Ordinary Thinking

Objective Questions

Adsorption and Adsorption isotherm

1. Chemisorption
(a) Involves the weak attractive interactions between adsorbent and adsorbate
(b) Is irreversible in nature
(c) Decreases with increase of temperature
(d) Involves multilayer formation of adsorbent on adsorbate

2. Chemisorption
(a) Increases with temperature
(b) Decreases with temperature
(c) Remains unaffected by change of temperature
(d) Either increases or decreases with temperature

3. Which among the following statement is false **[KCET (Med.) 2002]**
(a) The adsorption may be monolayered or multilayered
(b) Particle size of adsorbent will not affect the amount of adsorption
(c) Increase of pressure increases amount of adsorption
(d) Increase of temperature may decrease the amount of adsorption

4. Wood charcoal is used to decolourise sugar because it **[CPMT 2002]**
(a) Adsorbs coloured material
(b) Absorbs decolorised material
(c) Reduces coloured material
(d) None of these

5. If the absorbate is held on a surface by weak Vander Waal's forces, the absorption process is called **[Kerala (Med.) 2002]**
(a) Physical adsorption (b) Chemical adsorption
(c) Heat of adsorption (d) Enthalpy of adsorption

6. When the temperature is raised, the viscosity of liquid decreases, this is because **[Kerala (Med.) 2002]**
(a) Decreased volume of the solution
(b) Increase in temperature increases the average kinetic energy of molecules, which overcome the attractive force between them
(c) Decreased covalent and hydrogen bond forces
(d) Increased attraction between molecules

7. A solid acts as an adsorbent because it has
(a) A definite shape
(b) Small pores in it
(c) Unsaturated valencies
(d) A high lattice energy

8. Point out the wrong statement :
Physical adsorption is characterised by
(a) Attraction due to weak Vander Waal's forces
(b) Irreversible nature of adsorption
(c) Multimolecular adsorption layers
(d) Decrease in adsorption with increase in temperature

9. When the temperature is lowered and pressure is raised, the adsorption of a gas on a solid **[MP PMT 1997]**
(a) Decreases
(b) Increases
(c) Remains unaffected
(d) Decreases first then increases

10. In physical adsorption, the gas molecules are held on solid surface by **[MP PET 1996; AIIMS 1998]**
(a) Chemical forces (b) Electrostatic forces
(c) Gravitational forces (d) Vander Waal's forces

11. Adsorption is multilayer in the case of **[MP PET 1999]**
(a) Physical adsorption (b) Chemisorption
(c) Both (d) None of both

12. Physical adsorption
(a) Involves the weak attractive interaction between the adsorbent and adsorbate
(b) Involves the chemical interactions between the adsorbent and adsorbate
(c) Is irreversible in nature
(d) Increases with increase of temperature

13. The charge on As_2S_3 sol is due to the adsorbed **[MP PMT 1985]**
(a) H^+ (b) OH^-
(c) O^{2-} (d) S^{2-}

14. In the adsorption of acetic acid on activated charcoal, the acetic acid is an **[MP PET 1994; MP PMT 2002]**
(a) Adsorber (b) Absorber
(c) Adsorbent (d) Adsorbate

15. Sticking of one substance at the surface of another is called
(a) Absorption (b) Chemisorption
(c) Adsorption (d) Desorption

16. The charge on colloidal particles is due to
(a) Presence of electrolyte
(b) Very small size of particles
(c) Adsorption of ions from the solution
(d) None of these

17. Which one of the following statement is not correct

(a) The extent of adsorption depends on the nature of the adsorbent and adsorbate

(b) The extent of adsorption depends on the pressure of the gas

(c) The extent of adsorption depends on the temperature

(d) The extent of adsorption has no upper limit

18. For the adsorption of a gas on a solid, the plot of log (x/m) versus log P is linear with slope equal to **[CBSE PMT 1994]**

(a) k (b) log k

(c) n (d) $1/n$

19. According to Langmuir adsorption isotherm, the amount of gas adsorbed at very high pressures **[MP PMT 1993]**

(a) Reaches a constant limiting value

(b) Goes on increasing with pressure

(c) Goes on decreasing with pressure

(d) Increases first and decreases later with pressure

20. Which of the following statement is not correct **[MP PET 1993]**

(a) Physical adsorption is due to Vander Wall's forces

(b) Chemical adsorption decreases at high temperature and low pressure

(c) Physical adsorption is reversible

(d) Adsorption energy for a chemical adsorption is generally greater than that of physical adsorption

