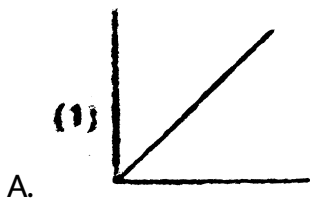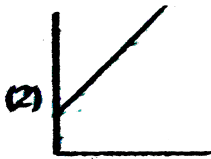# CHEMISTRY

## PHYSICAL, INORGANIC, AND ORGANIC CHEMISTRY

## SURFACE CHEMISTRY
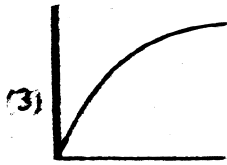
**Physical Chemitry Surface Chemistry**

**1.** The variation of $\dfrac{p}{(x/m)}$ as a function of $p$ when Lanmuir's is isotherm is valid is :
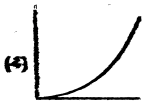
A.

B.


C.


D.


Answer: 2

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2. Disperse phase and dispersion medium in butter are respectively

A. solid and liquid

B. liquid and solid

C. liquid and liquid

D. solid and solid

**Answer: 2**

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**3.** The disperse pahse, dispersion medium and nature of colloidal solution (lyophilic or lyophobic) of gold solution respectively, are :

A. solid, solid , lyophobic

B. liquid ,liquid, lyophobic

C. solid,liquid,lyophobic

D. solid,liquid,lyophilic

**Answer: 3**

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**4.** Breding arc method cannot be used to prepare colloidal solution of which of the following ?

A. $Pt$

B. $Fe$

C. $Ag$

D. $Au$

**Answer: 2**

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**5.** A colloidal solution of a solid as dispersed phase and liquid as dispersion medium is known as :

A. Gel

B. Sol

C. Solid foam

D. Emulsion

**Answer: 2**

▶ **View Text Solution**

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**6.** Position of non-polar and polar parts in micelle is

A. polar at outer surface but non $-$ polar at inner surface

B. polar at inner surface but non $-$ polar at outer surface

C. distributed all over the surface

D. present in the surface only

**Answer: 1**

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**7.** A gelatin sol at $pH$ less then 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: 2

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**8.** Ferric chloride is applied to stop bleeding due to cut because :

A. $Fe^{3+}$ ion Caogulates blood which is a negatively charged sol.

B. $Fe^{3+}$ ion Coagulates blood whichis a positively charged sol.

C. $Cl^-$ ion Coagulates blood which is a positively charged sol.

D. $Cl^-$ ion Coagulates blood which is a negatively charged sol.

Answer: 1

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9. Correct equation of Freundich 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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**10.** On addition of one $ml$ solution $10\%$ $NaCl$ to $10ml$ gold sol in the presence of $0.0250g$ of starch , the coagulation is just prevented starch has the gold number :

    A. $2.5$

    B. $25$

    C. $0.25$

    D. $250$

**Answer: 2**

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**11.** Which one of the following is a lyophilic colloid ?

A. Milk

B. Gum

C. Fog

D. Blood

**Answer: 2**

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**12.** An arsenious sulphide sol carries a negative charge the maximum precipitating power fo this sol is possessed by

A. $K_2SO_4$

B. $CaCl_2$

C. $Na_2PO_4$

D. $AlCl_3$

**Answer: 4**

13. Movement of dispersion medium under the influence of electric field is —

    A. Electro — osmosis

    B. Electrophoresis

    C. Electrodialysis

    D. Cataphoresis

**Answer: 3**

**14.** Which one of the following is an incorrect statement for physisorption ?

A. it is a reversible process

B. It requries less heat of adsoption

C. it requires activation energy

D. It takes place at low temperature

**Answer: 3**

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**15.** Surface tension of lyophilic sol 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 these

**Answer: 1**

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**16.** Which of the following characteristic is not correct for physical adsorption?

A. Adsorption increases with increase in temperature

B. Adsorption is spontaneous

C. Both enthalpy and entropy of adsorption are negative

D. Adsorption on solids is reversible

**Answer: 1**

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**17.** Identify the correct statements regarding enzymes.

    A. Enzymes are specific biological catalyst than can normally function at very low temperature $(T \sim 100K)$

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

    C. Enzymes are specific biological catalyst that cannot poisoned

    D. Enzymes are specific biological catalyst that posses well defined active sites

**Answer: 4**

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**18.** Adsorption of gases on solid surface is generally exothermic

because

    A. Enthalpy is positive

    B. Entropy decreases

    C. Entropy increases

    D. Free energy increase

**Answer: 2**

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**19.** Which of the following is correct about lyophilic sold?

    A. They are irreversible

    B. They are formed by inorganic substances

C. They are readily coagulated by addition of electroylstes

D. They are self stabilized

**Answer: 4**

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**20.** According to Hardy — Schulze rule, the coagulating power of cation follows the order :

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

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

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

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

**Answer: 2**

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**21.** The stability of lyophilic collid is due to which of the following :

A. Charge on their particles

B. Large size of their particles

C. Small size of their particles

D. Solvation by dispersion medium

Answer: 4

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**22.** The activation energy and enthalpy of chemisorption of oxygen on a metal surface is $37.3kJmol^{-1}$ and $-72.1kJmol^{-1}$ At a certain pressure, the rate constant for chemisorption is $1.2 \times 10^{-3}$ at $3198K$ . What will be the value of the rate constant at $308K$ ?

A. $7.6 \times 10^{-4} s^{-1}$

B. $1.6 \times 10^{-6} s^{-1}$

C. $7.6 \times 10^{-2} s^{-1}$

D. $1.6 \times 10^{-5} s^{-1}$

**Answer: 1**

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**23.** Which is the correct statements 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 stabilized by fat

**Answer: 1**

**24.** Which of the following is true in respect of adsorption

    A. $\Delta G < 0, \Delta S > 0, \Delta H < 0$

    B. $\Delta G < 0, \Delta S < 0, \Delta H < 0$

    C. $\Delta G > 0, \Delta S > 0, \Delta H < 0$

    D. $\Delta G < 0, \Delta S < 0, \Delta H > 0$

**Answer: 2**

**25.** How would you obtain a sol of $AgI$, the particles of which migrate toward 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 $Kl$ solution

C. By mixing equal volumes of $0.010MAgNO_3$ and $0.010MKl$

D. Convection current

Answer: 2

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26. The Brownian motion is due to ,

A. Temperature fluctuation withing the liquid phase

B. Attraction and repulsion between charge on the colloidal

particles

C. Impact of moleculars of the dispersion medium on the

colloidal particles

D. Convective current

**Answer: 3**

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**27.** At STP the volume of nitrogen gas required to cover a sample of silica gas, assuming larngmulr monolayer adsorption is found to be $1.30 gcm^{-2}g^{-1}$ of the gel.

The area occupied by a nitrogen molecule is $0.16nm^2$. What is the surface area per gram of silica gel ?

A. $5.568m^2g^{-1}$

B. $3.48m^2g^{-1}$

C. $1.6m^2g^{-1}$

D. None of these

**Answer: 1**

**28.** In the given isotherm select the incorrect statement?
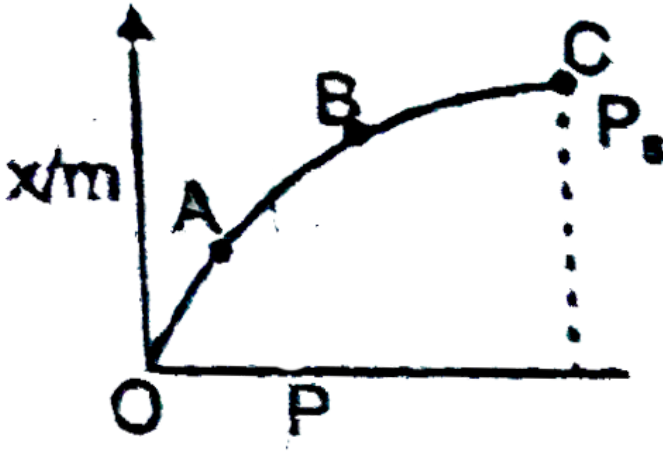


A. $x/m \propto P^{1/n}$ along $OA$

B. $x/m \propto P^{\circ}$ when ppoint $B$ reached

C. $x/m$ does not increase as rapidly with pressure along $BC$ due to less surface area available for adsorption

D. Nature of isotherm is different for two gases for same adsorbent.

**Answer: 2**

29. $3.6$ gram of oxygen is adsorbed in $1.2g$ of metal powder. What volume of oxygen adsorbed per gram of the adsorbent at $STP$ ?

A. $0.19Lg^{-1}$

B. $1Lg^{-1}$

C. $2.1Lg^{-1}$

D. none of these

**Answer: 3**

**30.** Which of the following will have the highest coagulating power for $Fe(OH)_3$ colloid?

A. $PO_4^{3-}$
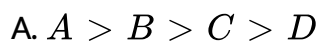
B. $SO_4^{2-}$

C. $Ca^{2+}$

D. $Al^{3+}$

**Answer: 1**

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**31.** The gold numbers of protective colloids $A, B, D$ and $D$ are 0.04, 0.004, 10 and 40 respectively. The protective powers of $A, B, C,$ and $D$ are in the order :

A. $A > B > C > D$

B. $B > A > C > D$

C. $D > C > A > B$

D. $D > C > B > A$

**Answer: 2**

▶ **View Text Solution**

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**32.** Equal volume each of two sols of $AgI,$ one obtained by adding $AgNO_3$ to slightly excess of $KI$ and another obtained by adding $KI$ to slight excess of $AgNO_3$, are mixed together . Then :

A. the two sols will stablize 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**

**33.** Under the influence of an electric field, the particles in a sol migrate cathode. The coagulation of the same sol is studied using $NaCl$, $Na_2SO_4$ and $Na_2PO_4$ solutions. Their coagulating values will be in maximum for :

A. $NaCl$

B. $Na_2SO_4$

C. $Na_2PO_4$

D. same for all

**Answer: 1**

**34.** During electro $-$ osmosis of $Fe(OH)_3$ sol :

    A. sol particles move towards anode

    B. sol particles move towards cathode

    C. the dispersion medium moves towards anode

    D. the dispersion medium moves towards cathode

**Answer: 3**

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**35.** Which of the following is wrong :

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

        that of chemisorption

B. Physisorption is not very specific but chomisorption is highly

specific

C. Chemisorption takes place at relatively high temperatures

D. In physisorption generally multi − molecular layers are

formed on the adsorbent

**Answer: 1**

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**36.** Which of the following gases, will be adsorbed maximum on a

solid surface :

A. $CO_2$

B. $O_2$

C. $N_2$ is added at constant volume

D. $H_2$

**Answer: 1**

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**37.** When $9.0ml$ of arsenius sulphide sol and $1.0ml$ of $1.0 \times 10^{-4} M BaCl_2$ are mixed turbidity due to precipitation just appears after 2 hours. The effective ion and its coagulating value are respectively.

