Surface Chemistry Important Questions With Answers

NEET Chemistry 2023

1. A colloidal system having a solid substance as a dispersed phase and a liquid as a dispersion medium is classified as_____.
   a) solid sol b) gel c) emulsion **d) sol**

   Solution : -
   Sol is a type of colloid in which solid substance is dispersed phase and liquid is dispersion medium.

2. Substances which behave as normal electrolytes in solution at low concentration and exhibit colloidal properties at higher concentration are called
   a) lyophilic colloids b) lyophobic colloids c) macromolecular colloids **d) associated colloids.**

   Solution : -
   At higher concentration the aggregated particles called micelles are formed by electrolytes like soap which act as colloidal particles.

3. In Freundlich adsorption isotherm, the value of 1/n is:
   a) between 0 and 1 in all cases b) between 2 and 4 in all cases c) 1 in cases of physical adsorption
   d) 1 in case of chemisorption

   Solution : -
   For Freundlich adsorption isotherm
   $\frac{x}{m} = kp^{1/n}$
   Where $\frac{x}{m}$ is the ratio of amount of adsorbent to the amount of adsorbate. The value of n is always greater than 1. So, the value of 1/n lies between 0 and 1 in all cases.

4. Which one of. the following statements is incorrect about enzyme catalysis?
   a) Enzymes are mostly proteinous in nature b) Enzyme action is specific
   c) Enzymes are denaturated by UV - rays and at high temperature
   d) Enzymes are least reactive at optimum temperature

   Solution : -
   Enzymes are protein in nature. They are highly specific and get denaturated by high temperature or UV - rays. At optimum temperature (25 - 35^0C) enzyme activity is maximum.

5. Which of the following will not form a colloidal system?
   a) Solid-gas b) Liquid-gas **c) Gas-gas** d) Gas-liquid

   Solution : -
   Gas-gas is a true solution.

6. The ratio of the number of moles of $AgNO_3$, $Pb(NO_3)_2$ and $Fe(NO_3)_3$ required for coagulation of a definite amount of a colloidal sol of silver iodide prepared by mixing $AgNO_3$ with excess of KI will be
   a) 1: 2 : 3 b) 3: 2: 1 **c) 6: 3 : 2** d) 2: 3 : 6

   Solution : -

With excess of KI, colloidal particles will be $[AgI]I^-$

$$\underset{1mol}{[AgI]I^-} + \underset{1mol}{AgNO_3} \rightarrow AgI\downarrow + AgI\downarrow + NO_3^-$$

$$2\underset{2mol}{[AgI]I^-} + \underset{1mol}{pb(NO_3)_2} \rightarrow 2AgI\downarrow + pbI_2\downarrow + 2NO_3^-$$

$$3\underset{3mol}{[AgI]I^-} + \underset{1mol}{Fe(NO_3)_3} \rightarrow 3AgI\downarrow + FeI_3\downarrow + 3NO_3^-$$

$$\underset{1mol}{\quad} \quad \underset{\frac{1}{3}mol}{\quad}$$

$\therefore$ Molar ratio required for coagulation of same amount of $[AgI]I^-$ is =1:$\frac{1}{2}$: $\frac{1}{3}$=6 : 3 : 2

7. Which of the following statement is correct for the spontaneous adsorption of a gas?
   a) ΔS is negative and therefore, ΔH should be highly positive.
   b) ΔS is negative and therefore, ΔH should be highly negative.
   c) ΔS is positive and therefore, ΔH should be negative.
   d) ΔS is positive and therefore, ΔH should be highly positive.

   Solution : -
   We know that
   ΔG = ΔH - T Δ S
   For adsorption of a gas, ΔS is negative because randomness decreases. Thus, for making ΔG negative, ΔH should be highly negative because reaction is exothermic.
   Thus, for adsorption of gas if ΔS is -ve than ΔH should be highly negative.

8. Which one of the following characteristics is associated with adsorption?
   a) ΔG and ΔH are negative but ΔS is positive. b) ΔG and ΔS are negative but ΔH is positive
   c) ΔG is negative but ΔH and ΔS are positive **d) ΔG, ΔH and ΔS all are negative**

   Solution : -
   As the molecules of the adsorbate are held on the surface of the solid adsorbent, entropy decreases. i.e., ΔS = -ve
   As we know that ΔG = ΔH - T Δ S
   For the adsorption to occur, ΔG = -ve and it will be possible only if ΔH = -ve.

