CHEMISTRY

BOOKS - GRB CHEMISTRY (HINGLISH)

SURFACE CHEMISTRY

Surface Chemistry

1. Which of the following statements about chemisorption is not applicable?

A. It involves chemical forces between adsorbent and adsorbate

B. It is irreversible in nature

C. It involves high heat of adsorption

D. It does not require activation energy

Answer: D

2. Adsorption is the phenomenon in which a substance :

    A. accumulates on the surface of the other substance

    B. goes into the body of the other substance

    C. remains close to the other substance

    D. none of these

Answer: A

3. There is desorption of physical adsorption when

A. temperature is increased

B. temperature is decreased

C. pressure is increased

D. concentration is increased

Answer: A

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4. Which of the following is not a characteristic of chemisorption?

A. It is reversible

B. It is specific

C. It is multilayer

D. Heat of adsorption is about $400kJ$

Answer: C

5. The following statements relate to the adsorption of gases on a solid surface. Identify the incorrect statement among them.

A. On adsorption, the residual forces on the surface are increased

B. On adsorption, decrease in surface energy appears as heat

C. Entropy of adsorption is negative

D. Enthaply of adsorption is negative

Answer: A

6. Finely divided catalyst has greater surface area and has greater catalytic activity than the compact solid. If a total surface area of 6291456 cm^2 is required for adsorption in a catalytic gaseous reaction, then how many splits should be made in a cube of exactly 1 cm in length to achieve required surface area?

[Given : One split of a cube gives eight cubes of same size]

   A. 60

   B. 80

   C. 20

   D. 22

Answer: C

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7. Volume of N_2 at 1 atm, 273 K required to form a monolayer on the surface of iron catalyst is $8.15 ml/gm$ of the adsorbent. What will be the surface area of the adsorbent per gram if each nitrogen molecule occupies $16 \times 10^{-22} m^2$?

[Take : $N_A = 6 \times 10^{23}$]

A. $16 \times 10^{-16} cm^2$

B. $0.35 m^2/g$

C. $39 m^2/g$

D. $22400 cm^2$

Answer: B

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8. The rate of chemisorption :

A. decreases with increase of pressure

B. increases with increase of pressure

C. is independent of pressure

D. is independent of temperature

Answer: B

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9. Softening of hard water is done using sodium aluminium silicate (zeolite) . This causes

A. adsorption of Ca^{2+} and Mg^{2+} ions of hard water replacing Na^{+} ions.

B. adsorption of Ca^{2+} and Mg^{2+} ions of hard water replacing Al^{3+} ions.

C. both (a) and (b)`

D. none of the above

Answer: A

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10. The pressure of the gas was found to decrease from 720 to 480 mm. When 5g of sample of activated charcoal was kept in a flask of one litre capacity maintained at $27°C$. If the density of charcoal is $1.25gm/mL$. The volume of gas adsorbed per gm of charcoal at 480 mm of Hg is :

A. $80.03mL$

B. $32.20mL$

C. $100.08mL$

D. $100.61mL$

Answer: D

11. Which is not purely surface phenomena?

A. Surface tension

B. Adsorption

C. Absorption

D. None of these

Answer: C

12. Soaking of water by a sponge is an example of

A. Simple adsorption

B. Physical adsorption

C. Chemisorption

D. Absorption

Answer: D

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13. The rate of physisorption increases with

A. decrease in temperature

B. increase in temperature

C. decrease in pressure

D. decrease in surface area

Answer: A

14. Adsorpton of gases on solid surface is generally exothermic because :

    A. enthalpy is positive

    B. entropy decreases

    C. entropy increases

    D. free energy increases

Answer: B

15. Which is not correct for physical adsorption ?

    A. Adsorption on solids is reversible.

B. Adsorption increases with increase in temperature.

C. Adsorption is spontaneous

D. Both enthalpy and entropy of adsorption are negative.

Answer: B

16. In Langumir's model of adosrption of a gas on a solid surface :

A. the rate of dissociation of adsorbed molecules from the surface does not depend on the surface covered

B. the adsorption at a single site on the surface may involve multiple molecules at the same time

C. the mass of gas striking a given area of surface is proportional to the pressure of the gas

D. the mass of gas striking a given area of surface is independent of the pressure of the gas

Answer: C

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17. In context with the industrial preparation of hydrogen from water gas $(CO + H_2)$, which of the following is the correct statement ?

A. CO is removed by absorption in aqueous Cu_2Cl_2 solution

B. H_2 is removed through occlusion with Pd

C. CO is oxidized to CO_2 with steam in the presence of a catalyst followed by absorption of CO_2 in alkali

D. CO and H_2 are fractionally separated using difference in their densities

Answer: C

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18. Which of the following statements is incorrect regarding physisorption?

A. More easily liquefiable gases are adsorbed readily.

B. Under high pressure it results into multi molecular layer on adsorbent surface.

C. Enthalpy of adsorption ($\Delta H_{adsorptoin}$) is low and positive.

D. It occurs because of van der Waals' forces.

Answer: C

19. Which of the following is incorrect?

A. Enthalpy (numerical value) of physisorption is greater than that of chemisorption

B. Physisorption is not very specific but chemisorption is highly specific

C. Chemisorption takes place at relatively high temperatures

D. In physisorption generally multi-molecular layers are formed on the adsorption

Answer: A

20. Which of the following gases, will be adsorbed maximum on a solid surface?

    A. CO_2

    B. O_2

    C. N_2

    D. H_2

Answer: A

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21. Which of the following relations is(are) correct according to Freundlich?

(P)x/m = constant ,

(Q) x/m = constant $\times \ p^{1/n}(n > 1)$,

(S) x/m = constant $\times \ p^n(n > 1)$

A. All are correct

B. All are wrong

C. (Q) is correct

D. (R) is correct

Answer: C

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22. The principle involved in the chromatographic operation is :

A. adsorption

B. absorption

C. partition

D. none of these

Answer: A

23. The physical adsorption of gases on the solid surface is due to :

A. van der Waal's forces

B. covalent bonding

C. hydrogen bonding

D. all of these

Answer: A

24. Which of the following interface cannot be obtained?

    A. Liquid-Liquid

    B. Solid-Liquid

    C. Liquid-Gas

    D. Gas-Gas

Answer: D

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25. Which of the following is not a favourable condition for physical adsorption?

    A. High pressure

    B. Negative ΔH

C. Higher critical temperature of adsorbate

D. High temperature

Answer: D

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26. 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

Answer: B

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27. Spontaneous adsorption of a gas on solid surface is an exothermic process because

A. enthalpy of the system increases.

B. entropy increases.

C. entropy decreases.

D. free energy change increases.

Answer: C

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28. Correct eqution of Freundlich isotherm is :

A. $\log\left(\dfrac{x}{m}\right) = \log K + \dfrac{1}{n}\log C$

B. $\log\left(\dfrac{x}{m}\right) = \log m + \dfrac{1}{m}\log C$

C. $\log\left(\dfrac{x}{m}\right) = \log C + \dfrac{1}{K}\log C$

D. $\log\left(\dfrac{x}{m}\right) = \log C + \dfrac{1}{n}\log K$

Answer: A

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29. 100 mL of 0.3 M acetic acid is shaken with 0.8 g wood charcoal. The final concentration of acetic acid in the solution after adsorption is 0.125 M. The mass of acetic acid adsorbed per gram of charcoal is :
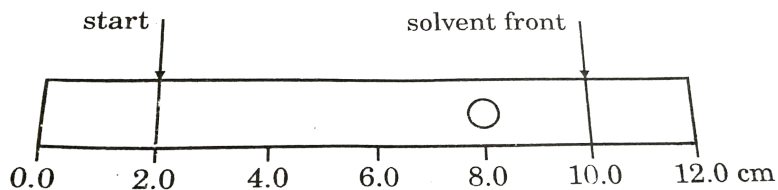
A. $1.05g$

B. $0.0131g$

C. $1.31g$

D. $0.131g$

Answer: C

30. A substance is analyzed by paper chromatography, giving the chromatogram shown.

What is the R_f value of the substance represented by the spot at 8.0 cm?

    A. 0.80

    B. 0.75

    C. 0.67

    D. 0.60

Answer: B

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31. Which of the following parameter is correct regarding adsorption of gases over solid?

A. $\Delta S_{\text{system}} > 0$

B. $\Delta S_{\text{surrounding}} > 0$

C. $\Delta G > 0$

D. $\Delta H > 0$

Answer: B

B Catalysis

1. Which one is false in the following statement?

A. A catalyst is specific in its action

B. A very small amount of the catalyst alters the rate of a

reaction

C. The number of free vacancies on the surface of the catalyst

increases on sub-division

D. Ni is used as a catalyst in the manufacture of ammonia.

Answer: D

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2. A catalyst increase rate of reaction by :

A. decreasing enthalpy

B. decreasing internal energy

C. decreasing activation energy

D. increasing activation energy

Answer: C

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3. Identify the option correctly representing True/False nature of the statements.