A. $Cl^-$, $10\text{m mol}/L$

B. $Cl^-$, $20\text{m mol}/L$

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

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

**Answer: 3**

**38.** 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: 4**

**39.** The presence of colloidal particles of dust in imparts blue colour to the sky. This is due to

A. Absorption of the light

B. Scattering of the light

C. Reflection of the light

D. None of the these

**Answer: B**

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**40.** The pressure of the gas was found to decrease from 720 to $480m$. 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 at $1.25gm/mL$. The volume of gas adsorbed per $gm$ of charcoal at $480mm$ of $Hg$ is

A. $80.03mL$

B. $32.20mL$

C. $100.08 mL$

D. None of these

**Answer: 3**

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41. Colloidal solution of silver is prepared by :

A. Colloidal milk

B. Double decomposition method

C. Bredig's method

D. Peptization

**Answer: 3**

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**42.** $5ml$ of standard gold sol, needs $0.5mg$ of gelation for its protection from coagulation, calculate the gold no of gelation.

A. 1

B. 2

C. 3

D. 4

**Answer: 1**

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Solved Examples

**1.** A sample of charcoal weighing 6 g was brought into contact with a gas contained in a vessel of one litre capacity at $27°$ C. The

pressure of the gas was found to fall from 700 and 400 mm. Calculate the volume of the gas (reduced to STP) that is adsorbed per gram of the adsorbent under the condition of the experiment (density of charcoal sample is $1.5 gcm^3$).

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**2.** When $SO_2$ is bubbled into $H_2S$ gas, colloidal sol is formed. What type of colloidal sol is it ?

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**3.** A reddish brown positively charged sol is obtained by adding small quantity of $FeCl_3$ solution to freshly prepared and well washed $Fe(OH)_3$ precipitate. How does it take place ?

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**4.** Suppose we have cube of 1.00 cm length. It is cut in all three directions, so as to produce eight cubes, each 0.50 cm on edge length. Then suppose these 0.50 cm cubes are each subdivided into eight cubes 0.25 cm on edge length, and so on. How many of these successive subdivisions are required before the cubes are reduced in size to colloidal dimensions of 100 nm.

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**5.** Under what conditions is Tyndal effect observed ?

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**6.** In the lower layer of the atmosphere, there is great deal of dust. When the weather is fine, it is possible to see the magnificent red

colour of the setting sun. What have these observation to do with colloids ?

**7.** Classify the following sols according to their charges :

(a) gold sol (b) ferric hydroxide sol (c) gelatine (d) blood (e) sulphur (f) arsenious sulphide (g) titanium oxide.

**8.** $SnO_2$ forms positively charged colloidal sol in acidic medium and negatively charged colloidal sol in basic medium. Explain ?

**9.** The particles of a particular colloidal solution of arsenic trisulphide $(As_2S_3)$ are negatively charged. Which 0.0005 M solution would be most effective in coagulating this colloidal solution. $KCl$, $MgCl_2$, $AlCl_3$ or $Na_3PO_4$ ? Explain.

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**Solved Problems**

**1.** 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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**2.** The presence of colloidal particles of dust in air imparts blue colour to the sky. This is de to

    A. Absorption of the light

    B. Scattering of the light

    C. Reflection of the light

    D. None of these

**Answer: B**

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**3.** The volume of nitrogen gas Um (measured at STP) required to cover a sample of silica get with a mono-molecular layer is $129cm^3g^{-1}$ of gel. Calculate the surface area per gram of the gel if each nitrogen molecule occupies $16.2 \times 10^{-20}m^2$.

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**4.** Which of the following has minimum gold number ?

    A. Potato starch

    B. Gum arabic

    C. Gelatin

    D. Albumin

**Answer: C**

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**5.** Which of the following are correctly matched ?

  A. Butter-gel

  B. Milk-emulsion

  C. Fog-aerosol

  D. Dust-solid sol

**Answer: A::B::C**

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**6.** Explain the adsorption of nitrogen on iron.

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**7.** How do size of particles of adsorbent, pressure of gas and prevailling temperature influence the extent of adsorption of a gas on a solid ?

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**8.** How is adsorption of a gas is related to its critical temperature ?

▶ Watch Video Solution

**9.** Physical adsorption is essentially quite appreciable :

   A. at room temperature

   B. at higher temperature

   C. at lower temperature

   D. None of these

**Answer: C**

**10.** What type of colloidal sols are formed in the following ?

(i) Through cooled water, vapours of sulphur are passed.

(ii) White of an egg is mixed with water.

**11.** What heppens when persistent dialysis of a colloidal solution is carried out.

Exercise 1 Part I Section A

**1.** Why is adsorption always exothermic ?

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**2.** What is the main difference between physisorpton and chemisorption ?

▶ Watch Video Solution

**3.** What are the factors which influence the adsorption of a gas on a solid ?

▶ Watch Video Solution

**4.** What is an adsorption isotherm ?

▶ Watch Video Solution

**5.** What do you understend by activation of adsorbent? How is it achieved ?

▶ **Watch Video Solution**

**6.** Which will be adsorbed more readily on the surface of charcoal and why— $NH_3$ or $CO_2$?

▶ **Watch Video Solution**

**7.** In an Adsorption experiment a graph between log x/m versus log P was found to be linear with a slope of $45°$ the intercept of the log x/m was found to be 0.3010. Calculate the amount of gas adsorbed per gram of charcoal under a pressure of 0.6 bar.

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**8.** $1g$ charcoal is placed in $100 mL$ of $0.5 M CH_3COOH$ to form an adsorbed mono-layer of acetic acid molecule and thereby the molarity of $CH_3COOH$ reduces to $0.49$. Calculate the surface area of charcoal adsorbed by each molecule of acetic acid. Surface are of charocal $= 3.01 \times 10^2 m^2 / g$.

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**9.** What role does adsorption play in heterogeneous catalysis ?

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**10.** How many grams of gas would be adsorbed per gram of a substance at 8 atm by assuming Freundlich adsorption isotherm.

$$\frac{x}{m} = kp^{1/m}$$ and $$k = 10^{-2}atm^{-1/3}$$ &

$$n = 3.$$

**11.** 10mg of an adsorbate gets adsorbed on a surface. This causes the release of 3J of heat at constant pressure and at $27^{\circ}C$. [Molar mass of adsorbate = 100 g/mol].

(i) Find $\triangle H_{adsorption}$.

(ii) Argue whether the adsorption is physical or chemical ?

(iii) If 20 mg of adsorbate is adsorbed at temperature $T_0$. Then compare $T_0$ and $27^{\circ}C$ :

**Section B**

**1.** Give two examples of hetergeneous catalysis.

**2.** Identify the correct order of steps in heterogeneous catalysis.

(i) Adsorption of reactant molecules on the surface of the catalyst.

(ii) Diffusion of reactant to the surface of the catalyst.

(iii) Formation of reactions product on the catalyst surface.

(iv) Diffusion of reactions product from the catalyst surface.

(v) Formation of activated intermediate.

**3.** Which one is false in the following statement?

A. A catalyst is specific in its action

B. A very small amount of the catalyst can alter the rate of a

reaction.

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

increases on sub-division

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

**Answer: D**

**4.** A catalyst increases rate of reaction by

A. Decreasing enthalpy

B. Decreasing internal energy

C. Decreasing activation energy

D. Increasing activation energy

**Answer: C**

**1.** How are the colloidal solutions classified on the the basis of physical states of the dispersed phase and dispersion medium ?

**2.** Explain the following terms with suitable examples.

(a) Gel (b) Liquid Aerosol (b) Hydrosol

**3.** How are associated colloids different from multimolecular and macromolecular colloids ?

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**4.** Give one example each of multimolecular and macro-molecular colloids.

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**5.** Describe a method each for the preparation of sols of sulphur and platinum in water

▶ **Watch Video Solution**

**6.** Colloidal solution of gold prepared by different methods of different colours because of :

    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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**7.** At CMC, the surfactant molecules :

    A. Decomposes

    B. Become completely soluble

C. Associate

D. Dissociate

**Answer: C**

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**Section D**

**1.** Explain the following terms :

(a)  Peptization  (b)  Electrophoresis  (c)  Dialysis  (d)  Brownian

movement

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**2.** Why the sun looks red at the time of setting ?

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**3.** Why is osmotic pressure of a colloidal solution less than that of

true solution ?

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**4.** A colloidal solution can be purified by the following method :

    A. dialysis

    B. peptization

    C. filtration

    D. oxidation

**Answer: A**

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**5.** 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**

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**6.** 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**

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Section E

**1.** Which one of the following electrolytes is most effective for the coagulation of $Fe(OH)_3 sol$ and why?

$NaCl, Na_2SO_4, Na_3PO_4$

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**2.** What do you understand by "isoelectric point" of a colloid ?

▶ **Watch Video Solution**

**3.** Rivers form delta on meeting with ocean, why ?

▶ **Watch Video Solution**

**4.** Artificial rain is made by spraying salt over clouds, why ?

▶ **Watch Video Solution**

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

    A. the 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**

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**6.** Protective sols are :

A. lyophilic

B. lyophobic

C. both (A) and (B)

D. none of (A) and (B)

**Answer: A**

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**7.** For the coagulation of 200 mL of $As_2S_3$ solution, 10 mL of 1 M NaCl is required. What is the coagulating value (number of milli moles of solute needed of coagulation of 1 liter of solution) of NaCl.