21. In adsorption of oxalic acid on activated charcoal, the activated charcoal is known as

(a) Adsorbent (b) Absorbate

(c) Adsorber (d) Absorber

22. Adsorption is phenomenon is which a substance

(a) Goes into the body of the other substance

(b) Remains close the other substance

(c) Accumulates on the surface of the other substance

(d) None of these

23. Physical adsorption is essentially quite appreciable

(a) At room temperature (b)At higher temperature

(c) At lower temperature (d) None of these

24. Adsorption increase when

(a) Temperature increases

(b) Temperature decreases

(c) Temperature remains constant

(d) None of these

25. In chemical adsorption, how many layers are adsorbed **[MP PMT 1996]**

(a) One (b) Two

(c) Multi (d) Zero

26. The adsorption of a gas on a solid surface varies with pressure of the gas in which of the following manner **[CPMT 1999]**

(a) Fast $\rightarrow$ slow $\rightarrow$ independent of the pressure

(b) Slow $\rightarrow$ fast $\rightarrow$ independent of the pressure

(c) Independent of the pressure $\rightarrow$ fast $\rightarrow$ slow

(d) Independent of the pressure $\rightarrow$ slow $\rightarrow$ fast

27. Which of the following statements is not applicable to chemisorption **[KCET (Med.) 1999; BHU 2000]**

(a) It is slow

(b) It is irreversible

(c) It is highly specific

(d) It is independent of temperature

28. Adsorption is always **[DPMT 2000]**

(a) Endothermic (b) Exothermic

(c) Either (a) or (b) (d) None of these

29. The colloidal system consisting of a liquid adsorbent in a solid adsorbate is termed as

(a) Aerosol (b) Sol

(c) Foam (d) Gel

30. Which one of the following substances adsorb hydrogen gas most strongly

(a) Activated carbon (b) Silica gel

(c) Platinum black (d) Iron powder

31. According to the adsorption theory of catalysis, the speed of the reaction increases because **[CBSE PMT 200**

(a) Adsorption lowers the activation energy of the reaction

(b) The concentration of reactant molecules at the active centres of the catalyst becomes high due to adsorption

(c) In the process of adsorption, the activation energy of the molecules becomes large

(d) Adsorption produces heat which increases the speed of the reaction

32. In Freundlich adsorption, isotherm adsorption is proportional to pressure P as

(a) P^0 (b) P

(c) P^n (d) $P^{1/n}$

33. 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

34. Which of the following is not a characteristic of chemisorption **[KCET 2003]**

(a) ΔH is of the order of 400 kJ

(b) Adsorption is irreversible

(c) Adsorption may be multimolecular layer

(d) Adsorption is specific

35. The viscosity of the solvent depends on

[Kerala (Med.) 2002]

(a) Isothermic nature
(b) Solute - solute interaction
(c) Solute - solvent interaction
(d) Density of the liquid

36. Which of the following kinds of catalysis can be explained by the adsorption theory ? [MP PET/PMT 1998]

(a) Homogeneous catalysis (b)Acid base catalysis
(c) Heterogeneous catalysis (d) Enzyme catalysis

37. Adsorption due to strong chemical forces is called [KCET (Med.) 2001]

(a) Chemisorption (b) Physiosorption
(c) Reversible adsorption (d) Both (b) and (c)

38. In neutralisation of KI by $AgNO_3$ positive charge is due to absorption of [AMU 2000]

(a) Ag^+ ions (b) Ag
(c) I ions (d) Both (b) and (c)

39. Physical adsorption is inversely proportional to the [AFMC 2000]

(a) Volume (b) Concentration
(c) Temperature (d) All of these

40. 50 *ml* of 1 *M* oxalic acid is shaken with 0.5 *gm* of wood charcoal. The final concentration of the solution after adsorption is 0.5 *M*. Amount of oxalic acid absorbed per *gm* of charcoal is

(a) 3.45 *gm* (b) 3.15 *gm*
(c) 6.30 *gm* (d) None

41. Noble gases are adsorbed by [DCE 2004]

(a) Anhydrous calcium chloride
(b) Ferric hydroxide
(c) Conc. H_2SO_4
(d) Activated coconut charcol

42. Animal charcoal is used in decolourising colour of liquids because it is a good

(a) Adsorbate (b) Adsorbent
(c) Oxidising agent (d) Reducing agent

43. What will be the effect of increase in temperature on physical adsorption [Pb. CET 2000]

(a) It will decrease
(b) It will increase
(c) First increase then decrease
(d) None of these

44. 0.2 *gm* of fine animal charcoal is mixed with half litre of acetic acid solution and shaken for 30 minutes [DPMT 2004]

(a) Concentration remains same
(b) Concentration increases
(c) Concentration of the solution decrease
(d) None of these