Statement-1: Changing the catalyst can change the final product obtained in some reaction.

Statement-2: Catalyst cannot change equilibrium constant of a reaction.

Statement-3: Lacto bacilli enzyme is responsible for curd formation from milk.

Statement-4: A promotor when taken without catalyst will always increase rate of reaction.

    A. All are true.

    B. Statement-4 is the only false statement.

    C. Statement-2 and Statement-3 are the only true statements.

    D. All are incorrect.

Answer: B

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4. A negative catalyst will :

    A. raise the energy of activation for a given reaction

    B. take away the internal energy of reactants and deactivate them

C. catalyse the backward reaction more than the forward one,

thereby shifting equilibrium backward

D. none of these

Answer: A

5. Heterogeneous catalysis is successfully explained by................

Theory.

A. Heterogeneous catalysis

B. Enzyme catalysis

C. Homogeneous catalysis

D. Acid base catalysis

Answer: A

6. Identify the correct statement regarding enzymes.

A. Enzymes are specific biological catalysts that can normally function at very high temperature (T = 1000 K).

B. Enzymes are normally heterogeneous catalysts that are very specific in action.

C. Enzymes are specific biological catalysts that cannot be poisoned.

D. Enzymes are non-biological catalysts.

Answer: B

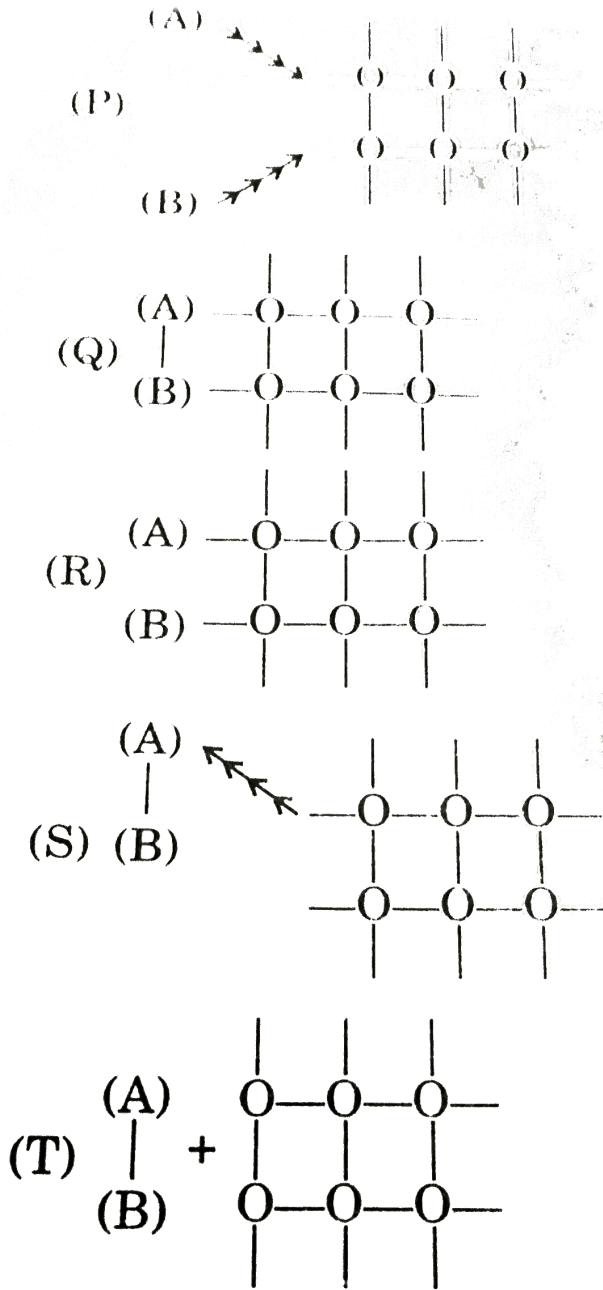**7.** Which of the following statement(s) is/are true?

  A. The concentration of a homogeneous catalyst may appear in

   the rate expression.

  B. A catalyst is always consumed in the reaction.

  C. A catalyst must always be in the same phase as the reactants.

  D. None of the above

Answer: A

8. Arrange the following diagrams in correct sequence of steps involved in the mechanism of catalysis, in accordance with modern

adsorption theory.

A. $P \rightarrow Q \rightarrow R \rightarrow S \rightarrow T$

B. $P \rightarrow R \rightarrow Q \rightarrow S \rightarrow T$

C. $P \rightarrow R \rightarrow Q \rightarrow T \rightarrow S$

D. $P \rightarrow Q \rightarrow R \rightarrow T \rightarrow S$

Answer: C

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9. Which can be used as a catalyst in an esterification reaction?

(P) NaOH (Q) H_2SO_4

A. P only

B. Q only

C. Both P and Q

D. Neither P and Q

Answer: B

10. Introduction of two drops of concentrated sulphuric acid, H_2SO_4, speeds up an esterification reaction. Introduction of a piece of platinum metal, Pt, speeds up the reaction of H_2 and O_2 gas. Which of the following statements is true?

A. Pt is a homogeneous catalyst, H_2SO_4 is a heterogeneous catalyst.

B. Pt is a heterogeneous catalyst, H_2SO_4 is a homogeneous catalyst.

C. Pt and H_2SO_4 are both heterogeneous catalysts.

D. Pt and H_2SO_4 are both homogeneous catalysts.

Answer: B

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11. Automobile catalytic converters are designed to :

    A. oxidize both CO and NO_x

    B. reduce both CO and NO_x

    C. oxidize CO and reduce NO_x

    D. reduce CO and oxidize NO_x

Answer: c

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12. Which of the following examples demonstrate homogeneous catalysis?

(P) Pt(s) catalyzing the reaction of $O_2(g)$ with CO(g)

(Q) $Cl_2(g)$ catalyzing the decomposition of $O_3(g)$

(R) $H_2O_2(aq)$ decomposition catalyzed by $Br_2(aq)$

A. P only

B. Q only

C. P and R only

D. Q and R only

Answer: D

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C Classification Of Colloids

1. The colloidal solutions of gold prepared by different methods have different colors due to :

A. different diameters of colloidal gold particles

B. variable valency of gold

C. different concentration of gold particles

D. impurities produced by different methods

Answer: A

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2. An example of intrinsic colliod (lyophilic colloids) is :

A. $As_2S_3 sol$

B. $Fe(OH)_3 sol$

C. Egg albumin

D. Au sol

Answer: C

3. Which of the following sols is positively charged?

    A. Arsenious sulphide

    B. Aluminium hydroxide

    C. Ferric hydroxide

    D. Silver iodide in silver nitrate solution

Answer: D

4. Which fo the folowing statement is not correct for a lyophobic solution?

    A. It can be easily solvated

B. It carries charges

C. The coagulation of this sol is irreversible in nature

D. It is less stable in a solvent

Answer: A

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5. which of the following statements is correct for a lyophilic solution?

A. It is not easily solvated

B. It is unstable

C. The coagulation of this sol is irreversible in nature

D. It is quite stable in a solvent

Answer: D

6. Liquid-Liquid sol is known as

A. aerosol

B. foam

C. emulsion

D. gel

Answer: C

7. The colloidal system consisting of a liquid adsorbete in a solid adsorbent is termed as:

A. aerosol

B. foam

C. emulsion

D. gel

Answer: D

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8. Which of the following statements is not correct?

A. A colloidal solution is a heterogeneous two-phase system.

B. Silver sol in water is an example of lyophilic solution.

C. Metal hydroxides in water are examples of lyophobic solution.

D. Liquid-liquid colloidal solution is not a stable system.

Answer: B

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9. A liquid is found to scatter a beam of light but leaves no residue when passed through the filter paper.

    A. a suspension

    B. oil

    C. a colloidal sol

    D. a true solution

Answer: C

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10. size of colloidal particles may range from:

    A. 1 to 1000 nm

B. 10 to 100 pm

C. 1 to 100 μm

D. 1 to 10 mm

Answer: A

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11. which of the following represents a multimolecular colloidal paricles?

A. Starch

B. A sol of gold

C. Proteins

D. Soaps

Answer: B

12. Which of the following represents macromolecular colloidal particles?

    A. Solution of gold

    B. Cellulose

    C. Soaps

    D. Synthetic detergents

Answer: B

13. Select correct statements(s).

A. Hydrophilic colloid is a colloid in which there is a strong attraction between the dispersed phase and water.

B. Hydrophobic colloid is a colloid in which there is a lack of attraction between the dispersed phase and water.

C. Hydrophobic sols are often formed when a solid crystallises rapidly from a chemical reaction or a supersaturated solution.