A. 200

B. 100

C. 50

D. 25

**Answer: C**

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**8.** Which of the following ions is most effective in the coagulation of an arsenious suphide solution?
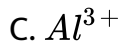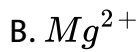
A. $K^+$

B. $Mg^{2+}$

C. $Al^{3+}$

D. $C$

**Answer: C**

**9.** 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**

**Section F**

**1.** Name two dimulsifier.

**2.** What is the difference between sols and emulsions.

**3.** What is demulsification ?

**4.** What is phase inversion in emulsion ?

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**5.** Small liquid droplets in another liquid is called

A. Suspension

B. Emulsion

C. Gel

D. True solution

**Answer: B**

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**Exercise 1 Part Ii Section A**

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

    A. It involves chemical forces between adsorbent and absorbate

    B. It is irreversible in nature

    C. It involves high heat of adsorption

    D. It does not require activation energy

**Answer: D**

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**2.** Following is the variation of physical adsorption with temperature.

(A)

A.



(B)

B.



(C)

C.



(D)

D.
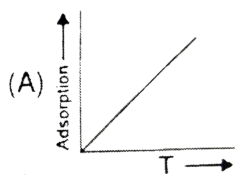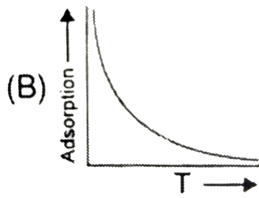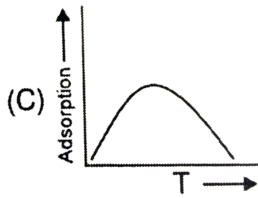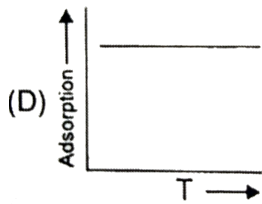


**Answer: B**

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**3.** 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**

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**4.** 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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**5.** Volume of $N_2$ at 1 atm, 273 K required to form a monolayer on the surface of iron catalyst is $8.15ml/gm$ 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. $0.35m^2/g$

C. $39m^2/g$

D. $22400 cm^2$

**Answer: B**

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**6.** 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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**7.** 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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**8.** 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 these

**Answer: A**

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**Exercise 1 Part Iii**

**1.** Match list I with list II and select the correct answer :

| | List-I | | List-II |
|---|---|---|---|
| (P) | Mechanical property of colloid | (1) | Dialysis |
| (Q) | Purification | (2) | Peptization |
| (R) | Gold number | (3) | Brownian movement |
| (S) | Formation of a sol | (4) | Protection |

Code:

A.
$$\begin{array}{cccc} P & Q & R & S \\ 3 & 4 & 1 & 2 \end{array}$$

|   | P | Q | R | S |
|---|---|---|---|---|
| B. | 1 | 2 | 4 | 3 |
| C. | 3 | 1 | 4 | 2 |
| D. | 2 | 3 | 1 | 4 |

**Answer: C**

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**2.** Match list I with list II and give the correct answer :

| | List-I | | List-II |
|---|---|---|---|
| A | Gold sol | (p) | Bredig's Arc method |
| B | Purification of colloidal solution | (q) | Negatively charged |
| C | $As_2S_3$ sol | (r) | Dialysis |
| D | Zeta potential | (s) | Electro kinetic potential |
| E | Casein | (t) | Double decomposition reaction |
| | | (u) | Protective colloid |

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**Exercise 2 Part I**

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

    A. It is not easily solvated

    B. The coagulation of this sol is irreversible in nature

    C. It is unstable

    D. It is quite stable in a solvent

**Answer: D**

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**2.** Liquid-liquid colloidal system is known as

    A. aerosol

    B. foam

C. emulsion

D. gel

Answer: C

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**3.** The colloidal system consisting of a liquid dispersed in a solid dispersion medium is termed as :

A. aerosol

B. foam

C. emulsion

D. gel

Answer: D

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**4.** Which of the following statements is not correct ?

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

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

   C. Metal hydroxide in water are examples of lyophobic solution

   D. Liquid-liquid colloidal solution is not stable system

**Answer: B**

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**5.** size of colloidal particles may range from:

   A. 1 to 1000 nm

   B. 10 to 100 pm

C. 1 to 100 $\mu m$

D. 1 to 10 mm

**Answer: A**

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**6.** which of the following represents a multimolecular colloidal paricles?

A. Starch

B. A sol of gold

C. Proteins

D. Soaps

**Answer: B**

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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. $\left[Fe(CN)_6\right]^{3-}$
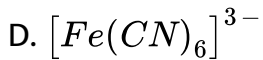
**Answer: D**

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**8.** Which of the following represents macromolecular colloidal particles?

   A. Solution of gold

B. Cellulose

C. Soaps

D. Synthetic detergents

Answer: B

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9. Gold number of some lyophilic sols are :

| I | Casein | 0.01 |
| II | Haemoglobin | 0.03 |
| III | Gum arabic | 0.15 |
| IV | Sodium oleate | 0.40 |

Which has maximum protective power :

A. I

B. II

C. III

D. IV

**Answer: A**

**10.** Arsenic 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**

**11.** Smoke is a dispersion of :

A. gas in gas

B. gas in solid

C. solid in gas

D. liquid in gas

Answer: C

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

A. scattering

B. coagulation

C. Brownian motion

D. electro-osmosis

**Answer: A**

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**13.** 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 these

**Answer: B**

**14.** Soaking of water by a sponge is an example of :

    A. Simple adsorption

    B. Physical adsorption

    C. Chemisoption

    D. Absorption

**Answer: D**

**15.** Identify the appropriate graph between enthalpy and progress of physical adsorption.

(A) H

Progress

A.

(B) H

Progress

B.

(C) H

Progress

C.

(D) H

Progress

D.
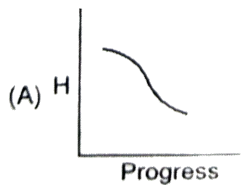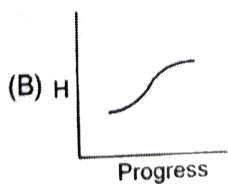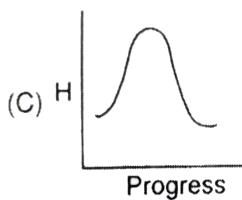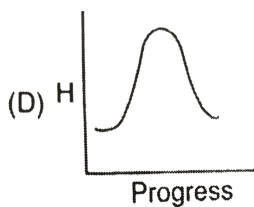
**Answer: A**

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**16.** Hydrolysis of ester in catalysed by acid. Rate of hydrolysis of

ester were obtained initially and after some ester has been

hydrolysed as $R_0$ and $R_t$ then (same temp.)

A. $R_0 = R_t$

B. $R_0 < R_t$

C. $R_0 > R_t$

D. Cannot be determined

**Answer: B**

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**Exercise 2 Part Ii**

1. When a graph is plotted between log x/m and log p, it is straight line with an angle $45°$ and intercept 0.3010 on y - axis. If initial pressure is 0.3 atm, what will be the amount of gas adsorbed per gram of adsorbent : (Report your answer after multiplying by 10)
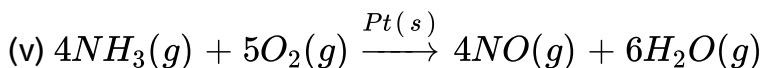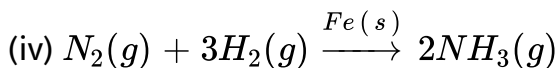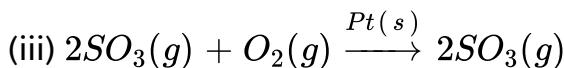
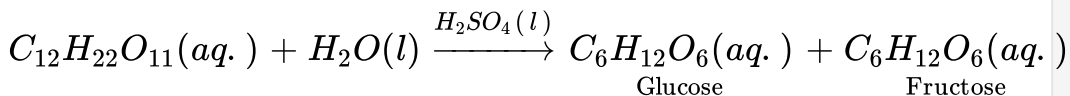**2.** The volume of nitrogen gas Um (measured at STP) required to cover a sample of silica get with a mono-molecular layer is $129 cm^3 g^{-1}$ of gel. Calculate the surface area per gram of the gel if each nitrogen molecule occupies $16.2 \times 10^{-20} m^2$.
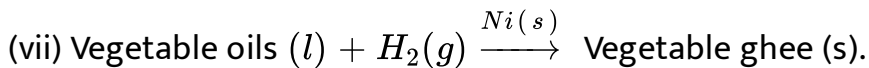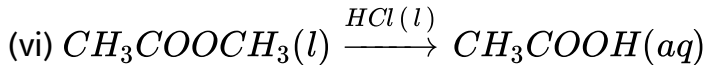
**3.** How many of these reactions are homogeneously catalyzed ?

(i) $2SO_2(g) + O_2(g) \xrightarrow{NO(g)} 2SO_3(g)$

(ii)

$C_{12}H_{22}O_{11}(aq.) + H_2O(l) \xrightarrow{H_2SO_4(l)} \underset{\text{Glucose}}{C_6H_{12}O_6(aq.)} + \underset{\text{Fructose}}{C_6H_{12}O_6(aq.)}$

(iii) $2SO_3(g) + O_2(g) \xrightarrow{Pt(s)} 2SO_3(g)$

(iv) $N_2(g) + 3H_2(g) \xrightarrow{Fe(s)} 2NH_3(g)$

(v) $4NH_3(g) + 5O_2(g) \xrightarrow{Pt(s)} 4NO(g) + 6H_2O(g)$

(vi) $CH_3COOCH_3(l) \xrightarrow{HCl\,(l)} CH_3COOH(aq)$

(vii) Vegetable oils $(l) + H_2(g) \xrightarrow{Ni\,(s)}$ Vegetable ghee (s).
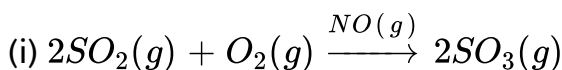
**4.** Coagulation value of the electrolytes $AlCl_3$ and NaCl for $As_2S_3$ sol are 0.093 and 52 respectively. How many times $AlCl_3$ has greater coagulating power than NaCl?