9. Why is gelatin mixed with gold sol?
   a) Gold sol is lyophobic sol, gelatin acts as stabilising agent.
   b) Gold sol is lyophilic sol, gelatin acts as stabilising agent.
   c) Gelatin produces negative charge on gold particles in gold sol.
   d) Gelatin helps gold sol to get its critical micelle concentration.

10. If x is amount of adsorbate and m is amount of adsorbent, which of the following relations is not related to adsorption process?
    a) $\frac{x}{m}$ = f (T) at constant p b) p = f (T) at constant $\left(\frac{x}{m}\right)$ **c) $\frac{x}{m}$ = p x T** d) $\frac{x}{m}$ = f (p) at constant T

    Solution : -
    $\frac{x}{m}$ = p x T is the incorrect relation
    As the extend of adsorption, $\frac{x}{m} \propto \frac{P}{T}$

11. **Assertion:** In physical adsorption, enthalpy of adsorption is very low.
    Reason: In physical adsorption, attraction between gas molecules and solid surface is due to weak van der Waals forces.
    a) If both assertion and reason are true and reason is the correct explanation of assertion.
    b) If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false. d) If both assertion and reason are false.

12. Mark the incorrect combination out of the following examples of colloidal solutions

a)

Colloid	Dispersion medium	Dispersed phase
Smoke	Gas	Solid

b)

Colloid	Dispersion medium	Dispersed phase
Mist	Gas	Liquid

c)

Colloid	**Dispersion medium**	**Dispersed phase**
Gel	**Liquid**	**Liquid**

d)

Colloid	Dispersion medium	Dispersed phase
Emulsion	Liquid	Liquid

13. Mixing of positively charged colloidal solution with negatively charged colloidal solution brings _____.
The decreasing order of coagulating power of Na^+, Ba^{2+} and Al^{3+} for negatively charged colloidal solution is_____.
a) mutual coagulation, $Na^+ > Ba^{2+} > Al^{3+}$ **b) mutual coagulation, $Al^{3+} > Ba^{2+} > Na^+$**
c) coagulation, $Na^+ > Ba^{2+} > Ae^+$ d) peptization, $Al^{3+} > Ba^{2+} > Na^+$

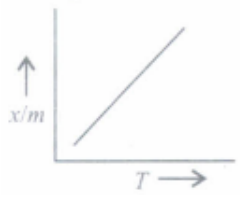
Solution : -
According to Hardy Schulze rule, the coagulating power of an ion depends upon its valency. Higher the valency of ion, greater is its coagulating power.

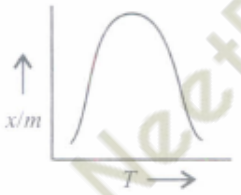
14. According to adsorption theory of catalysis, the rate of reaction increases with the use of a catalyst because:
a) the heat liberated during adsorption increases the rate of reaction
b) the kinetic energy of reactants increases which increases the rate of reaction
c) the activation energy of reaction increases which increases the rate of reaction
d)
the concentration of reactants at the active centres becomes high due to adsorption resulting in increase in the rate of reaction

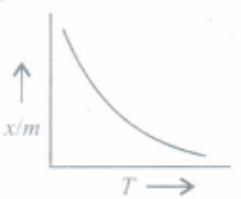
15. Which of the following gases is least adsorbed on charcoal?
a) HCl b) NH_3 c) O_2 **d) CO_2**

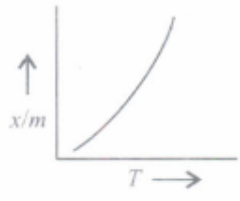
Solution : -
It has been found that more readily liquefiable gases are adsorbed more than permanent gases.

16. Which of the plots is adsorption isobar for chemisorption?

a) 

b) 

c) 

d) 

Solution : -
The extent of adsorption first increases and then decreases with increase in temperature.

17. At low pressure, the fraction of the surface covered follows
a) zero-order kinetics **b) first-order kinetics** c) second-order kinetics d) fractional order kinetics.

Solution : -
As $\frac{x}{m}=kp^{1/n}$
At low pressure - $\frac{x}{m} \propto P$ (graph is nearly a straight line) Thus, the reaction follows first order kinetics.

18. Which of the following process is not responsible for the presence of electric charge on the sol particles?
a) Electron capture by sol particles b) Adsorption of ionic species from solution
c) Formation of Helmholtz electrical double layer **d) Absorption of ionic species from solution**

Solution : -
The sol particles acquire positive or negative charge by preferential adsorption of positive or negative ions.