D. All of the above

Answer: D

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14. Which one of the following statements is false for hydrophilic sols?

A. They do not require electrolytes for stability

B. Their viscosity is of the order of that of water

C. Their surface tension is usually lower than that of dispersion

medium

D. None of the above

Answer: B

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15. Lyophilic sols are

A. irreversible sols

B. they are prepared from inorganic compound

C. coagulated by adding electrolytes

D. self-stabilizing

Answer: D

16. The volume of colloidal particles V_c as compared ot the volume of solute particles in true solution V_c could be :

    A. ~1

    B. ~10^{23}

    C. ~10^{-3}

    D. ~10^3

Answer: D

17. surface tension of lyophilic sols is

    A. lower than that of H_2O

B. more than that of H_2O

C. equal to that of H_2O

D. none of the above

Answer: A

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18. the stability of lyophilic colloids is due to

A. Charge on their particles

B. Large size of their particles

C. Small size of their particles

D. Solvation by dispersion medium

Answer: D

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19. Which one is a colloid solution?

A. NaCl

B. Urea

C. Cane sugar

D. Blood

Answer: D

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20. Fog is an example of

A. liquid dispersed in gas

B. gas dispersed in gas

C. solid dispersed in gas

D. solid dispersed in liquid

Answer: A

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21. Which one of the following is not a colloidal solution?

A. Smoke

B. Ink

C. Air

D. Blood

Answer: C

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22. Positive sol is :

A. Gold

B. gelatin

C. As_2S_3

D. none of these

Answer: B

23. Which one is a lyophobic colloid?

A. Gelatin

B. Starch

C. Sulphur sol

D. Gum arabic

Answer: C

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24. Smoke is an example of :

A. gas dispersed in liquid

B. gas dispersed in solid

C. solid dispersed in gas

D. solid dispersed in solid

Answer: C

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25. A colloid always :

   A. contains two phases

   B. is a true solution

   C. contains three phases

   D. contains only water soluble particles

Answer: A

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26. Lyophobic colloids are :

   A. reversible colloids

   B. irreversible colloids

   C. protective colloids

D. gum proteins

Answer: B

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27. The size of a colloidal particle is :

A. $> 0.1\mu$

B. $1m\mu$ to 0.1μ

C. $< 0.1\mu$

D. more than $3000m\mu$

Answer: B

28. In which of the following colloidal solution dispersed phase is liquid while dispersion medium is gas?

    A. Cloud

    B. smoke

    C. Milk

    D. Dust

Answer: A

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D Purification And Preparation Of Colloid

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1. the colloidal sols are purified by

    A. dialysis

B. peptization

C. filtration

D. oxidation

Answer: A

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2. Peptisation is :

A. conversion of a colloidal into precipitate form

B. conversion of precipitate into colloidal sol

C. conversion of metal into colloidal sol by passage of electric

current

D. conversion of colloidal sol into macromolecules

Answer: B

3. Bleeding is stopped by the application of ferric-chloride this is because:

A. the blood starts flowing in opposite direction

B. the blood reacts and forms a solid, which seals the blood vessel

C. the blood is coagulated and thus the blood vessel is sealed

D. the ferric chloride seals the blood vessel

Answer: C

4. Which of the following statements is not correct?

A. Peptization is the process by which certain substances are

converted into the colloidal state.

B. Metal sol of gold, silver and platinum can be prepared by

Bredig's arc method.

C. Impurities present in a solution makes it more stable.

D. Dialysis is a process to remove impuritites of ions and

molecules from a solution.

Answer: C

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5. A reddish brown sol (containing Fe^{3+}) is obtained by :

A. the addition of small amount of $FeCl_3$ solution to freshly

prepared $Fe(OH)_3$ precipitate

B. the addition of $Fe(OH)_3$ to freshly prepared $FeCl_3$ solution

C. the addition of NH_4OH to $FeCl_3$ solution dropwise

D. the addition of NaOH to $FeCl_3$ solution dropwise

Answer: A

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6. The stabilization of a lyophobic colloid is due to :

A. preferential adsorption of similar charged particle on colloidal surface.

B. the large electro-kinetic potential developed in the colloid.

C. the formation of a covalent bond between two phases.

D. the viscosity of the medium.

Answer: A

7. Which one of the following statements is correct?

A. Brownian movement is more pronounced for smaller particles than for bigger ones

B. Sols of metal sulphides are lyophilic

C. Schulze-Hardy law states, the bigger the size of the ion, the greater is its coagulating power

D. One would expect charcoal to adsorb hydrogen gas more strongly than chlorine.

Answer: A

8. The potential differnce between the fixed particles layer and the diffused layer having opposite charge id called :

A. water potential

B. zeta potential

C. electrode potential

D. none of these

Answer: B

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9. Peptization is a process of :

A. precipitation of colloidal particles

B. purification of colloids

C. dispersing precipitate into colloidal sols

D. movement of colloidal particles in the electrical field

Answer: C

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10. Colloidal solution of silver is prepared by :

A. Colloidal milk

B. Double decomposition method

C. Bredig's method

D. Peptization

Answer: C

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11. The fresh precipitate can be transformed in colloidal state by

A. Peptization

B. diffusion

C. coagulation

D. dialysis

Answer: A

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12. When freshly precipitated $Fe(OH)_3$ is shaken with aqueous solution of $FeCl_3$, a colloidal solution is formed. The process is known as :

A. emulsification

B. coagulation

C. peptization

D. electro-osmosis

Answer: C

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E Coagulation Protection And Application Of Colloids

1. Gold number of a lyphilic sol is such property that:

    A. that larger its value, the greater is the peptising power

    B. the lower its value, the greater is the peptising power

    C. the lower its value, the greater is the protecting power

    D. the larger its value, the greater is the protecting power

Answer: C

2. Protective sols are:

    A. lyophilic

    B. lyophobic

    C. both (a) and (b)

    D. none of (a) and (b)

Answer: A

3. For the coagulation of $200 mL$ of $As_2 S_3$ solution $10 mL$ of $1 M NaCl$ is required. What is the coagulationg value (number of

milimoles of solute needed for coagulation of 1 litre of solution) of $NaCl$.

    A. 200

    B. 100

    C. 50

    D. 25

Answer: C

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4. Which of the following ions is most effective in the coagulation of an arsenious suphide solution?

    A. K^+

    B. Mg^{2+}

C. Al^{3+}

D. Cl^-

Answer: C

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5. Which of the following ions is most effective in the coagulation of ferric hydroxide solution?

A. Cl^-

B. Br^-

C. NO_2^-

D. SO_4^{2-}

Answer: D

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6. Coagulation value of the electrolytes $AlCl_3$ and NaCl for As_2S_3 sol are 0.093 and 52 respectively. How many times $AlCl_3$ has greater coagulating power than NaCl?
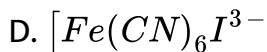
    A. 930

    B. 520

    C. 560

    D. None of these

Answer: C

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7. Which of the following anions will have minimum flocculation value for the ferric oxide solution?

A. Cl^-

B. Br^-

C. SO_4^{2-}

D. $[Fe(CN)_6I^{3-}$

Answer: B

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8. Which is an example of coagulation?

A. Curdling of milk

B. Purification of water by addition of alum

C. Formation of deltas at the river beds

D. All the three are examples of coagulation

Answer: D

9. Gold number of some lyophilic sols are :

(P) : Casein : 0.01
(Q) : Haemoglobin : 0.03
(R) : Gum arabic : 0.15
(S) : Sodium oleate : 0.40
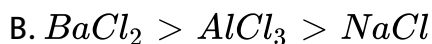
Which has maximum protective power?

A. P

B. Q

C. R

D. S

Answer: A

10. A colloidal solution is subjected to an electrical field. The particle move towards anode. The coagulation of same sol is studied using $NaCl$, $BaCl_2$ and $AlCl_3$ solutions. Their coagulating power should be

A. $NaCl > BaCl_2 > AlCl_3$

B. $BaCl_2 > AlCl_3 > NaCl$

C. $AlCl_3 > BaCl_2 > NaCl$

D. $BaCl_2 > NaCl > AlCl_3$

Answer: C

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11. Which of the following is most effective in coagulating a ferric hydroxide sol ?

A. KCl

B. KNO_2

C. K_2SO_4

D. $K_3[Fe(CN)_6]$

Answer: D

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12. Smoke has generally blue tinge. It is due to

A. Scattering of light

B. coagulation

C. Brownian motion

D. electro-osmosis

Answer: A

13. Gold number of haemoglobin is 0.03. Hence, 100 mL of gold sol will require how many mg haemoglobin so that gold is not coagulated by 1 mL of $10\,\%$ NaCl solution?

A. $0.03mg$

B. 30 mg

C. $0.30mg$

D. 3 mg

Answer: C

14. Arsenic (III) sulphide forms a sol with a negative charge. Which of the following ionic substances should be most effective in coagulating the sol?