**5.** Among the following number of correct statements are :

(i) Stability of lyophilic colloids is mainly due to the strong interaction between dispersed particle and dispersion medium.

(ii) Entropy change for adsorption of gases over solid is positive.

(iii) Gelatin has considerably low value of gold number and is effective protective colloid.

(iv) Zeta potential is also responsible for stability of lyophobic colloid solution.

(v) Surface tension of lyophilic colloidal solution is lesser than that of dispersion medium.

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**6.** For the just coagultion of 250 mL of $Fe(OH)_3$ sol, 2 mL of $1 M Na_2SO_4$ electrolyte is required. What is the coagulating value of $Na_2SO_4$ electrolyte.

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7. The minimum concentration of an electrolyte required to cause coagulation of a sol is called its flocculation value. It is expressed in millimoles per litre. If the flocculation value of $MgSO_4$ for standard

$As_2S_3$ sol is 3.33. How many milligrams of $MgSO_4$ is to be added to 20 ml standard $As_2S_3$ sol so that flocculation just starts ?

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Exercise 2 Part Iii

**1.** Which of the following statements about physical adsorption is correct ?

    A. It is always monolayer

    B. It is reversible in nature

    C. It is involves van der Waals interactions between adsorbent and adsorbate

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

**Answer: B::C::D**

**2.** 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**

**3.** 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 generally around 80 - 240 kJ

**Answer: A::B::D**

**4.** Which is/are a purely surface phenomena :

A. surface tension

B. adsorption

C. absorption

D. none of these

**Answer: A::B**

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**5.** Which of the following are correct statements ?

A. Spontaneous adsorption of gases on solid surface is an exothermic process as entropy decreases during adsorption

B. Formation of micelles takes place when temperature is below Kraft Temperature $(T_k)$ and concentration is above critical micelle concentration (CMC)

C. Longer the length of hydrophobic chain, smaller is the value of critical micelle concentration (CMC)

D. According to Hardy-Schulze rule the coagulation (flocculating) value of $Fe^{3+}$ ion will be more than $Ba^{2+}$ or $Na^+$.

Answer: A::C

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6. Which of the following statements are true for physisorption ?

A. Extent of adsorption increases with increase in pressure.

B. It needs activation energy
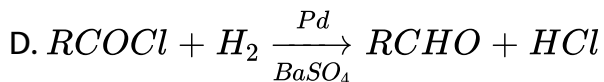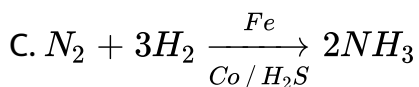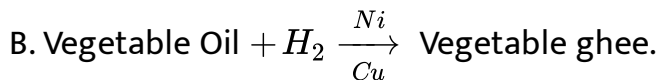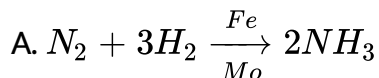
C. It can be reversed easily

D. It occurs at high temperature.

Answer: A::C

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**7.** Identify the reactions that includes inhibtors in the reactions mixture.

A. $N_2 + 3H_2 \xrightarrow[Mo]{Fe} 2NH_3$

B. Vegetable Oil $+ H_2 \xrightarrow[Cu]{Ni}$ Vegetable ghee.

C. $N_2 + 3H_2 \xrightarrow[Co/H_2S]{Fe} 2NH_3$

D. $RCOCl + H_2 \xrightarrow[BaSO_4]{Pd} RCHO + HCl$

**Answer: C::D**

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**8.** Which of the following are the correct :

A. A Catalyst remains unchanged in mass and chemical composition at the end of reactions.

B. Finely devided state of catalyst is more efficient for the reactions.

C. Catalyst change equilibrium state of the reaction.

D. A catalyst changes the entropy and the free energy of a reaction.

**Answer: A::B**

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**9.** 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**

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**10.** 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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**11.** Which of the following are hydrophobic sols ?

A. Protein sol

B. Gold sol

C. Gum sol

D. $Fe(OH)_3$ sol

**Answer: B::D**

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12. Which of the following are multimolecular colloids ?

A. Sulphur

B. Egg albumin in water

C. Gold sol

D. Soap solution

**Answer: A::C**

**13.** 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**

**14.** Which of the following is/are not true for lyophilic colloid ?

    A. These are prepared by special indirect methods.

B. The particles must travel towards the anode or cathode

    under the influence of an electric field.

C. These are called on intrinsic colloid

D. Small quantity of electrolyte is sufficient to cause

    precipitation of these.

**Answer: A::B::D**

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**15.** 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

16. Which of the following statements is correct ?

   A. Peptization is the process by which some fresh precipitates

   are converted into the colloidal state by addition of little

   suitable electrolyte.

   B. Metal sols 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 impurities of ions and

   molecules from a solution.

Answer: A::B::D

**17.** 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. formation of ice

**Answer: A::B::C**

**18.** 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. This process is called mutual coagulation.

C. They become positively charged colloids.

D. They become negatively charged colloids.

Answer: A::B

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19. Which of the following are incorrect statements ?

A. Hardy schulz rule is related to coagulation

B. Brownian movement and Tyndall effect are the characteristic

of colloids.

C. In gel, the liquid is dispersed in liquid

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

lyophillic sols.

**Answer: C::D**

20. 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: B::C::D**

**Exercise 2 Part Iv Comprehension**

# 1. Comprehension # 1

Many lyophilic sols and few lyophobic sols when coagulated under some special conditions changes into semi rigid mass, enclosing whole amount 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 exchange of solvent method.

Types of Gel :

(i) Elastic gel : Those gel which have elastic properties.

Ex : Gelatin, Strach, Agar-agar etc.

(ii) Non-elastic gel : Those gel which are rigid.

Ex : Silica gel.

Properties 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.

Ex : Gelatin, Agar-Agar show syneresis at low concentration while

sillicic acid 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 swelling 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.

Ex : Gelatin and silica liquify on shaking changing into corresponding sol and 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. Cheese

Answer: A

**2.** Comprehension # 1

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Ex : Gelatin and silica liquify on shaking changing into corresponding sol and sol on keeping changes back into gel.

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

A. imbibition

B. synersis

C. coagulation

D. thixotropy

**Answer: A**

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**3.** Comprehension # 1

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Ex : Gelatin and silica liquify on shaking changing into corresponding sol and sol on keeping changes back into gel.

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. synersesis

B. thixotropy

C. double decompostion

D. peptization

**Answer: B**

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**4.** Comprehension # 2

The clouds consist of charged particles of water dispersed in air. Some of them are +vely charged, others are -vely charged. When +vely charged clouds come closer they cause lightening and thundering whereas when +ve and -ve charged colloids come closer

they cause heavy rain by aggregation of minute particles. It is possible to cause artificial rain by throwing electrified sand or silver iodide 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 solution

**Answer: A**

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**5.** Comprehension # 2

The clouds consist of charged particles of water dispersed in air. Some of them are +vely charged, others are -vely charged. When +vely charged clouds come closer they cause lightening and thundering whereas when +ve and -ve charged colloids come closer they cause heavy rain by aggregation of minute particles. It is possible to cause artificial rain by throwing electrified sand or silver iodide 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 $TiO_2$.

AgI helps in artificial rain because :

A. it helps in ionisation of water

B. it helps in dispersion process

C. it helps in coagulation

D. all of them

**Answer: C**

**6.** Comprehension # 2

The clouds consist of charged particles of water dispersed in air. Some of them are +vely charged, others are -vely charged. When +vely charged clouds come closer they cause lightening and thundering whereas when +ve and -ve charged colloids come closer they cause heavy rain by aggregation of minute particles. It is possible to cause artificial rain by throwing electrified sand or silver iodide 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 $TiO_2$.

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 these

Answer: A

▶ View Text Solution

| Column-1 | | | Column-2 | | | Column-3 |
|---|---|---|---|---|---|---|
| (I) | Positively charged colloid | (i) | Can be coagulated by adding metal sulphide sol | (P) | During electrophoresis coagulation will take place at anode |
| (II) | Negatively charged colloid | (ii) | Can be coagulated by adding metal oxide sol | (Q) | During electro-osmosis level of dispersion medium will increase on anode side. |
| (III) | Can be prepared by Bredig's Arc method | (iii) | Coagulation value of Na₂SO₄ > MgCl₂ for this colloid | (R) | During Electro-phoresis coagulation will take place at cathode. |
| (IV) | Can be prepared by peptisation | (iv) | Coagulating power of MgSO₄ > NaCl for this colloid. | (S) | During electro-osmosis level of dispersion medium will increase on cathode side. |

7.

Select the only incorrect option for $AgI/I^-$ sol.

A. (II) (ii) (P)

B. (IV) (iv) (P)

C. (II) (iii) (S)

D. (IV) (iii) (Q)

**Answer: D**

▶ **View Text Solution**

| Column-1 | | Column-2 | | Column-3 | |
|---|---|---|---|---|---|
| (I) | Positively charged colloid | (i) | Can be coagulated by adding metal sulphide sol | (P) | During electrophoresis coagulation will take place at anode |
| (II) | Negatively charged colloid | (ii) | Can be coagulated by adding metal oxide sol | (Q) | During electro-osmosis level of dispersion medium will increase on anode side. |
| (III) | Can be prepared by Bredig's Arc method | (iii) | Coagulation value of $Na_2SO_4$ > $MgCl_2$ for this colloid | (R) | During Electro-phoresis coagulation will take place at cathode. |
| (IV) | Can be prepared by peptisation | (iv) | Coagulating power of $MgSO_4$ > $NaCl$ for this colloid. | (S) | During electro-osmosis level of dispersion medium will increase on cathode side. |

**8.**

Select the only correct option $Fe(OH)_3$ sol.

