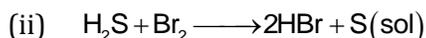
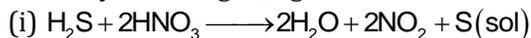
Thus, hard water is said to consume more soap.

13. What is the difference between multimolecular and macromolecular colloids? Give an example of each. How are associated colloids different from these two types of colloids?

Sol. Multimolecular colloids contain dispersed particles made of aggregates of many molecules. These are lyophobic colloids e.g. As_2S_3 sol. Macromolecular colloids are molecularly dissolved solutions of a polymer (due to large size of polymer molecule, it take colloidal state) and are lyophilic colloids e.g. starch solution. Association colloids are also lyophilic colloids but are formed by the aggregation of soap or detergent molecules in solution above CMC (these are miceller colloids).

14. Describe a chemical method each for the preparation of sols of sulphur and platinum in water.

Sol. S-sol: By bubbling H_2S gas in cold solution of an oxidising agent.



Pt-sol: By reducing its salt solution by suitable reducing agent like formaldehyde, SnCl_2 , hydrazine etc.



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

Sol. Soap molecules adsorb on to the (oily) surface and try to emulsify it. Soap micelles to solubilize the insoluble dirt / greasy material.

16

System		Special Name	
a)	liquid dispersed in gas	i)	solid sol
b)	gas dispersed in liquid	ii)	gel
c)	liquid dispersed in liquid	iii)	solid foam
d)	solid dispersed in liquid	iv)	sol
e)	gas dispersed in solid	v)	emulsion
f)	liquid dispersed in solid	vi)	foam
g)	solid dispersed in solid	vii)	aerosol

Sol: (a) - (vii), (b) - (vi), (c) - (v), (d) - (iv), (e) - (iii), (f) - (ii), (g) - (i)

17. Which of the following can act as a protective colloid?

(A) gelatin

(B) silica gel

(C) oil-in-water emulsion

(D) all correct

Sol: (A)

18. The coagulation of 100 ml of a colloidal sol of gold is completely prevented by addition of 0.25 g of starch to it before adding 1 ml of 10 % NaCl solution. Find out the gold number of starch.

Sol: Starch added to 100 ml of gold sol to completely prevent coagulation by 1 ml of 10% NaCl sol = 0.25 g = 250 mg.
Starch required to be added to 10 ml of gold sol to completely prevent coagulation by 1 ml of 10 % NaCl sol = 25 mg
∴ By definition, gold number of starch = 25

19. For the coagulation of 100 ml of arsenious sulphide sol, 5 ml of 1 M NaCl is required. What is the Flocculation value of NaCl?

Sol: 5 ml of 1 M NaCl contains = $\frac{1}{1000} \times 5$ moles = 5 millimoles of NaCl.

Thus 100 ml of As_2S_3 sol require NaCl for complete coagulation = 5 millimoles
∴ 1 L i.e. 1000 ml of the sol require NaCl for complete coagulation = 50 millimoles
∴ By definition, Flocculation value of NaCl = 50.

20. How rubber is obtained by latex?

Sol: Latex is a colloidal solution of rubber having - vely charged rubber particles. These are coagulated to give rubber.

21. Differentiate between physical & chemical adsorption?

Sol:

Physical adsorption	Chemical adsorption
a) Forces between adsorbate & adsorbent are weak van der waal forces.	a) Forces between adsorbate & adsorbent are strong chemical forces.
b) Low heat of adsorption.	b) High heat of adsorption.

22. Differentiate between multi molecular, macromolecular and associated colloids?

Sol:

Multi molecular colloids	Macromolecular colloids	Associated colloids
a) They consist of aggregates of atoms or molecules which generally have diameter less than 1 nm. b) They are usually lyophobic	a) They consist of large molecules. b) They are hydrophilic.	a) Behave as colloidal size particles at higher conC. b) They have both lyophobic character & lyophilic character.

23. Discuss the effect of pressure & temperature on the adsorption of gases on solids?

Sol:

Effect of pressure on adsorption : - at constant temp the extent of adsorption of Gas (x/m) in the solid increases with pressure. A graph between x/m and the pressure P of a gas at constant temp is called adsorption isotherm.
 Effect of temp on adsorption – adsorption is generally temp. dependent. Mostly adsorption processes are exothermic and hence, adsorption decreases with increasing temp. However for an endothermic adsorption process adsorption increases with increase in temperature.

24.

Explain what is observed when
 (i) An electrolyte, NaCl is added to hydrate ferric oxide sol.
 (ii) Electric current is passed through a colloidal sol.

Sol:

(i) The positively charged colloidal particles of $\text{Fe}(\text{OH})_3$ get coagulated by the positively charged Cl^- ions provided by NaCl.
 (ii) On passing direct current, Colloidal particles move towards the positively charge electrode where they lose their charge and get coagulated.

25. Explain what is observed when a colloidal solution is kept in the path of light?

Sol:

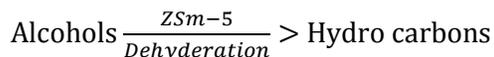
Scattering of light by the colloidal particles takes place and the path of light becomes visible (Tyndall effect).

26. Describe some features of catalysis by zeolites?

Sol: Features of catalysis by zeolites:-

- (i) Zeolites are hydrated alumino silicates which have a three dimensional network structure containing water molecules in their pores.
- (ii) To use them as catalysts, they are heated so that water of hydration present in the pores is lost and the pores become vacant.
- (iii) The size of pores varies from 260 to 740 pm. Thus, only those molecules can be adsorbed in these pores and catalyzed whose size is small enough to enter these pores. Hence, they act as molecular sieves or shape selective catalysts

An important catalyst used in petroleum industries is zsm-5. It converts alcohols into petrol by first dehydrating them to form a mixture of hydro carbons.



27. Comment on the statement that "colloid is not a substance but state of a substance"?

Sol: The given statement is true. This is because the statement may exist as a colloid under certain conditions and as a crystalloid under certain other conditions. e.g: NaCl in water behaves as a crystalloid while in benzene, behaves as a colloid (called associated colloid). It is the size of the particles which matters i.e. the state in which the substance exist. If the size of the particles lies in the range 1 nm to 1000nm it is the colloid state.