A. KCl

B. $MgCl_2$

C. $Al_2(SO_4)_3$

D. Na_3PO_4

Answer: C

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15. Blood is purified by :

A. dialysis

B. electro-osmosis

C. coagulation

D. filtration

Answer: A

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16. Most effective ion to coagulate a negative sol is :

A. PO_4^{3-}

B. Al^{3+}

C. Ba^{2+}

D. K^+

Answer: B

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17. Identify the statement which is correct w.r.t. surface phenomenon.

A. Osmotic pressure of rubber sol will be same as that of sucrose solution having same mass mixed in same mass of H_2O

B. A gas may show physisorption at low temperature and chemisorption at higher temperatures.

C. Soap sol of sodium palmitate will be coagulated near cathode on electrophoresis.

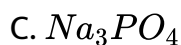D. Gold sol on mixing with starch sol causes stablisation of starch sol.

Answer: B

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18. Which of the following electrolytes is most effective in the coagulation of gold solution?

A. $NaNO_3$

B. $K_4[Fe(CN)_6]$

C. Na_3PO_4

D. $MgCl_2$
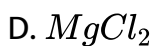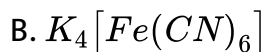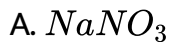
Answer: D

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19. Which of the following is property of colloid?

A. Scattering of light

B. Shown attraction

C. dialysis

D. emulsion

Answer: A

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20. An arsenious sulphide sol carries a negative charge . The maximum precipitating power for this sol is possessed by

A. K_2SO_4

B. $CaCl_2$

C. Na_3PO_4

D. $AlCl_3$

Answer: D

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21. Tyndall effect is shown by

A. sol

B. solution

C. plasma

D. precipitation

Answer: A

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22. According to Hardy Schulze rule, the power of coagulation of an

ion depends upon.............

A. $Na^+ > Ba^{2+} > Al^{3+}$

B. $Al^{3+} > Ba^{2+} > Na^+$

C. $Ba^{2+} > Al^{3+} > Na^+$

D. $Al^{3+} > Na^+ > Ba^{2+}$

Answer: B

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23. Among the electrolytes $Na_2, SO_4, CaCl_2, Al_2(SO_4)_3$ and NH_4Cl, the most effective coagulating agent for Sb_2S_3 sol is

A. Na_2SO_4

B. $CaCl_2$

C. $Al_2(SO_4)_3$

D. NH_4Cl
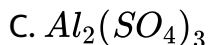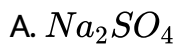
Answer: C

24. The dispersed phase in colloidal iron (III) hydroxide and collodial gold is positively and negtively charged respectively with of the following statement is not correct ?

    A. Coagulation in both sols can be brought about by electrophoresis.

    B. Mixing the sols has no effect.

    C. Sodium sulphate solution causes coagulation in both sols

    D. Magnesium chloride solution coagulates, the gold sol more readily than the iron (III) hydroxide sol.

Answer: B

25. Gold numbers of protective colloids A, B, C and D are $0.5, 0.01, 0.10$ and 0.005 respectivaly. The correct order of their protective power is

   A. $C < B < D < A$

   B. $A < C < B < D$

   C. $B < D < A < C$

   D. $D < A < C < B$

Answer: B

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26. On passing light from colloidal solution, the effect due to scattering of light is known as :

   A. electrophoresis

B. tyndall effect

C. electrosmosis

D. coagulation

Answer: B

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27. The solution in which the light is scattered by the particles is :

A. suspension

B. colloidal solution

C. true solution

D. none of these

Answer: B

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28. The charge on As_2S_3 sol is due to the adsorbed :

A. H^+

B. OH^-

C. O^{-2}

D. S^{2-}
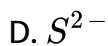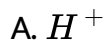
Answer: D

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29. Sky looks blue due to

A. dispersion

B. reflection

C. transmission

D. scattering

Answer: D

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30. Gold number is minimum in case of..............

A. Gelatin

B. egg albumin

C. gumarabic

D. starch

Answer: A

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31. Tyndall effect will be observed in :

A. solution

B. precipitate

C. sol

D. vapour

Answer: C

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32. The Brownian motion is due to :

A. temperature fluctuation within the liquid phase

B. attraction and repulsion between charge on the colloidal

particles

C. impact of molecules of the dispersion medium on the

  colloidal particles

D. convective current

Answer: C

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33. What happens when lyophilic sol is added to a lyophobic sol?

A. A film of lyophilic sol is formed over lyophobic sol and

  lyophobic sol is stabilized.

B. Lyophobic sol gets coagulated.

C. Lyophilic sol gets coagulated.

D. Lyophilic sol gets protected by the lyophobic sol.

Answer: A

34. Identify the statement which is incorrect w.r.t. surface phenomenon.

A. A sol, prepared by adding excess $AgNO_3$ solution in KI solution when subjected to electro-phoresis will show coagulation near

B. The conductivity of a soap solution decreases steeply at CMC.

C. Tyndall effect will be more prominent in gold solution as compared to rubber solution.

D. Extent of physisorption increases with increase in temperature initially and then decreses with temperature.

Answer: D

35. If $Fe_{OH}-(3)$ sol is subjected to electrophoresis then which of the following statements regarding coagulation will be correct?

A. No coagulation will occur at any electrode

B. coagulation will occur at cathode

C. Coagulation will occur at anode

D. Coagulation will occur at both the electrodes

Answer: B

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36. on addition of 1 ml solution of $10\% \ NaCl$ to 10 ml gold sol in the presence of 0.25g of strach, the coagulation is just prevented. Strach has the following gold number

A. 0.025

B. 0.25

C. 2.5

D. 25

Answer: D

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37. which of the following will have the highest coagulating power for As_2S_3 colloid?

A. PO_4^{3-}

B. SO_4^{2-}

C. Na^+

D. Al^{3+}

Answer: D

---

38. According to the Tyndall effect, a beam of light becomes visible when passed through all of the following except a(n) :

A. aerosol

B. colloid

C. emulsion

D. solution

Answer: D

---

39. Which of the following ions has maximum flocculation value?

A. $[Fe(CN)_6]^{4-}$

B. Cl^-

C. SO_4^{2-}

D. PO_4^{3-}
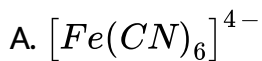
Answer: B

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40. Which of the following is a mismatch?

A. Lyophilic colloids-reversible sols

B. Associated colloids-micelles

C. Tyndall effect-scattering of light by colloidal particle

D. Electrophoresis-movement of dispersion medium under the

influence of electric field

Answer: D

---

41. Which of the following ions will be most effective in coagulating

the As_2S_3 sol?

A. Fe^{3+}

B. Ba^{2+}

C. Cl^-

D. PO_4^{3-}

Answer: A

42. (i) At 298 K the volume of NH_3 adsorbed by 1 g of charcoal is higher than that of H_2 under similar conditions.

(ii) The movement of colloidal particles towards the oppositely charged electrodes on passing current is known as Brownian movement.

If T for true and F for false then correct option is :

    A. T, T

    B. T, F

    C. F, T

    D. F, F

Answer: B

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43. Which of the following will show Tyndall effect?

A. Aqueous solution of soap below critical micelle concentration

B. Aqueous solution of soap above critical micelle concentration

C. Aqueous solution of sodium chloride

D. Aqueous solution of sugar

Answer: B

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44. Which of the following statements regarding sols is not correct?

A. Brownian movement stablises sols.

B. In a reaction, catalyst may change qualitatively as well as physically.

C. An emulsion can be broken both by heating as well as freezing.

D. On prolonged dialysis, colloids become stable.

Answer: D

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F Emulsion Micelle And Gel

1. Small liquid droplets in another liquid is called

A. suspension

B. emulsion

C. gel

D. true solution

Answer: B

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2. At CMC, the surfactant molecules :

A. decomposes

B. become completely soluble

C. associate

D. dissociate

Answer: C

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3. Some types of gels like gelatin loose water slowly . The process is known as :

A. synersis

B. thixotropy

C. peptisation

D. imbibition

Answer: A

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4. Among the following, which surfactant will form micelles in aqueous solution at the lowest molar concentration at ambient conditions?

A. $CH_3(CH_2)_{15}N^+(CH_3)_3Br^-$

B. $CH_3(CH_2)_{11}OSO_3^- Na^+$

C. $CH_3(CH_2)_6COO^- Na^+$

D. $CH_3(CH_2)_{11}N^+(CH_3)Br^-$
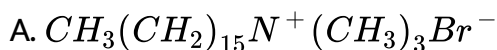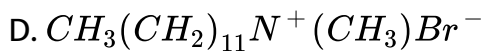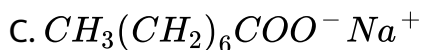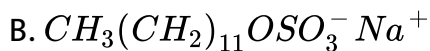
Answer: A

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5. Compared to common colloidal sols milcells have:

A. higher colligative properties

B. lower colligative properties

C. same colligative properties

D. None of these

Answer: B

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6. Milk is an example of :

    A. true solution

    B. gel

    C. suspension

    D. emulsion

Answer: D

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7. Which is the correct statement in case of milk?