A. (I) (iii) (Q)

B. (IV) (i) (Q)

C. (I) (iii) (R)

D. (IV) (iv) (S)

**Answer: B**

> ▶ **View Text Solution**

| Column-1 | | Column-2 | | Column-3 | |
|---|---|---|---|---|---|
| (I) | Positively charged colloid | (i) | Can be coagulated by adding metal sulphide sol | (P) | During electrophoresis coagulation will take place at anode |
| (II) | Negatively charged colloid | (ii) | Can be coagulated by adding metal oxide sol | (Q) | During electro-osmosis level of dispersion medium will increase on anode side |
| (III) | Can be prepared by Bredig's Arc method | (iii) | Coagulation value of $Na_2SO_4 > MgCl_2$ for this colloid | (R) | During coagulation will take place at cathode. Electro-phoresis |
| (IV) | Can be prepared by peptisation | (iv) | Coagulating power of $MgSO_4 > NaCl$ for this colloid. | (S) | During electro-osmosis level of dispersion medium will increase on cathode side. |

**9.**

Select the only incorrect option for gold sol.

A. (II) (ii) (P)

B. (II) (iii) (S)

C. (III) (iv) (S)

D. (II) (iii) (Q)

**Answer: D**

> ▶ **View Text Solution**

**1.** Rate of physisorption increases with :

    A. decrease in temperature

    B. increases in temperature

    C. decrease in pressure

    D. decrease in surface area

**Answer: A**

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**2.** Adsorpton of gases on solid surface is generally exothermic

because :

A. enthalpy is positive

B. entropy decreases

C. entropy increases

D. free energy increases

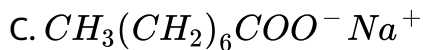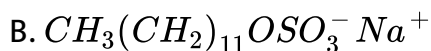**Answer: B**

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**3.** Lyophilic sol are

A. Irreversible sols

B. They are prepared from inorganic compound

C. Coagulated by adding electrolytes

D. Self-stabilizing

**Answer: D**

**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. $CH_3(CH_2)_{11}N^+(CH_3)_3Br^-$
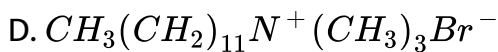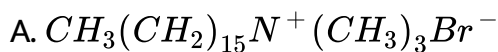
**Answer: A**

**5.** 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. $NH_4Cl$
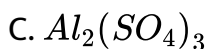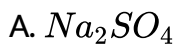
**Answer: C**

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**6.** Silver (atomic weight $108gmol^{-1}$) has a density of $10.5gcm^{-3}$. The number of silver atoms on a surfaces of area $10^{-12}m^2$ can be expressed in scientific notation as $Y \times 10^{-x}$, The value of $x$ is ........

**7.** The correct statement(s) pertiaining 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**

**8.** Choose the correct reason(s) for the stability of the lyophobic colloidal particles.

A. Preferential adsorption of ions on their surface from the solution.

B. Preferential adsorption of solvent on their surface from the solution

C. Attraction between different particles having opposite charges on their surface.

D. Potential difference between the fixed layer and the diffused layer of opposite charges around the colloidal particles.

**Answer: A::D**

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**9.** The given graph/data I, II, III and IV represent general trends observed for different physisorption and chemisorption processes under mild conditions of temperature and pressure. Which of the following choice (s) about I, II, III and IV is (are) correct.
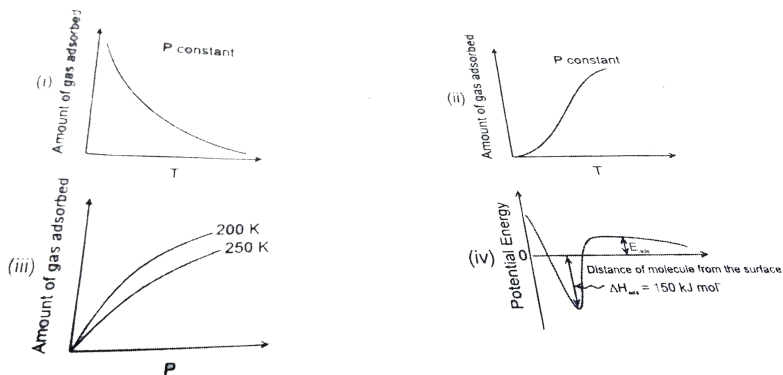


A. I is physisorption and II is chemisorption

B. I is physisorption and III is chemisorption

C. IV is chemisorption and II is chemisorption

D. IV is chemisorption and III is chemisorption

Answer: A::C

**10.** Methylene blue, from its aqueous solution, is adsorbed on activated charcoal at $25° C$. For this process, the correct statement is

A. The adsorption requires activation at $25° C$.

B. The adsorption is accompanied by a decreases in enthalpy.

C. The adsorption increases with increase of temperature.

D. The adsorption is irreversible.

**Answer: B**

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**11.** When $O_2$ is adsorbed on a metallic surface, electron transfer electron transfer occurs from the metal to $O_2$. The TRUE

statement (s) regarding this adsorption is (are)

A. $O_2$ is physisorbed

B. heat is released

C. occupancy of $\pi_{2p}$ of $O_2$ is increased

D. bong length of $O_2$ is increased

Answer: B::C::D

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**12.** The qualitative sketches I,II and III given below show the variation of surface tension with molar concentration of three different aqueous solution $KCl, CH_3OH$ and $CH_3(CH_2)_{11}OSO_3NA^+$ at room temperature. The correct assignment of the sketches is

A. $I:KCl$     $II:CH_3OH$     $III:CH_3(CH_2)_{11}OSO_3^- Na^+$

B. $I:CH_3(CH_2)_{11}OSO_3^- Na^+$     $II:CH_3OH$     $III:KCl$

C. $I:KCl$     $II:CH_3(CH_2)_{11}OSO_3^- Na^+$     $III:CH_3OH$

D. $I:CH_3OH$     $II:KCl$     $III:CH_3(CH_2)_{11}OSO_3^- Na^+$
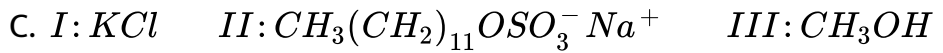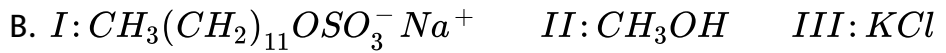
**Answer: D**

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**13.** The correct statement(s) about surface properties is (are)

A. The critical temperatures of ethane and nitrogen of same amount of activated charcoal at a given temperature.

B. Cloud is an emulsion type of colloid in which liquid is dispersed phase and gas is dispersion medium.

C. Adsorption is accompanied by decrease in enthalpy and decrease in entropy of the system.

D. Brownian motion of colloidal particles does not depend on the size of the particles but depends on viscosity of the solution.

**Answer: A::C**

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**Exercise 3 Part Ii Jee Main**

**1.** Which one of the following characteristics 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

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2. 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**

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**3.** The volume of a colloidal particle $V_C$ as compared to the volume

of a solute particle in a true solution $V_S$ could be

A. ~1

B. ~$10^{23}$

C. ~$10^{-3}$

D. ~$10^{3}$

**Answer: D**

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**4.** 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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**5.** Gold numbers of protective colloids A, B, C and D are 0.50, 0.01, 0.10 and 0.005 respectively. The correct order of their protective powers 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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**6.** Which of the following statements is incorrect regarding physiosorptions ?

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 ( $\triangle H_{adsorption}$) is low and positive.

D. It occurs because of van der Waal's forces.

**Answer: C**

**7.** According to Freundlich adsorption isotherm, which of the following is correct?

A. $\dfrac{x}{m} \propto p^0$

B. $\dfrac{x}{m} \propto p^1$

C. $\dfrac{x}{m} \propto p^{1/n}$

D. All the above are correct for different ranges of pressure

Answer: D

**8.** The coagulating power of electrolytes having inos $Na^{\oplus}$, $Al^{3+}$ and $Ba^{2+}$ for arsenic sulphide sol increases in the order

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

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

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

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

Answer: B

**9.** 3 gram of activated charcoal was added to 50 mL of acetic acid solution (0.06N) in a flask. After an hour it was filtered and the strength of the fitrate was found to be 0.042 N. The amount of acetic acid adsorbed (per gram of charcoal) is :

A. $18mg$

B. $36mg$

C. $42mg$

D. $54mg$

**Answer: A**

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**10.** For a linear plot of log(x/m) versus log p in a Freundlich adsorption isotherm, which of the following statements is correct ?

(k and n are constants)

A. 1/n appears as the intercept

B. Only 1/n appears as the slope.

C. log(1/n) appears as the intercept.

D. Both k and 1/n appear in the slope term.

Answer: B

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11. The Tyndall effect is observed only when following conditions are satisfied :

(a) The diameter of the dispersed particles is much smaller than the wavelength of the light used.

(b) The diameter of the dispersed particles is not much smaller than the wavelength of the light used

(c) The refractive indices of the dispersed phase and dispersion medium are almost similar in magnitude.

(d) The refractive indices of the dispersed phase and dispersion medium differ greatly in magnitude.

A. (b) and (d)

B. (a) and (c)

C. (b) and (c)

D. (a) and (d)

**Answer: A**

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**12.** The following statement relate to the adsorption of gases on a solid surface. Identify the incorrect statement among them :

A. On adsorption decrease in surface energy appears as heat

B. Enthalpy of adsorption is negative

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

D. Entropy of adsorption is negative

Answer: C

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**13.** Under ambient conditions, which among the following surfactants will form micelles in aqueous solution at lowest molar concentration ?

A. $CH_3 - (CH_2)_8 - COO^- Na^+$

B. $CH_3(CH_2)_{11} \overset{\oplus}{N}(CH_3)_3 Br^-$

C. $CH_3 - (CH_2)_{13} - OSO_3^- Na^+$

D. $CH_3(CH_2)_{15}\overset{\oplus}{N}(CH_3)_3Br^-$
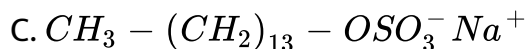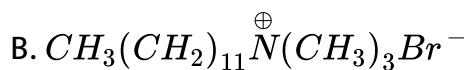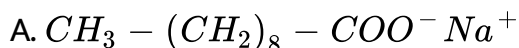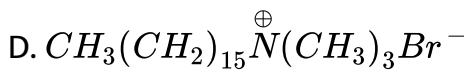
**Answer: D**

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14. The most appropriate method of making egg-albumin sol is :

A. Keep the egg in boiling water for 10 minutes. After removing

the shell, transfer the yellow part of the content to $100mL$ of

$5\%$ w/V saline solution and homogenize with a mechanical

shaker.