19. Match the column I with column II and mark the correct option.

Column I	Column II

(p)	Silver sol	(i)	Kalaazar
(q)	Colloidal gold	(ii)	Stomach disorder
(r)	Milk of magnesia	(iii)	Eye lotion
(s)	Colloidal antimony	(iv)	Intramuscular injection

a) (p) - (iv), (q) - (iii), (r) -(ii), (s) - (i) b) (p) - (iv), (q) - (i), (r) -(iii), (s) - (ii)
c) (p) - (iii), (q) - (iv), (r) -(ii), (s) - (i) d) (p) - (i), (q) - (ii), (r) -(iv), (s) - (iii)

20. In which of the following reactions heterogeneous catalysis is involved?

(I) $2SO_{2(g)} + O_{2(g)} \xrightarrow{NO_{(g)}} 2SO_{3(g)}$

(II) $2SO_{2(g)} \xrightarrow{Pt_{(s)}} 2SO_{3(g)}$

(III) $N_{2(g)} + 3H_{2(g)} \xrightarrow{Fe_{(s)}} 2NH_{3(g)}$

(IV) $CH_3COOCH_{3(l)} + H_2O_{(l)} \xrightarrow{HCl_{(l)}} CH_3COOH_{(aq)} + CH_3OH_{(aq)}$

a) (II), (III) b) (II), (III), (IV) c) (I), (II), (III) d) (IV)

21. Movement of dispersion medium under the influence of electric field is known as
a) electrodialysis b) electrophoresis **c) electroosmosis** d) cataphoresis.

Solution : -
When movement of particles (electrophoresis) is prevented by some suitable means, it is observed that the dispersion medium begins to move in an electric field. This phenomenon is termed as electroosmosis.

22. Which of the following is an example of absorption?
a) Water on silica gel **b) Water on calcium chloride** c) Hydrogen on finely divided nickel
d) Oxygen on metal surface

Solution : -
Anhydrous calcium chloride acts as a dehydrating agent, it removes water by the process of absorption.

23. Method by which lyophobic sol can be protected
a) by addition of oppositely charged sol. b) by addition of an electrolyte **c) by addition of lyophilic sol**
d) by boiling.

Solution : -
Lyophilic colloids have a unique property of protecting lyophobic colloids. When a lyophilic sol is added to the lyophobic sol, the lyophilic particles form a layer around lyophobic particles and thus protect the latter from electrolytes. Lyophilic colloids used for this purpose are called protective colloids.

24. Measuring Zeta Potential is useful in determining which property of collodial solution
a) Size of the colloidal particles b) Viscosity c) Solubility **d) Stability of colloidal particles**

Solution : -
Greater to Zeta potential more will be the stability of colloidal particles

25. In Freundlich adsorption equation $x/m = kp^{1/n}$, the value of n is
a) always greater than one b) always smaller c) always smaller
d) greater than one at low temperature and smaller than one at high temperature.

Solution : -
n is always greater than one.

26. Which of the following is not correctly matched?
a) Gelatin - Lyophilic colloid **b) Gold sol - Lyophilic colloid** c) Arsenious sulphide - Lyophobic colloid
d) Ferric hydroxide - Lyophobic colloid

Solution : -
Gold sol is a lyophobic colloid.

27. fog is an example of colloidal system of
a) liquid in gas b) gas in liquid c) solid in gas d) gas in solid.

28. $Fe(OH)_3$ sol can be more easily coagulated by Na_3PO_4 in comparison to KCl because
a) mass of Na_3PO_4 is more than KCl hence it is more effective than KCl
b)
phosphate ion (PO^{3-}_4) has higher negative charge than Cl ion hence are more effective for coagulation
c) KCl is more soluble than Na_3PO_4 hence less effective for coagulation
d) Na+ ions are more effective than K+ ions for coagulation

Solution : -
Ferric hydroxide is a positively charged sol hence ions carrying negative charge can coagulate it. Since PO^{3-}_4 has higher negative charge than Cl hence it is more effective for coagulation.

29. At CMC (critical micelle concentration) the surface molecules
a) dissociate **b) associate** c) become bigger in size due to adsorption
d) become smaller in size due to decomposition

Solution : -
At CMC, the particles of an electrolyte aggregate and form associated colloids known as micelles.