    A. Milk is an emulsion of fat in water

    B. Milk is an emulsion of protein in water

C. Milk is stabilized by protein

D. Milk is stablilized by fat

Answer: A

8. Which of the following statement regarding micelle is incorrect?

A. It is formed at a certain minimum concentration known as

CMC.

B. It contains a charged terminal, either positive or negative.

C. On dilution, a micelle turns into normal solution.

D. It is formed below Kraft temperature.

Answer: D

1. Assertion: All colloidal dispersions give very low ormotic pressure and show very small freezing point depression or boiling point elevation.

Reason: Tyndall effect is due to scattering of light from the surface of colloidal particles.

    A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

    B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

    C. Statement-1 isTrue, Statement-2 is False.

    D. Statement-1 is False, Statement-2 is True.

Answer: B

2. Assertion: The Brownian movement is due to the bombardment on colloidal particle by the molecules of dispersion midium which are in the constant motion like molecules in a gas.

Reason: Brownian movement provides a visible proof of the random kinetic motion of molecules in a liquid.

   A. Statement-1 is True, Statement-2 is True, Statement-2 is a

   correct explanation for Statement-1.

   B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a

   correct explanation for Statement-1.

   C. Statement-1 isTrue, Statement-2 is False.

   D. Statement-1 is False, Statement-2 is True.

Answer: B

3. Statement- 1: In the coagulation of negatively charged arsenic sulphide sol, the coagulating power decreases in the order $Al^{3+} > Ba^{2+} > Na^{+}$.

Statement- 2: Generally greater the valency of coagulating ion, the greater is its power of coagulation.

    A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

    B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

    C. Statement-1 isTrue, Statement-2 is False.

    D. Statement-1 is False, Statement-2 is True.

Answer: A

4. Assertion: Gold number is the measure of protective powers of differents colloids.

Reason: The smaller the gold number of lyophilic colloid, the smaller is its protective power.

    A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

    B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

    C. Statement-1 isTrue, Statement-2 is False.

    D. Statement-1 is False, Statement-2 is True.

Answer: C

5. Assertion: The property of adsorption is shown by solids to a much larger extent than liquids.

Reason: Solids, particularly when finely divided, have a large surface area.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 isTrue, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

6. Assertion: Aquenous gold colloidal solution is red in colour.

Reason: The colour ariesedue to scattering of light by colloidal gold particles.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 isTrue, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

7. Assertion: Isoelectric point is pH at which colloidal can move towards either of electrode.

Reason: At isoelectric point coolidal particles becomes electrically netural .

    A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

    B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

    C. Statement-1 isTrue, Statement-2 is False.

    D. Statement-1 is False, Statement-2 is True.

Answer: D

8. Assertion: A gas with higher critical temperature gets adsorbed to more extent than a gas with lower critical temperature.

Reason: The easily liquefiable gases get adsorbed to more extent which have higher critical temperature.

    A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

    B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

    C. Statement-1 isTrue, Statement-2 is False.

    D. Statement-1 is False, Statement-2 is True.

Answer: B

9. Assertion: When $AgNO_3$ is treated with excess of Kl, colloidal particles gets attracted towards anode.

Reason: Colloidal particles adsorb common ions and thus becomes charged.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 isTrue, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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10. Assertion: Colloidal solution exhibit Tyndall effect while true solution particles.

Reason: Because the size of the colloidal particles is large enough to scatter light as compared to size of the true solution particles.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 isTrue, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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11. Assertion: Physisorption of molecules occures on surface only.

Reason: in this process, the bonds of the adsorbed molecules are broken.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 isTrue, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

12. Assertion: Medicines in the colloidal state are more effective.

Reason: In the colloidal state, the medicine are easily assimilated by the body.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 isTrue, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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13. Assertion: Tetraethyl lead minimizes the knocking effect when mixed with petrol.

Reason: Because tetraethyl lead acts as a `-Ve catalyst.

    A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

    B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

    C. Statement-1 isTrue, Statement-2 is False.

    D. Statement-1 is False, Statement-2 is True.

Answer: A

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14. Assertion: In physisorption, adsorption increase with increases in temperature.

Reason: Physisorpation is of exothermic nature.

    A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

    B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

    C. Statement-1 isTrue, Statement-2 is False.

    D. Statement-1 is False, Statement-2 is True.

Answer: D

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Multiple Objective Type

1. Which of the following statement(s) is/are correct?

A. The elevation in boiling point of an alcoholic solution of sulphur is more than that of its sol in water if mass of sulphur present per unit volume of mixture is same in both cases.

B. CMC value of $CH_3(CH_2)_9NH_2Cl$ will be less than that of $CH_3(CH_2)_6COONa$.

C. The graph of log (x/m) versus log P as per Freundlich theory will be a straight line having constant slope throughout.

D. CO(g) can displace adsorbed $O_2(g)$ from surface of an adsorbent showing physisorption.

Answer: A::B::D

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2. From the following options select the options which are correct with respect the adsorption.

A. The "y-intercept" of log x/m versus log P as per Freundlich theroy is greater for O_2 as compared to H_2 at same temperature.

B. Adsorption of gas on a solid is an enthalpy driven process.

C. Decrease in pressure cause desorption in case of chemisorptions.

D. Adsorption isobars keeps on decreasing with increase in temperature if there is only Vander Waal's interactions between adsorbent and adsorbate.

Answer: A::B::D

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3. Which of the following options is/are correct regarding catalytic action?

A. Conversion of proteins into amino acids by hydrolysis in intestines is catalysed by enzyme pancreatic trypsin.

B. In case of fever the activity of biochemical catalyst gets adversely affected.

C. Catalyst cannot change the final product obtained in the reaction.

D. Zeolites are shapes selective catalysts.

Answer: A::B::D

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4. Identify the statement(s) which is not correct with respect to surface penomenon.

A. If on adding electrolyte in an emulsion conductivity decreases then it will be an oil in water emulsion.

B. Tyndall effect is observed when refractive indices of the dispersed phase and the dispersion medium differ greatly in magnitude.

C. Macromolecular colloids are generally lyophobic in nature.

D. Gases which can react with the adsorbents generally show chemisorption.

Answer: A::B::C

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5. Which of the following options is/are true w.r.t. surface phenomenon?

A. At extremely low pressures, graph of $\log \dfrac{x}{m}$ versus log P for adsorption of gases over a solid will have unit slope.

B. On mixing 100 ml of 0.1 M NaCl solution to 200 ml of 0.02 M $Pb(NO_3)_2$ solution, a negatively charged sol will be obtained.

C. On adding invertase to an aqueous solution of cane sugar the rate of inversion of specific optical rotation of the solution increases.

D. Metal sulphide sols are reversible sols.

Answer: A::B::C

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6. Which of the option(s) regarding true/false nature of the statement is/are correct?

S-1 : Out of all colligative properties, osmotic pressure is easisest to determine experimentally.

S-2 : Chemisorption is a multilayer process.

S-3 : Solubility of gases in water increases with increase in temperature.

S-4 : Addition of NaCl can cause coagulation in both +vely charged and -vely charged sols.

S-5 : Enzyme catalysed reactions are elementary reactions.

S-6 : For the same atomic radius, the density of an element will be greater for BCC lattice than FCC lattice.

    A. There are more false statements than true statements

    B. S-3 and S-5 are false statements

    C. S-1 and S-4 are the only true statements

    D. Only S-1 is a true statement

Answer: A::B::C

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7. Which of the following options are correctly matched?

    A. Smoke : Aerosol : Soap lather : Foam

    B. Mist : Aerosol , Milk : Emulsion

    C. Gem stones : Solid sol, Pumice stone : Solid foam

    D. Butter : Gel , Cell fluids : Sol

Answer: A::B::C::D

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8. Which of the following options is / are correct with respect to catalysis / catalyst?

A. Zeolites acts as good shape-selective catalyst because of their honeycomb-like structure.

B. The modern adsorption theory for heterogeneous catalysts can explain action of catalytic promoters and catalytic poisons.

C. Catalytic action is highly selective.

D. Mixture of enzyme catalyst in water will show Tyndall effect.

Answer: A::C

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9. Identify the option(s) which is/are incorrect with respect to adsorption.

A. During adsorption there will be an increase in residual forces on the molecules.

B. The extent of adsorption per unit mass of adsorbent will remain same even on changing surface are of same mass of adsorbent.

C. When equilibrium is attained in adsorption then due to adsorption of gas at equilibrium, entropy of system and entropy of surrounding both increase by the same amount.