B. Break an egg carefully and transfer the transparent part of

the content to 100 mL of $5\%$ w/V saline solution and stir will.

C. Keep the egg in boiling water for 10 minutes. After removing

the shell, transfer the white part of the content to 100 mL of

5 % w/V saline solution and homogenize with a mechanical

shaker.

D. Break an egg carefully and transfer only the yellow part of the

content to 100 mL of 5 % w/V saline solution and stir well.

**Answer: B**

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15. A particular adsorption process has the following characteristics

: (i) It arises due to vander Waals forces and (ii) it is reversible.

Identify the correct statement that describes the above adsorption

process :

A. Enthalpy is adsorption is greater than $100 kJmol^{-1}$.

B. Adsorption is monolayer.

C. Adsorption increases with increase in temperature.

D. Energy of activation is low.

**Answer: D**

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16. Gold numbers of some colloids are :

Gelatin : 0.005 - 0.01 , Gum Arabic : 0.15 - 0.25, Oleate : 0.04 - 1.0,

Starch : 15 - 25.

Which among these is a better protective colloid ?

A. Gelatin

B. Starch

C. Gum Arabic

D. Oleate

**Answer: A**

**17.** Among the following, correct statement is :

A. One would expect charcoal to adsorb chlorine more than hydrogen sulphide

B. Sols metal sulphides are lyophilic

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

D. Brownian movement is more pronounced for smaller particels than for bigger - particles.

**Answer: D**

**18.** Adsorption of a gas on a surface follows Freundlich adsorption isotherm. Plot of $\log \dfrac{x}{m}$ versus log P gives a straight line with slope equal to 0.5, then :

($\dfrac{x}{m}$ is the mass of the gas adsorbed per gram of adsorbent)

    A. Adsorption is proportional to the pressure.

    B. Adsorption is proportional to the square root of pressure.

    C. Adsorption is proportional to the square of pressure.

    D. Adsorption is independent of pressure.

**Answer: B**

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**19.** Which of the following statements about colloids is False ?

A. When silver nitrate solution is added to potassium iodide solution a negatively charged colloidal solution is formed.

B. Freezing point of colloidal solution is lower than true solution at same concentration of a solute.

C. Colloidal particles can pass through ordinary filter paper.

D. When excess of electrolyte is added to colloidal solution, colloidal particle will be precipitated.

Answer: B

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20. If x gram of gas is adsobed by m gram of adsorbent at pressure P the plot of log $\dfrac{x}{m}$ versus log P is linear .the slope of the plot is :

(n and k are constant and n $>$ 1)

A. $2k$

B. log k

C. n

D. $\dfrac{1}{n}$

**Answer: D**

---

**21.** Two compounds I and II are eluted by column chromatography (adsorption of $I > II$). Which one of the following is a correct statement ?

A. I movers faster and has higher $R_f$ value than II

B. II moves faster and has higher $R_f$ value than I

C. I moves slower and has higher $R_f$ value than II

D. II moves slower and has higher $R_f$ value than I

**Answer: B**

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**22.** Which one of the following is not a property of physical adsorption ?

A. Higher the pressure, more the adsorption

B. Greater the surface area, more the adsorption

C. Lower the temperature, more the adsorption

D. Unilayer adsorption occurs

**Answer: D**

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**23.** Adsorption of a gas follows Freundlich adsorption isotherm. In the given plot, x is the mass of the gas adsorbed on mass m of the adsorbent at pressure p. $\dfrac{x}{m}$ is proportional to :
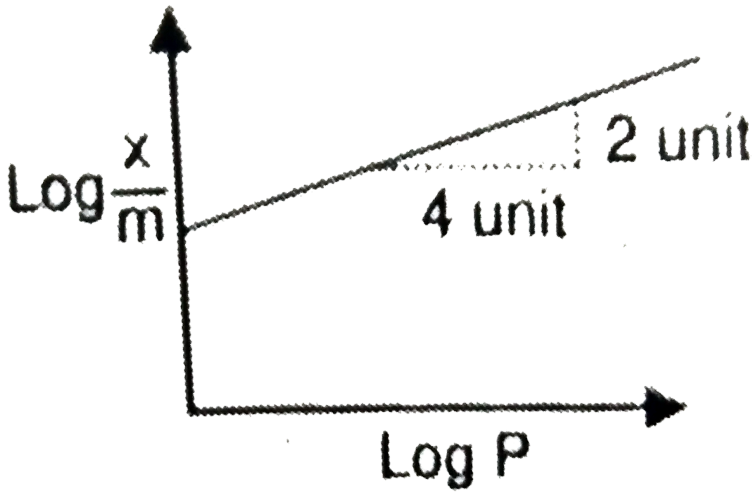


A. $p^2$

B. p

C. $p^{1/2}$

D. $p^{1/4}$

**Answer: C**

**24.** For coagulation of arsenious sulphide sol, which one of the following salt solution will be most effective ?

A. $Na_3PO_4$

B. $AlCl_3$

C. $BaCl_2$

D. $NaCl$
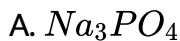
**Answer: B**

**25.** Which of the following is not an example of heterogeneous catalytic reaction ?

A. Ostwals's process

B. Haber's process

C. Combustion of coal

D. Hydrogenation of vegetable oils

**Answer: C**

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26. Haemoglobin and gold sol are examples of

A. negatively charged sols

B. positively charged sols

C. positively and negatively charged sols, respectively

D. negatively and positively charged sol, repectively

**Answer: C**

**27.** An example solid sol of

    A. Butter

    B. Hair cream

    C. Paint

    D. Gem stones

**Answer: D**

**28.** Among the colloids cheese (C), milk (M) and smoke (S), the correct combination of the dispered phase and dispersion medium, respectively is :

A. C : liquid in solid, M : liquid in liquid, S : solid in gas

B. C : solid in liquid, M : liquid in liquid, S : gas in solid

C. C : solid in liquid, M : solid in liquid, S : solid in gas

D. C : liquid in solid, M : liquid in solid, S : solid in gas

Answer: A

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29.

Given

| Gas | $H_2$ | $CH_4$ | $CO_2$ | $SO_2$ |
|---|---|---|---|---|
| Critical Temperature $/K$ | 33 | 190 | 304 | 630 |

On the basis of data given above, predict which of the following

gases shows least adsorption on a definite amount of charcoal ?

A. $CH_4$

B. $H_2$

C. $CO_2$

D. $SO_2$

**Answer: B**

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30. Among the following, the false statement is :

A. It is possible to cause artificial rain by throwing electrified

sand carrying charge opposite to the one on clouds from an

aeroplane.

B. Lyophilic solution can be coagulated by adding an electrolyte

C. Latex is a colloidal solution of rubber particles which are

positively charged

D. Tyndall effect can be used to distinguish between a colloidal

solution and a true solution

**Answer: C**

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**Additional Problems For Self Practice**

**1.** For adsorption of a gas on a solid, the plot of log (x/m) Vs log P is

linear with a slope equal to :

[n being a whole number]

A. K

B. log k

C. n

D. 1/n

**Answer: D**

**Part I Practice Test 1 Iit Jee Main Pattern**

**1.** 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**

**2.** On passing light from collidal solution, the effect due to scattering of light is known as :

A. Electrophoresis

B. Tyndall effect

C. Electro osmosis

D. Coagulation

Answer: B

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**3.** Tyndall effect is shown by :

A. Colloid

B. True solution

C. Suspension

D. all of these

**Answer: A**

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**4.** Milk is an example of :

    A. True solution

    B. Gel

    C. Suspension

    D. Emulsion

**Answer: D**

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**5.** 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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**6.** Which of the following electrolytes will be most effective in the coagulation of gold sol :

A. $NaNO_3$

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

C. $Na_3PO_4$

D. $MgCl_2$
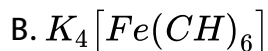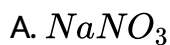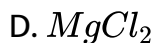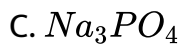
**Answer: D**

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**7.** The stability of lyophilic colloid is due to which of the following :

A. Charge on their particles

B. Large size of their particels

C. Small size of their particles

D. Solvation by dispersion medium

**Answer: D**

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**8.** A colloidal solution is subjected on electrical field. The particles move towards anode. The coagulation of the same solution is studied using $NaCl$, $BaCl_2$ and $AlCl_3$ solution. Their coagulating power should be

A. $NaCl > BaCl_2 > AlCl_3$

B. $BaCl_2 > AlCl_3 > NaCl$

C. $AlCl_3 > BaCl_2 > NaCl$

D. $BaCl_2 > NaCl > AlCl_3$
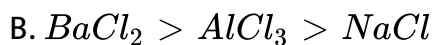
**Answer: C**

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

A. $KCl$

B. $KNO_2$

C. $K_2SO_4$

D. $K_3\left[Fe(CN)_6\right]$

**Answer: D**

▶ **Watch Video Solution**

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**10.** Fog is an example of colloidal system of :

A. Liquid dispersed in gas

B. Gas dispersed in gas

C. Solid dispersed in gas

D. Solid dispersed in liquid

**Answer: A**

**11.** The charge on $As_2S_3$ sol is due to the adsorbed :

A. $H^+$

B. $OH^-$

C. $O^{-2}$

D. $S^{-2}$

**Answer: D**

**12.** Sky looks blue due to

A. Dispersion

B. Reflection

C. Transmission

D. Scattering

Answer: D

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13. Tyndall effect will be mainly observed in :

A. Lyophilic colloid

B. Lyophobic colloid

C. True solution

D. Vapour

Answer: B

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**14.** 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. All of these

**Answer: C**

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**15.** For coagulating $As_2S_3$ colloidal sol, which of the following will

have the lowest coagulation value

A. $NaCl$

B. $KCl$

C. $BaCl_2$

D. $AlCl_3$

**Answer: D**

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**16.** Positive sol is :

A. Gold

B. Gelatin

C. $As_2S_3$

D. $Al_2(SO_4)_3$

**Answer: B**

**17.** Which one is a lyophobic colloid?

    A. Gelatin

    B. Starch

    C. Sulphur

    D. Gum arabic

**Answer: C**

**18.** 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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**19.** A colloidal solution of arsenious sulphide is most readily coagulated by the addition of a normal solution ?