30. The Langmuir adsorption isotherm is deduced by using the assumption that:
a) the adsorption takes place in multi-layers
b) the adsorption sites are equivalent in their ability to adsorb the particles.
c) the heat of adsorption varies with coverage d) the adsorbed molecules interact with each other

Solution : -
The main assumption of Langmuir adsorption isotherm are:
(i) Adsorption takes place on the surface of the solid only till the whole of the surface is completely covered with a unimolecular layer of the adsorbed gas.
(ii) Adsorption consists of two opposing processes condensation and evaporation.
(iii) The rate of condensation depends upon the uncovered surface of the adsorbent available for condensation.

31. During dialysis
a) only solvent molecules can diffuse b) solvent molecules, ions and colloidal parficles can diftuse
c) all kinds of particles can diffuse through the semi permeable membrane
d) solvent molecules and ions can diffuse

Solution : -
The principle of dialysis is based upon the fact that colloidal particles cannot pass through a parchment or cellophane membrane while the ions of the electrolyte can pass through it.

32. Which is not correct regarding the adsorption of a gas on surface of solid
a) On increasing temperature, adsorption increase continuously
b) Enthalpy and entropy change are -ve. c) Adsorption is more for some specific substances
d) This phenomenon is reversible

Solution : -
Proof that increasing temperature adsorption of a gas on surface of solid decreases. Solid adsorb greater amount of substances at lower temperature

33. Which out of the following electrolyte solutions having the same concentration will be most effective in causing the coagulation of arsenic sulphide sol?
a) KCl b) $MgCl_2$ **c) $AlCl_3$** d) Na_3PO_4

Solution : -

AS_2S_3 is a negatively charged sol. To cause its coagulation, the ions must be positively charged. Greater the magnitude of positive charge, greater will be its coagulating power. Thus $AlCl_3$ containing Al^{3+} ion will be most effective in causing coagulation of AS_2S_3.

34. Soap mixed with water below critical micelle concentration behaves as:
a) associated colloid b) macromolecular colloid c) normal electrolytic solution
d) multimolecular colloid.

35. **Assertion:** Amylase in the presence of sodium chloride i.e., Na^+ions are catalytically very active.
Reason: Metal ions such as Na^+, Mn^{2+},CO^{2+},Cu^{2+}, etc. act as activators.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

Solution : -
Metal ions when weakly bonded to enzyme molecules increase their catalytic activity.

36. Which of the following gases present in a polluted area will be adsorbed most easily on the charcoal gas mask?
a) H_2 b) O_2 c) N_2 **d) SO_2**

Solution : -
Easily liquefiable gases like CO_2, NH_3, SO_2 etc. are more easily adsorbed than the elemental gases like H_2, N_2, O_2, etc.

37. Which of the following is not a favourable condition for physical adsorption?
a) High pressure b) Negative $\triangle H$ c) Higher critical temperature of adsorbate **d) High temperature**

38. Match the column I and column II and mark the appropriate choice

Column I		Column II	
(A)	Diastase	(i)	Proteins⟶ peptones
(B)	Pepsin	(ii)	Glucose ⟶ ethyl alcohol
(C)	Ptyalin	(iii)	Starch ⟶ maltose
(D)	Zymase	(iv)	Starch ⟶ sugar

a) (A) ⟶ (iv), (B) ⟶ (ii), (C) ⟶ (i), (D) ⟶(iii) b) (A) ⟶ (ii), (B) ⟶ (i), (C)⟶ (iv), (D)⟶ (iii)
c) (A) ⟶ (i), (B) ⟶ (ii), (C) ⟶ (iii), (D)⟶ (iv) **d) (A) ⟶ (iii), (B) ⟶ (i), (C) ⟶ (iv), (D) ⟶ (ii)**

39. The activity of an enzyme becomes ineffective
a) at low temperature b) at atmospheric pressure **c) at high temperature** d) in aqueous medium

Solution : -
Enzymes are effective only at optimum temperature. They become ineffective at very high temperature.

40. Which of the following is not the correct difference between lyophobic and lyophilic sols?
a)

Lyophobic sols	Lyophilic sols
Require special methods for preparation	Can be prepared by shaking with the solvent

b)

Lyophobic sols	**Lyophilic sols**
Are reversible	**Are irreversible**

c)

Lyophobic sols	Lyophilic sols
Easily coagulated by electrolytes	coagulated

d)

Lyophobic sols	Lyophilic sols
Are less stable	Are more stable

Solution : -
Lyophobic sols are irreversible while lyophilic sols are reversible.