D. Adsorption of gas on a solid surface is an entropy driven process.

Answer: A::B::C::D

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10. Identify the statements which are not correct.

A. Soap sol of sodium palmitate will be coagulated near cathode on electrophoresis.

B. If on adding electrolyte in an emulsion conductivity decreases it should be an oil in water emulsion.

C. Macromolecular colloids are generally lyophilic.

D. A promotor when taken without catalyst cannot change rate of reaction.

Answer: A::B

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11. Which of the following statements is not correct?

A. Muddy water can be coagulated more effectively by alum as compared to NaCl.

B. Surface tension of lyophilic colloids is less than that of the dispersion medium.

C. When excess $AgNO_3$ solution is added to KI sol and the resultant colloidal state is subjected to electrophoresis, coagulation will be observed near anode.

D. Ferrimagnetic substances on heating show paramagnetic behaviour.

Answer: C

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12. Which of the following options is/are correct regarding catalytic action?

A. Conversion of proteins into amino acids by hydrolysis in intestines is catalysed by enzyme pancreatic trypsin.

B. In case of fever the activity of biochemical catalyst gets adversely affected.

C. Catalyst cannot change the final product obtained in the reaction.

D. Zeolites are shapes selective catalysts.

Answer: A::B::D

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13. Identify the statement(s) which is not correct with respect to surface penomenon.

A. If on adding electrolyte in an emulsion conductivity decreases then it will be an oil in water emulsion.

B. Tyndall effect is observed when refractive indices of the dispersed phase and the dispersion medium differ greatly in magnitude.

C. Macromolecular colloids are generally lyophobic in nature.

D. Gases which can react with the adsorbents generally show chemisorption.

Answer: A::B::C

14. Sodium palmitate is a major constituent in soap. When an aqueous solution of sodium palmitate having 1 kg of solvent is analysed for its boiling point, following data is obtained.

Moles	Boiling Point
0	100° C
0.02	100.0372° C
0.04	100.0744° C
0.05	100.093° C
0.06	100.1° C
0.08	100.12° C

Identify the option(s) which is/are correct.

A. Aqueous mixture of sodium palmitate having concentration equal to 0.07 M will be heterogeneous.

B. The CMC value of sodium palmitate should be less than 0.06M.

C. Osmotic pressure at 0.08 M at 300 K will be 1.9704 atm.

D. At 0.4 M concentration, the solution is homogeneous.

Answer: A::B

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15. Which of the following reactions can result in formation of a colloidal solution?

A. Reduction of $SO_2(g)$ with H_2S to give sulphur and water.

B. Reduction of $AuCl_3$ with HCHO in presence of water.

C. Hydrolysis of $FeCl_3$ in presence of NaOH.

D. Hydrolysis of ester in presence of acid.

Answer: A::B::C

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16. Which of the following methods to prepare sol, the colloidal particles will be negatively charged?

A.

$$100ml \quad 2 \times 10^{-6}M - AgNO_3 + 100ml \quad \text{of} \quad 4 \times 10^{-5}M - KI$$

B. Addition of little KOH in freshly prepared precipitate of

$Al(OH)_3$.

C. Addition of little HCl in freshly prepared precipitate of

$Al(OH)_3$.

D. Gold sol by Bredig-Arc method.

Answer: A::B::D

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17. Which of the following is (are) lyophobic colloids?

A. Gold sol

B. $As_2S_3 sol$

C. Starch sol

D. $Fe(OH)_3$ sol

Answer: A::B::D

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18. Which of the following are correctly matched?

A. Butter-gel

B. Milk-emulsion

C. Fog-aerosol

D. Dust-solid sol

Answer: A::B::C

19. Which is not correct for physical adsorption ?

A. It is usually monolayer

B. It is reversible in nature

C. It involves van der Waals' interactions between adsorption and adsorbate

D. It involves smaller enthalpy of adsorption as compared to chemisorption

Answer: B::C::D

20. Which of the following statements regarding adsorption is/are correct?

A. Extent of adsorption of gases on charcoal increases with increase in pressure of the gas.

B. Extent of adsorption is independent of temperature.

C. Extent of chemisorption by a given mass of adsorbent is limited.

D. Extent of adsorption is dependent on the nature of adsorbent.

Answer: A::C::D

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21. Which of the following is not a characteristic of chemisorption?

A. It is irreversible

B. It is specific

C. It is multilayer phenomenon

D. Heat of adsorption is about - 400 kJ

Answer: A::B::D

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22. The diameter of colloidal particle is of the order

A. $10^{-3}m$

B. $10^{-6}m$

C. $10^{-15}m$

D. $10^{-7}m$

Answer: B::D

23. Which of the following colloidal solutions contain negatively charged colloidal particles?

A. $Fe(OH)_3$ sol

B. As_2S_3 sol

C. Blood

D. Gold sol

Answer: B::C::D

24. Which of the following are examples of aerosols?

A. Whipped cream

B. Cloud

C. Fog

D. Soap lather

Answer: B::C

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25. Which of the following statements are true for physisoption?

A. Extent of adsortption increases with increase in pressure.

B. It needs activation energy.

C. It can be reversed easily.

D. It occurs at high temperature.

Answer: A::C

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26. Which of the following are hydrophobic sols?

A. Protein sol

B. Gold sol

C. Gum sol

D. $Fe(OH)_3$ sol

Answer: B::D

27. If Cl_2 gas is enclosed in presence of powdered charcoal in a closed vessel, the pressure of the gas decreases. It is because :

A. the gas molecules are absorbed at the surface

B. the gas molecules concentrate at the surface of the charcoal

C. the gas molecules are adsorbed at the surface

D. the gas molecules are desorbed by the surface

Answer: B::C

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28. When negatively charged colloids like As_2S_3 sol is added to positively charged $Fe(OH)_3$ sol in suitable amounts :

A. both the sols are precipitated simultaneously.

B. the process is called mutual coagulation.

C. they become positively charged colloids.

D. They become negatively charged colloids.

Answer: A::B

29. Which of the following are incorrect statements?

    A. Hardy Schulze rule is related to coagulation.

    B. Brownian movement and Tyndall effect are the characteristics

       of colloids.

    C. In gel, the liquid is dispersed in liquid.

    D. Higher the gold number, more is the protective power of

       lyophilic sols.

Answer: C::D

30. Which of the following are multimolecular colloids?

A. Sulphur sol

B. Egg albumin in water

C. Gold sol

D. Soap solution

Answer: A::C

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31. The origin of charge on colloidal solution is :

A. Self dissociation (in soaps and detergents)

B. Electron capture during Bredig's arc method

C. Selective adsorption of ion on their surface

D. It is due to addition of protective colloids

Answer: A::B::C

32. Which of the following are based on Tyndall effect?

A. Tail of comets

B. Deltas

C. Blue colour of sky

D. Coagulation

Answer: A::C

33. The correct statement(s) pertaining to the adsorption of a gas on a solid surface is (are) :

A. Adsorption is always exothermic.

B. Physisorption may transform into chemisorption at high temperature.

C. Physisorption increases with increasing temperature but chemisorption decreases with increasing temperature.

D. Chemisorption is more exothermic than physisorption, however it is very slow due to higher energy of activation.

Answer: A::B::D

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34. The size of colloidal particles is :

A. $1 - 10Å$

B. $20 - 50Å$

C. $10 - 10000Å$

D. $1 - 200$Å

Answer: B

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35. Which of the following statements is/are correct?

A. The efficiency of a heterogeneous catalyst depends upon its surface area.

B. Catalyst operates by providing alternate path for the reaction that involves a lower activation energy.

C. Catalyst lowers the energy of activation of the forward direction without affecting the energy of activation of the backward direction.

D. Catalyst does not affect the overall enthalpy change of the reaction.

Answer: A::B::D

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36. Choose the correct statement(s).

A. When the reactants and the catalyst are in the same phase (i.e, liquid or gas), the process is said to homogeneous catalysis.

B. Oxidation of Na_2SO_3 in presence of Na_3AsO_3 in excess of air is an example of induced catalysis.

C. Ester hydrolysis (in acidic medium) is slow in the beginning and becomes faster after some time.

D. (Metal ions) when weakly bonded to enzyme molecules decrease their catalytic activity.

Answer: A::B::C

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Comprehension Type

1. Specific surface area of a solid adsorbent is the surface area of the unit mass of the adsorbent. For any adsorbent, the specific surface area may be increased by taking the adsorbent in powdered form or by increasing the pores in the solid.

If unit mass of a solid, taken as cube of volume 8 cm^3, is powdered into identical 10^{12} cubes, then the specific surface area of the solid increased by :

A. 10^{12} times

B. 10^8 times

C. 10^4 times

D. 10^{-8} times

Answer: C

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2. Specific surface area of a solid adsorbent is the surface area of the unit mass of the adsorbent. For any adsorbent, the specific surface area may be increased by taking the adsorbent in powdered form or by increasing the pores in the solid.