A. $NaCl$

B. $CaCl_2$

C. $Na_3PO_4$

D. $Al_2(SO_4)_3$

**Answer: D**

**20.** A colloid always :

    A. Contains two phases

    B. Is a true solution

    C. Contains three phases

    D. Contains only water soluble particles

**Answer: A**

**21.** Which of the following ions has maximum flocculation value :

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

B. $Cl^-$

C. $SO_4^{2-}$

D. $PO_4^{3-}$
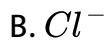
**Answer: B**

▶ **View Text Solution**

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**22.** 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**

**23.** 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**

**24.** A negative catalyst will

A. raise the energy of activation for a given reaction

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

C. catalyst the backward reaction more than the forward one, thereby shifting equilibrium backward.

D. none of these

**Answer: B**

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25. A liquid is found to scatter a beam of light but leaves no residue when passed through filter paper. The liquid can be described as

A. a suspension

B. Oil

C. a colloidal sol

D. a true solution

**Answer: C**

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26. Which of the following kinds of catalysis can be explained by the adsorption theory ?

A. heterogeneous catalysis

B. enzyme catalysis

C. homogeneous catalysis

D. acid base catalysis

**Answer: A**

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

(i) x/m = constant

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

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

A. All are correct

B. All are wrong

C. (ii) is correct

D. (iii) is correct

**Answer: C**

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

A. vander Waals forces

B. covalent bonding

C. hydrogen bonding

D. All of these

**Answer: A**

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**29.** The equation for Freundlich adsorptin 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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## Part Ii National Standard Examination In Chemistry Stage 1

**1.** Smoke is a colloidal sol of

A. Gas dispersed in a solid

B. solid dispersed in a gas

C. solid dispersed in a liquid

D. gas dispersed in a liquid

**Answer: B**

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**2.** A catalyst :

    A. alters the reaction mechanism

    B. decreases the activation energy

    C. increases the average kinetic energy of reacting molecule

    D. increases the frequency of collisions of reacting species

**Answer: B**

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**3.** The colloidal system in which the disperse phase and dispersion medium are both liquids is known as :

    A. an emulsion

    B. an areosol

C. gel

D. a foam

**Answer: A**

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**4.** Soaps essentially form a colloidal solution in water and remove the greasy matters by :

A. adsorption

B. emulsification

C. coagulation

D. absorption

**Answer: B**

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**5.** Swimming for a long time in salt water makes the skin of one's finger tips wrinkled. Which one of the following properties is responsible for this observation ?

A. osmosis

B. dialysis

C. electrodialysis

D. coagulation

**Answer: A**

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**6.** Tyndal effect in a colloid is due to

A. interference of light

B. defraction of light

C. reflection of light

D. scattering of light.

**Answer: D**

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7. Ferric chloride is applied to stop bleeding cut because

A. $Fe^{3+}$ coagulates blood which is a positively charged sol

B. $Fe^{3+}$ coagulates blood which is a negatively charged sol

C. $Cl^-$ coagulates blood which is a positively charged sol

D. $Cl^-$ coagulates blood which is negatively charged sol

**Answer: B**

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**8.** A catalyst is a substance which

    A. accelerates the rate of reaction

    B. does not influence the rate of reaction

    C. changes the equilibrium position

    D. does not alter the energy of activation of the reaction

**Answer: A**

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**9.** In nature, ammonia is synthesisd by nitrifying bacteria using enzymes while in industry it is manufactured from $N_2$ and $H_2$ using iron oxide catalyst at $550^\circ C$. Under the same industrial conditions, enzymes cannot be used because

A. enzymes get deactivated at high temperature

B. enzymes catalyze reactions only in living systems

C. the reaction becomes vigorous and uncontrollable

D. the enzymes use nitrates in place of $N_2$.

**Answer: A**

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**10.** A catalyst increases the

A. rate of forward reaction only

B. free energy change in the reaction

C. rates of both forward and reverse reactions

D. equilibrium constant of the reaction.

**Answer: C**

**11.** A soap solution in water removes greasy substances by

    A. adsorption

    B. peptization

    C. coagulation

    D. emulsifiction

**Answer: D**

**12.** Smoke is an example of

    A. sol

B. aerosol

C. emulsion

D. gel

**Answer: B**

> ▶ **Watch Video Solution**

**13.** A catalyst speeds up a chemical reraction by

A. shifting the equilibrium

B. increasing the activation energy

C. initiating the reaction

D. decreasing energy of activation

**Answer: D**

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**14.** The plot representing Langmuir's adsorption isotherm is :
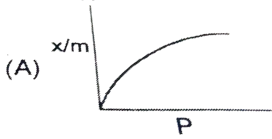
A.
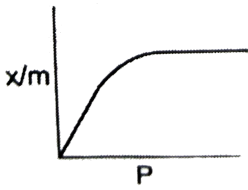

B.
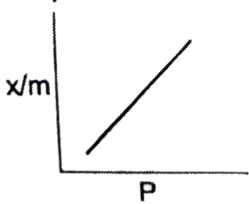

C.


D.
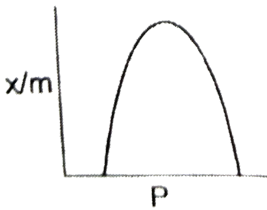

**Answer: B**

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**15.** Frendlich adsorption isotherms are properly represented as in



(A) $x/m$ — curves labelled 273 K, 245 K, 195 K, axis $P\rightarrow$

A.

(B) $x/m$ — curves labelled 273 K, 245 K, 195 K, axis $P\rightarrow$

B.

(C) $x/m$ — curves labelled 195 K, 245 K, 273 K, axis $P\rightarrow$

C.

(D) $x/m$ — curves labelled 195 K, 245 K, 273 K, axis $P\rightarrow$

D.
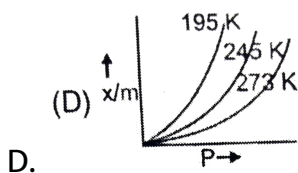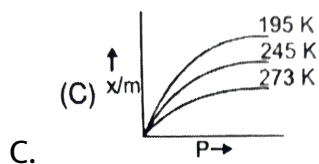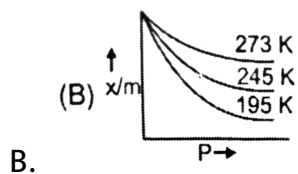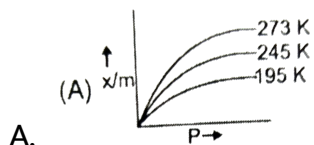
**Answer: C**

**16.** A gold sol is prepared by :

   A. dissolving gold in Aqua-regia and precipitation by dilution

   B. double decomposition of $AuCl_3$

   C. Bredy's arc method

   D. grinding in a colloidal mill

**Answer: C**

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**17.** Effective electrolyte to cause the flocculation of a negatively charged arsenium sulphide colloid is :

   A. $NaCl$

   B. $BaCl_2$

C. $K_3Fe(CN)_6$

D. $AlCl_3$
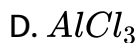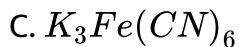
**Answer: D**

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**18.** A catalyst is a substance that :

A. undergoes chemical change to accelerate the rate of the reaction

B. decreases the energy of activation of the reaction

C. increases the kinetic energy of the reaction

D. lowers the potential energy of the products with respect to that of the reactants.

**Answer: B**

**19.** Which of the following reaction parameters will change due to addition of a catalyst ?

    A. Free energy

    B. Only equilibrium constant

    C. Only rate constant

    D. Both equilibrium constant and rate constant

**Answer: C**

**20.** In electrophoresis,

    A. the colloidal particles migrate in an applied electric field.

B. the medium migrates in applied electric field

C. both colloidal particles and the medium migrate.

D. neither the particles not the medium migrate.

**Answer: A**

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**21.** 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 :
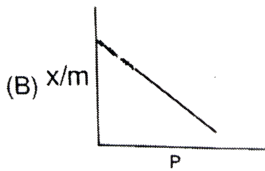
A. $1.05g$

B. $0.0131g$

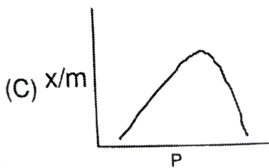C. $1.31g$

D. $0.131g$

**Answer: C**

22. The mass of argon adsorbed per unit mass of carbon surface is plotted against pressure. Which of the following plots is correct if x and m represent the masses of argon and carbon respectively ? (.......... Represents extrapolated data)
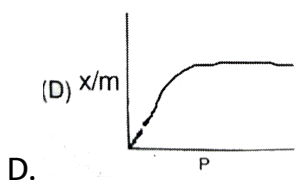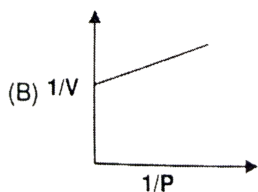
(A) x/m

A.

(B) x/m

B.

(C) x/m
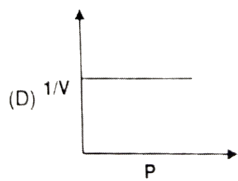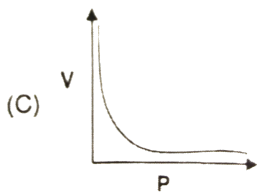
C.

(D) x/m

D.
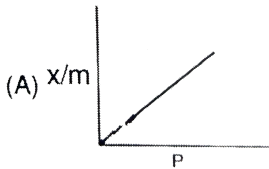
**Answer: D**

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**23.** An adsorption isotherm equation proposed by Langmuir is of the form $V = \dfrac{V_0 bPO}{(1 + bP)}$ where V is the volume of gas adsorbed at pressure P. For a given adsorbate/adsorbent system, $V_0$ and b are constants. The dependence of V on P can be depicted as

A. 