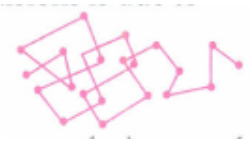
41. Which of the following forms cationic micelles above certain concentration?

a) Sodium ethyl sulphate b) Sodium acetate c) Urea **d) Cetyl trimethyl ammonium bromide**

Solution : -

Cetyl trimethyl ammonium bromide forms cationic micelles above certain concentration. In the molecules of detergents, the negative ions aggregate to form a micelle of colloidal size. In polar medium like water the negative ion has a long hydrocarbon chain and a polar group $-Br^-$ at one end and on the other hand it has N^+ ion thus cationic micelle is formed.

42. The cause of Brownian movement which is not shown by true solutions or suspensions is due to



a) unbalanced bombardment of particles by molecules of the dispersion medium

b) attractive forces between dispersed phase and dispersion medium

c) larger size of the particles due to which they keep colliding and settling down

d) conversion currents formed in the sol.

Solution : -

The colloidal particles are in a continuous zig-zag motion due to unbalanced bombardment of the particles by molecules of the dispersion medium.

43. Which of the following electrolytes will have maximum coagulating value for AgI/ Ag^+ sol?

a) Na_2S **b) Na_3PO_4** c) Na_2SO_4 d) NaCl

Solution : -

AgI/ Ag^+ is positive colloid, it will be coagulated easily by the anion with large negative charge i.e., PO_4^{3-}.

44. Which of the following statements given about emulsions is incorrect?

a) The droplets in emulsions are often negatively charged and can be precipitated by electrolytes.

b)

Emulsion can be diluted with any amount of the dispersed liquid. On the other hand, the dispersion medium when mixed, forms a separate layer.

c) Emulsions can be broken into constituent liquids by heating, freezing, centrifuging, etc.

d) Emulsions also show Brownian movement and Tyndall effect.

Solution : -

Emulsions can be diluted with any amount of the dispersion medium. On the other hand, the dispersed liquid when mixed, forms a separate layer.

45. Select the correct statements

(i) Physical adsorption is weak, multilayer, non-directional and non-specific.

(ii) Chemical adsorption is strong, unilayer, directional and strong.

(iii) Chemical adsorption decreases with temperature.

(iv) Chemical adsorption is more stronger than physical adsorption.

a) (i) and (iii) only b) (i), (ii) and (iv) only c) (iii) only d) All of these.

Solution : -

Chemisorption first increases with temperature as it requires energy of activation.

46. Which of the following statements are correct?

(i) When an animal hide, which has negatively charged particles, is soaked in tannin, which contains positively charged colloidal particles, mutual coagulation does not take place.

(ii) Photographic films are prepared by coating an emulsion of the light-sensitive silver bromide in gelatin over glass plates or celluloid films.

(iii) Latex is a colloidal solution of rubber particles which are negatively charged.

(iv) In Cottrell precipitator, the smoke, before it comes out from the chimney, is led through a chamber containing plates having a charge opposite to that carried by smoke particles. The particles on coming in contact with these plates acquire some charge and do not get precipitated.

a) (i) and (iv) only **b) (ii) and (iii) only** c) (ii), (iii) and (iv) only d) All of these.

47. **Assertion:** In the coagulation of a negative sol the flocculating power is in the order: $Al^{3+} > Ba^{2+} > Na^{+}$
Reason: Greater the valence of the flocculating ion added, greater is its power to cause precipitation.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

Solution : -
This is Hardy-Schulze rule.

48. On the basis of data given below predict which of the following gases shows least adsorption on a definite amount of charcoal?

Gas	CO_2	SO_2	CH_4	H_2
Critical temp./K	304	630	190	33

a) CO_2 b) SO_2 c) CH_4 **d) H_2**

Solution : -
More easily liquefiable gases are adsorbed readily. Thus, H_2 gas having low critical temperature (33 K) is not easily liquified and shows least adsorption.

49. Which of the following graphs would yield a straight line?
a) x/m vs p b) log x/m vs p c) x/m vs log p **d) log x/m vs log p**

Solution : -
Equation of straight line for adsorption is $\log \frac{x}{m} = \log k + \frac{1}{n} \log p$. Thus, plot between $\log \frac{x}{m}$ vs log p gives a straight line.

50. Which of the following interfaces cannot be obtained?
a) Liquid-Liquid b) Solid-Liquid c) Liquid-Gas d) Gas-Gas