$112cm^3$ hydrogen gas is adsorbed uniformly at the surface of 5 gm palladium at $273°C$ and 2 atm. If the effective surface area of each hydrogen molecule is $0.4nm^2$, then the specific surface area of palladium is : [Take : $N_A = 6x10^{23}$]

A. $1.2 \times 10^7 cm^2/gm$

B. $2.4 \times 10^6 cm^2/gm$

C. $6.0 \times 10^7 cm^2/gm$

D. $0.6 \times 10^6 cm^2/gm$

Answer: B

3. Whenever a mixture of gases is allowed to come in contact with a particular adsorbent under the same conditions, the more strong adsorbate is adsorbed to greater extent irrespective of its amount present, e.g., H_2O is adsorbed to more extent on silica gel than N_2 and O_2. This shows that some adsorbates are preferentially adsorbed. It is also observed that preferentially adsorbable adsorbent can displace a weakly adsorbed substance from the surface of an adsorbent. Preferential adsorption depends on

strength of attraction, surface area, polar nature and other factors. Which of the following isomer of C_6H_{14} is adsorbed to maximum extent?

A. Normal hexane

B. Neo-hexane

C. Iso-hexane

D. 3-Methyl pentane

Answer: A

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A. HCl

B. N_2

C. CH_4

D. H_2

Answer: A

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A. extent of adsorption increases

B. extent of adsorption decreases

C. no effect on adsorption

D. extent of adsorption first decreases, then increases

Answer: A

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6. When a solution of palmitic acid (Mol. Mass = 256) in benzene containing 5.12 gm of acid/lit. is dropped on water surface, the benzene evaporates and the acid forms a monolayer film. The area covered by one molecule of palmitic acid is $1.54nm^2$. Assuming each molecule of palmitic acid to be a sphere, answer the question that follow. $\left[N_A = 6 \times 10^{23}\right]$

What is the approx density of each molecule of palmitic acid?

A. $0.3gm/ml$

B. $0.4gm/ml$

C. $0.5gm/ml$

D. $1gm/ml$

Answer: A

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7. When a solution of palmitic acid (Mol. Mass = 256) in benzene containing 5.12 gm of acid/lit. is dropped on water surface, the benzene evaporates and the acid forms a monolayer film. The area covered by one molecule of palmitic acid is $1.54nm^2$. Assuming each molecule of palmitic acid to be a sphere, answer the question that follow. $\left[N_A = 6 \times 10^{23}\right]$

What volume of solution must be dropped on the water surface in order to cover a surface area of $1848cm^2$?

A. $10^{-2}lit.$

B. $10^{-5}ml$

C. $10^{-2}ml$

D. $10^{-4}lit.$

Answer: C

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8. Many lyophilic sols and few lyophobic sols when coagulated under some special conditions changes into semi rigid mass, enclosing whole amount of liquid within of liquid within itself, it is called gel and the process is called gelation. Gelatin, agar-agar, gum-Arabic can be converted into gels by cooling them under moderate concentration conditions. Hydrophobic sols like silicic acid. $Al(OH)_3$ are prepared by double decomposition and exchanged of solvent method.

Types of gel :

1. Syneresis/weeping of gel : The spontaneous liberation of liquid from a gel is called syneresis or weeping of gels. It is reverse of swelling.

e.g., geletin, agar-agar show syneresis at low concentration while silicic shows it at high concentration.

2. Imbibition or swelling of gel : When gel is kept in a suitable liquid (water) it absorb large volume of liquid. The phenomenon is called imbibition or sweeling of gel.

3. Thixotropic : Some gels when shaken to form a sol, on keeping changes into gel are termed as thixotropic gel and phenomenon is called thixotropy.

e.g., gelatin and silica liquify on shaking changing into corresponding sol and the sol on keeping changes back into gel.

Which of the following is used to adsorb water?

    A. silica gel

    B. Calcium acetate

    C. Hair gel

    D. Chesse

Answer: A

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The process of imbibing water when elastic gel are placed in water is called :

   A. imbibation

   B. synerisis

   C. coagulation

   D. thixotropy

Answer: A

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Some types of gels like gelatin and silica liquify on shaking thereby changing into sols. The sols on standing change back into gels. This process is know as :

A. syneresis

B. thixotropy

C. double decomposition

D. peptization

Answer: B

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11. The clouds consist of charged particles of water dispersed in air. Some of them are +vely charged, other are -vely charged. When +vely charged clouds come closer they cause lightening and thundering whereas when +ve and -ve charged colloid come closer they cause heavy rain by aggregation of minute particles. It is possible to cause artificial rain by throwing electrified sand or silver iodic from an aeroplane and thus coagulating the mist hanging in air.

Smoke screen is a cloud of smoke used to hide military, naval police etc. It consists of fine particles of TiO_2.

When excess of $AgNO_3$ is treated with KI solution, AgI forms :

    A. $+ve$ charged sol

    B. $-ve$ charged sol

    C. neutral sol

    D. true sol

Answer: A

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Smoke screen is a cloud of smoke used to hide military, naval police etc. It consists of fine particles of TiO_2.

AgI helps in artificial rain because :

A. it helps in ionisation of water

B. it help in dispersion process

C. it help in coagulation

D. all of the above

Answer: C

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Smoke screen is a cloud of smoke used to hide military, naval police

etc. It consists of fine particles of TiO_2.

Smoke screens consist of :

   A. fine particles of TiO_2 dispersed in air by aeroplanes

   B. fine particles of AgI dispersed in air by aeroplanes

   C. fine particles of Al_2O_3 dispersed in air by aeroplanes.

   D. none of the above

Answer: A

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14. The colloidal particles are electrically charged as a indicated by their migration towards cathode or anode under the applied electric field. In a particular colloidal system, all particles carry either positive charge or negative charge.

The electric charge on colloidal particles orginate in several ways.

According to preferential adsorption theory, the freshly obtained precipitate particles adsorb ions from the dispersion medium, which are common to their lattice and acquire the charge of adsorbed ions. For example, For example, freshly obtained $Fe(OH)_3$ precipitated is dispersed, by a little $FeCl_3$, into colloidal solution owing to the adsorption of Fe^{3+} ions in preference. Thus sol particles will be positively charged.

In some cases the colloidal particles are aggregates of cations or anions having ampiphilic character. When the ions posses hydrophobic part (hydrocarbon end) as well as hydrophilic part (polar end group), they undergo association in aqueous solution to form particles having colloidal size. The formation of such particles, called micelles plays a very important role in the solubilization of water insoluble substances, (hydrocarbon, oils, fats, grease etc.). In micelles, the polar end groups are directed towards water and the hydrocarbon ends into the centre. The charge on sol particles of proteins depends on the pH. At low pH, the basic group of protein molecule is ionized (protonated) and at higher pH (alkaline

medium), the acidic group is ionized. At isoelectric pH, characteristic to the protein, both basix and acidic groups are equally ionized. The stability of colloidal solution is attributed largely to the electric charge of the dispersed particles. This charge causes them to be coagulated or precipitated. On addition of small amount of electrolytes, the ions carrying oppiste charge are adsorbed by sol particles resulting in the neutralization of their charge. When the sol particles either with no charge or reduced charge, come closer due to Brownian movement, they coalesce to form bigger particles resulting in their separation from the dispersion medium. This is what is called coagulating or precipitation of the colloidal solution. The coagulating power of the effective ion, which depend on its charge, is expressed in terms of its coagulating value, defined as its minimum concentration (m mol/L) needed to precipitate a given sol.

A gelatin sol at pH less than the isoelectric value is subjected to an electric field. The sol particles migrate toward :

A. anode

B. cathode

C. both anode and cathode

D. neither anode nor cathode

Answer: B

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Which of the following ions would have the minimum coagulating value for sol obtained on peptizing $Sn(OH)_4$ by little NaOH solution?

A. Cl^-

B. SO_4^{2-}

C. K^+

D. Ba^{2+}

Answer: D

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How would you obtain a sol of AgI, the particles of which migrate towards cathode under the electric field?

A. By adding little excess of KI to $AgNO_3$ solution

B. By adding little excess of $AgNO_3$ to KI solution

C. By mixing equal volumes of 0.010 M $AgNO_3$ and 0.010 M KI

D. None of the above

Answer: B

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When 9.0 ml of arsenious sulphide sol and 1.0 ml of $1.0 \times 10^{-4} MBaCl_2$ are mixed, turbidity due to precipitation just appears after 2 hours. The effective ion and its coagulating value are respectively :

A. Cl^- $10m$ mol$/L$

B. Cl^- $20m$ mol$/L$

C. Ba^{2+}, $10m$ mol$/L$

D. Ba^{2+}, $20m$ mol$/L$

Answer: C

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100 ml each of two sols of AgI, one obtained by adding $AgNO_3$ to slight excess of KI and another obtained by adding KI to slight excess of $AgNO_3$, are mixed together. Then :

A. The two sols will stabilize each other

B. The sol particles will acquire more electric charge

C. The sols will coagulate each other mutually

D. A true solution will be obtained

Answer: C

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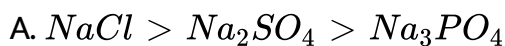
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its coagulating value, defined as its minimum concentration (m

mol/L) needed to precipitate a given sol.