(B) 1/V

B.      1/P

(C)

C.



(D) 1/V

D.

**Answer: B**

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## Part Iii High Level Problems

**1.** A $1cm \times 1cm$ square paper coated with a suitable adsorbent on both sides. The paper is dipped in a aqueous solution of glucose of volume 20 mL and concentration 20 ppm. Final concentration glucose was dropped to 19 ppm due to adsorption. Find the number of glucose particles per unit area of the paper.

**2.** When 9.0 ml of arsenius sulphide sol and 1.0 ml of $1.0 \times 10^{-4} M BaCl_2$ are mixed, turbidity due to precipitation just appears after 2 hours. Find the coagulating value of the effective ion.

## Only One Option Correct Type

**1.** Some type of gels like gelatin loose water slowly. The process is known as :

    A. Synerisis

    B. Thixotropy

C. Peptisation

D. Imbibition

**Answer: A**

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**2.** Select correct statement (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**

**3.** 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**

**4.** The stabilisation of a lyophobic colloid is due to :

    A. preferential adsorption of similar charged particle on colloids

       surface.

    B. interaction between dispersed phase and dispersion medium

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

    D. the viscosity of the medium.

**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**

**6.** Graph between $\log x / m$ and $\log p$ is a straight line inclined at an angle of $45°$ . When pressure is $0.5 atm$ and $1nk = 0.693$, the amount of solute adsorbed per gram of adsorbent will be:

A. 1

B. 1.5

C. 0.25

D. 2.5

**Answer: A**

**7.** The coagulation of $200mL$ of a positive colloid took place when $0.73gHCl$ was added to it without changing the volume much. The flocculation value of $HCl$ for the colloid is

a. 36.5 , b. 100 , c. 200 , d. 150

A. 0.36

B. 36.5

C. 100

D. 150

**Answer: C**

Single And Double Value Integer Type

**1.** 0.02 g of gelatin is required to protect 10 mL of gold sol from 10 % $NaCl$, then find the gold number for gelatin. Report your answer by multiplying by 100.

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**One Or More Than One Options Correct Type**

**1.** The incorrect statements are -

A. For coagulation of $As_2S_3$ sol, +ve ions are effective.

B. For coagulation of aluminium hydroxide sol $Ba^{2+}$ ions are more effective than $Na^+$

C. Cellulose solution is an example of multimolecular colloid system

D. Colloidal sol of metals such as gold, silver etc are prepared by

   Bredig's arc method.

**Answer: B::C**

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**2.** An example of extrinsic colloid (lyophobic colloids) is :

   A. $As_2S_3$ sol

   B. $Fe(OH)_3$ sol

   C. Egg albumin

   D. Au sol

**Answer: A::B::D**

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**3.** Which of the following are the characteristic of chemisorption :

A. Multilayer adsorption

B. Exothermic nature

C. Strong adsorption by adsorption sites

D. Irreversible

**Answer: B::C::D**

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**4.** 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 adsorbed 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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**5.** 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**

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**6.** Which of the following statements is 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: B::C::D**

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**7.** Which one of the following statements is/are not 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: B::C::D

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**Part Iv Practice Test 2 Iit Jee Advanced Pattern Section 1**

**1.** An arsenious sulphide sol carries a negative charge . The maximum precipitating power for this sol is possessed by
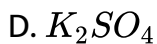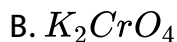
A. $K_2SO_4$

B. $CaCl_2$

C. $Na_3PO_4$

D. $AlCl_3$
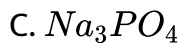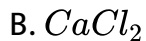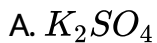
**Answer: D**

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**2.** According to Hardy - Schulze rule, the coagulating power of cation follows the order :

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**

**3.** Which of the following ielectrolytes is least effective in causing flocculation of ferric hydroxide sol?

A. $K_4\left[Fe(CN)_6\right]$

B. $K_2CrO_4$

C. $KBr$

D. $K_2SO_4$
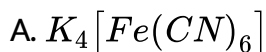
**Answer: C**

**4.** Lyophobic colloids are :

A. Reversible colloids

B. Irreversible colloids

C. Protective colloids

D. Gum proteins

**Answer: B**

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**5.** which among the following statement is false ?

A. Increase of pressure increases the amount of adsorption.

B. Increase of temperature may decrease the amount of adsorption.

C. The adsorption may be monolayered or multilayered.

D. Particle size of the adsorbent will not effect the amount of adsorption.

**Answer: D**

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**6.** (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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**7.** Identify the correct statement regarding enzymes.

   A. Enzymes are specific biological catalysts that can normally

   function at very high tempt. $(T \approx 1000K)$

   B. Enzymes are normally heterogeneous catalysts that are very

   specific in action

   C. Enzymes are specific biological catalysts that can not be

   poisoned

   D. Enzymes are non-biological catalysts.

**Answer: B**

**Section 2**

1. Which of the following statements is 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 effect the overall enthalpy change of the reaction.

**Answer: A::B::D**

**2.** Which of the following statements 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 these

**Answer: A**

**3.** 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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**4.** The incorrect statements are -

A. For coagulation of $As_2S_3$ sol, +ve ions are effective.

B. For coagulation of aluminium hydroxide sol $Ba^{2+}$ ions are more effective than $Na^+$

C. Cellulose solution is an example of multimolecular colloid system

D. Colloidal sol of metals such as gold, silver etc are prepared by Bredig's arc method.

**Answer: B::C**

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**5.** Select CORRECT statements :

A. Langmuir adsorption isotherm is expected to be applicable at low gas pressure and moderately high temperature.

B. The rate of an enzyme catalysed reaction depends upon enzyme concentration.

C. A negative catalyst raises the activation energy barrier of a reaction and thus reduces its rate.

D. In physisorption gases having higher critical temperature are adsorbed to a greater extent than those with lower critical temperature.

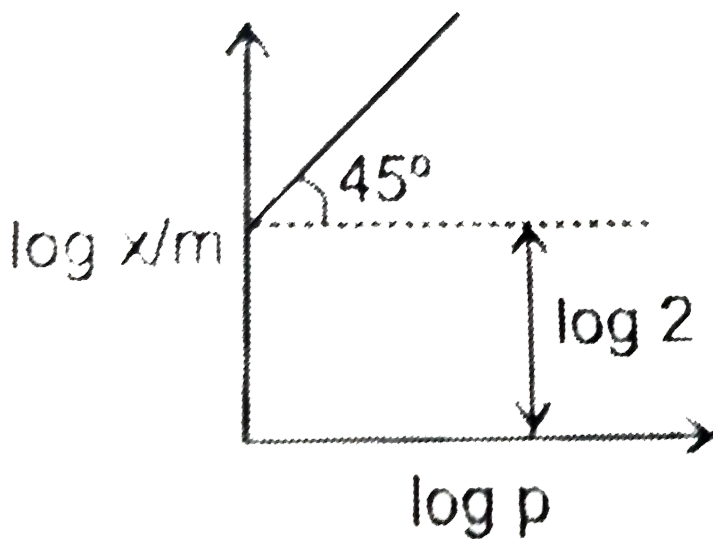**Answer: A::B::D**

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**Section 3**

**1.** On addition of $1mL$ 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?

**2.** At 2 atm pressure the value of $\dfrac{x}{m}$ will be : (log 2 = 0.3010)

**3.** 1 L of 0.6 M acetic acid is shaken with 2 g activated carbon. Activated carbon adsorbs some acetic acid on its surface only. This process is called adsorption. The final concentration of the solution after adsorption is 0.5 M. What is the amount of acetic acid adsorbed per gram of carbon.

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**4.** A detergent $(C_{12}H_{25}SO_4Na)$ solution becomes a colloidal solution at a concentration of $10^{-3}$ mol/lit. On an average $10^{13}$ colloidal particles are present in $1mm^3$ what is average number is $C_{12}H_{25}SO_4Na$ in one colloidal particle ?

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**5.** For the coagulation of 200 mL of $As_2S_3$ solution, 10 mL of 1 M NaCl is required. What is the coagulating value of NaCl.

**6.** A solution of palmitic acid (Molar mass = 256) in Benzene contain 5.12 g of acid per litre of solution. When this solution is dropped on a water surface, the Benzene evaporates and acid forms a monolayer film of solid type. If $500cm^2$ are is to be covered by a monolayer, then find X, where $X = \dfrac{V}{100}$, when V is volume required of solution. The area covered by 1 molecule $= 0.2nm^2$.

Section 4

**1.** 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.

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 these

Answer: B

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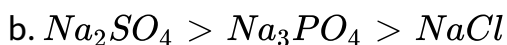
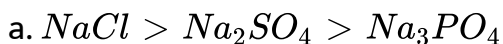slight excess of $AgNO_3$ are mixed together . Then :

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
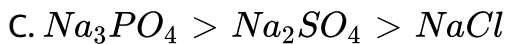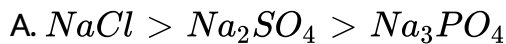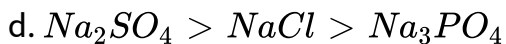
D. A true solution will be obtained

**Answer: C**

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**3.** Under the influemce 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 coagulation values will 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. $Na_2SO_4 > NaCl > Na_3PO_4$

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**

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**Section 5**

**1.** Match list I with list II and select the correct answer :

| | List I | | List II |
|---|---|---|---|
| P | Coagulation | 1. | Scattering of light |
| Q | Dialysis | 2. | Formation of colloidal solution from precipitates. |
| R | Peptization | 3. | Purification of colloids |
| S | Tyndall effect | 4. | Accmulation of collidal sols |

A.
| P | Q | R | S |
|---|---|---|---|
| 3 | 4 | 1 | 2 |

B.
| P | Q | R | S |
|---|---|---|---|
| 1 | 2 | 4 | 3 |

C.
| P | Q | R | S |
|---|---|---|---|
| 3 | 3 | 2 | 1 |

D.
| P | Q | R | S |
|---|---|---|---|
| 2 | 3 | 1 | 4 |

**Answer: C**

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