Under the influence of an electric field, the particles in a sol migrate

towards cathode. The coagulation of the same sol is studied using

NaCl, Na_2SO_4 and Na_3PO_4 solutions. Their coagulating values will

be in the order :

A. $NaCl > Na_2SO_4 > Na_3PO_4$

B. $Na_2SO_4 > Na_3PO_4 > NaCl$

C. $Na_3PO_4 > Na_2SO_4 > NaCl$

D. $Na_2SO_4 > NaCl > Na_3PO_4$

Answer: A

20. How many of the following statements are correct?

(a) Delta at the mouth of a river is formed due to the coagulation of the colloidal sea water by the electrolytes present in the river water.

(b) Artifical rain is caused by the coagulation of colloidal water droplets in the clouds by an electrolyte.

(c) Cotrell precipitator is used in the precipitation of the colloidal waste in the sewage water.

(d) Cheese is an example of solid foam.

(e) A colloid formed by adding small amount of $AgNO_3$ to KI solution is negatively charged.

(f) Micelles are formed only below the Kraft temperature (T_k)

(g) Mixing of hydrated ferric oxide sol and arsenious sulphide sol bring them in precipitated form.

(h) An oil in water emulsion can be diluted by addition of water.

(i) Emulsions show Brownian motion and Tyndall effect.

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1. Match column-I with column-II :

Column-I (Type of Reaction)		Column-II (Enzyme catalysed)	
(a)	Starch → Maltose	(p)	Urease
(b)	Sucrose → Glucose and fructose	(q)	Diastase
(c)	Urea → Ammonia and CO_2	(r)	Zymase
(d)	Glucose → Ethyl alcohol and CO_2	(s)	Invertase

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2. Match column-I with column-II :

Column-I		Column-II	
(a)	Coagulation	(p)	Scattering of light
(b)	Dialysis	(q)	Formation of colloidal solution from precipitates
(c)	Peptization	(r)	Purification of colloids
(d)	Tyndall effect	(s)	Accumulation of colloidal sols

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3. Match column-I with column-II :

	Column-I		Column-II
(a)	Mechanical property of colloidal	(p)	Dialysis
(b)	Purification	(q)	Peptization
(c)	Gold number	(r)	Brownian movement
(d)	Formation of a sol	(s)	Protection

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4. Match column-I with column-II :

	Column-I		Column-II
(a)	Gold sol	(p)	Bredig's Arc method
(b)	Purification of colloidal solution	(q)	Negatively charged
(c)	As_2S_3 sol	(r)	Ultra centrifugation
(d)	Zeta potential	(s)	Electro kinetic potential
(e)	Casein	(t)	Double decomposition reaction
		(u)	Protective colloid

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5. Match column-I with column-II :

Column-I		Column-II	
(a)	Tyndall effect	(p)	Zig-zag motion
(b)	Brownian movement	(q)	Sky is blue
(c)	Electrophoresis	(r)	Coagulation of colloids
(d)	Hardy Schulze rule	(s)	Charge on colloidal solution
(e)	Froth floatation	(t)	Emulsion of pine oil
		(u)	Gold number

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6. Match column-I with column-II :

Column-I		Column-II	
(a)	Protective colloid	(p)	$FeCl_3 + NaOH$
(b)	Liquid-liquid colloid	(q)	Lyophilic colloids
(c)	Positively charged colloid	(r)	Emulsion
(d)	Negatively charged colloid	(s)	$FeCl_3$ + hot water

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7. Match column-I with column-II :

Column-I		Column-II
(a) H_2 gas adsorption on Raney's Ni at low T	(p)	Exothermic
(b) H_2 gas adsorption on Raney's Ni at high T	(q)	Endothermic
(c) Decomposition of NH_3 on Pt-surface	(r)	Spontaneous process
(d) O_2 gas adsorption on activated charcoal	(s)	Follows zero order kinetics at high pressure
	(t)	Increase in system entropy

8. Match column-I with column-II :

Column-I		Column-II
(a) These are obtained from organic material such as starch, gum, etc.	(p)	Emulsifying agent
(b) Dispersed phase has little affinity for the dispersion medium	(q)	Electrophoresis

(c)	Fe(OH)$_3$ sol is attracted towards the negative plate when an electric field is applied	(r) Lyophobic sol
(d)	The protein casein in milk stabilised the butter fat in water	(s) Lyophilic sol

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1. In a particular case of physisorption, magnitude of enthalpy change and entropy change were observed to be 28 kJ/mole and 100 J/mole-K. Calculate the minimum temperature (in $.^{\circ}C$) above which physisorption will become non spontaneous.

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2. Molecular formula of starch can be represented as $(C_6H_{10}O_5)_n$. If the gold number of one such starch molecule is 6.48 and 0.01

millimoles of the above starch are required to be added to 10 ml of gold sol to prevent coagulation by 1 ml of 10% sodium chloride solution, then calculate the value of n.

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3. On addition of $1 mL$ solution of $10\% NaCl$ to $10mL$ gold sol in the presence of $0.0250g$ of starch, the coagulation is just prevented. What is the gold number of starch?

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4. Calculate the number of sols which are negatively charged.

$Fe_3O_3 \cdot xH_2O$ sol	Sb_2S_3 sol
Ag sol	Cu sol
blood	basic dye
sol of clay	sol of starch
sol of sodium stearate	sol of sodium laurysulphate
sol of charcoal	

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5. Calculate coagulation value of $AlCl_3$ if for coagulation of 400 ml of a gold sol, 427.2 milli-grams of $AlCl_3$ is required.

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6. At a temperature of 180 K, O_2 gas adsorbs on Pt surface following Freundlich adsorption isotherm. Following experimental data is obtained.

P (bar)	2.5	10	81
x/m	0.15	0.3	0.8538

where P is partial pressure of gas and x/m is mass of gas adsorbed per gm of platinum. Calculate millimoles of O_2 adsorbed per gm of platinum at 4 bar pressure and 180 K.

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7. For the coagulation of $100 mL$ of arsenious sulphite sol, $5 mL$ of $1 M NaCl$ is required. What is the flocculaton value of $NaCl$?

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8. In order to cause coagulation of 200 ml of gold sol, 585 ml 1% w/w NaCl solution having density 1.2 gm/ml was required. What will

be the coagulation value of NaCl?

(Express answer in milli-moles/litre)

9. $6.84 gm\, Al_2(SO_4)_3$ is needed to coagulate 2.5 L of As_2S_3 sol completely in 2.0 hrs. The coagulation value of $Al_2(SO_4)_3$ is :

10. A container contains 1 litre, 2 M solution of cyclobutane in either. A piece of 3 kg charcoal is dipped in the solution. Molecules of cyclobutane get adsorbed on the surface of charcoal and form monolyer cyclobutane. The molarity of resulting solution decreases to 1 M. If surface area availble for adsorption on charcoal $2cm^2/gm$. Then find distance (in pm) between two adjacent carbon atoms in a cyclobutane molecule.

(Assume: Shape of cyclobutane molecules as a perfect square.) [Use
: $N_A = 6 \times 10^{23}$]

11. In a vessel O_2 gas molecules were adsorbed on solid surface causing its partial pressure to decrease from 1 atm to 0.5 atm.

Given : $N_A = 6 \times 10^{23}$, Volume of vessel = 2.24 L Temperature = 273 K, Total area of solid surface $= 10^2 cm^2$

Number of active sites per unit area $= 10^{24} m^{-2}$ Find number of O_2 molecules adsorbed per active site.

12. Count the number of correct statements.

(a) Minimum potential required for electrophoresis is called zeta potential

(b) Tyndall effect increases with increase in difference in size of particle and wavelength of light used.

(c) Minimum amount of electrolyte in millimoles per 100 ml required to cause precipitate in two hours is called coagulating value.

(d) Zeolites are shape-selective catalyst.

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13. How many of the following may cause coagulation in colloidal solutions?

(a) Tanning

(b) Dialysis

(c) Cataphoresis

(d) Mixing of a lyophilic sol with a lyophobic sol

(e) Mixing of two lyophobic sols

(f) Mixing sol-I ($AgNO_3$ with excess KI) and sol-II (KI with excess

$AgNO_3$)

(g) Addition of alcohol to a hydrophilic sol followed by addition of small quantity of electrolyte

(h) Centrifuging

(i) Freezing