45. The equation for Freundlich adsorption isotherm is [MHCET 2004]

(a) $\frac{x}{m} = kp^{1/n}$ (b) $x = mkp^{1/n}$
(c) $x/m = kp^{-n}$ (d) All of these

46. The extent of adsorption of a gas on a solid depends on [KCET 2005]

(a) Nature of the gas (b) Pressure of the gas
(c) Temperature of the gas (d)

47. Activated charcoal is used to remove colouring matter from pure substances. It works by [KCET 2005]

(a) Oxidation (b) Reduction
(c) Bleaching (d) Adsorption

Catalyst and Catalysis

1. Mark the correct statement in a reversible reaction [CPMT 1974; EAMCET 1978, 79; MP PMT 1993]

(a) The catalyst catalyses the forward reaction
(b) The catalyst catalyses the backward reaction
(c) The catalyst influences the direct and the reverse reaction to the same extent
(d) The catalyst increases the rate of forward reaction and decreases the rate of backward reaction

2. A catalyst is used [MP PET 2004] [CPMT 1989]

(a) Only for increasing the velocity of the reaction
(b) For altering the velocity of the reaction
(c) Only for decreasing the velocity of the reaction
(d) All (a), (b) and (c) are correct

3. A catalyst is a substance which [NCERT 1981; CPMT 1996]

(a) Alters the equilibrium in a reaction
(b) Is always in the same phase as the reactants
(c) Participates in the reaction and provides easier pathway for the same
(d) Does not participate in the reaction but speeds it up

4. In Haber's process for the manufacture of ammonia [AMU 1984; CPMT 1974, 90]

(a) Finely divided iron is used as catalyst
(b) Finely divided molybdenum is used as catalyst
(c) Finely divided nickel is used as catalyst
(d) No catalyst is necessary

5. When $KClO_3$ is heated, it decomposes into $KCl + O_2$. If some MnO_2 is added, the reaction goes much faster because [CPMT 1971,76,80,94]

(a) MnO_2 decomposes to give O_2
(b) MnO_2 provides heat by reacting
(c) Better contact is provided by MnO_2
(d) MnO_2 acts as a catalyst

6. In the reaction $2SO_2 + O_2 \xrightarrow[As_2O_3]{Pt} 2SO_3$, As_2O_3 acts as a

[MP PET 1995]

(a) Autocatalyst (b) Poison

(c) Promotor (d) Positive catalyst

7. Reactions in Zeolite catalysts depend on **[BHU 2000]**

(a) Pores (b) Apertures

(c) Size of cavities (d) All of these

8. What is the role of a catalyst in a catalysed reaction

[MP PMT 1996; Pb. PMT 2000;UPSEAT 2001,02]

(a) Lowers the activation energy

(b) Increases the activation energy

(c) Affects the free energy change

(d) Affects the enthalpy change

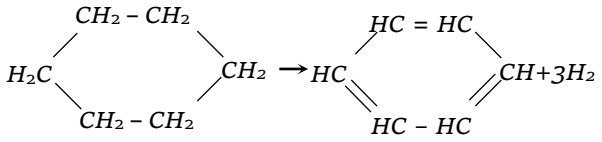
9. The catalyst used in the lead chamber process of sulphuric acid manufacture is

[CPMT 1977]

(a) Platinum (b) Oxide of nitrogen

(c) Nickel (d) Vanadium compounds

10. In the following reaction the catalyst used is



[AMU (Engg.) 1999]

(a) Al_2O_3 (b) Cr_2O_3

(c) Cr_2O_3 and Al_2O_3 (d) Zn dust

11. Enzymes with two sites are called **[AIIMS 2002]**

(a) Apoenzyme (b) Holoenzyme

(c) Allosteric enzyme (d) Conjugate enzyme

12. Which of the following types of metals make the most efficient catalysts **[DPMT 1985]**

(a) Alkali metals (b) Transition metals

(c) Alkaline–earth metals (d)Radioactive metals

13. An example of autocatalytic reaction is **[NCERT 1983]**

(a) The decomposition of nitroglycerine

(b) Thermal decomposition of $KClO_3$ and MnO_2 mixture

(c) Break down of ${}_6C^{14}$

(d) Hydrogenation of vegetable oil using nickel catalysts

14. In the case of auto catalysis

(a) Solvent catalyses

(b) Product catalyses

(c) Reactant catalyses

(d) Heat produced in the reaction catalyses

15. In a reversible reaction, a catalyst will affect the rate of

[KCET (Med.) 2002]

(a) Forward reaction

(b) Reverse reaction

(c) Forward and reverse reaction

(d) Neither (a) nor (b)

16. The role of a catalyst in a reversible reaction is to

[KCET (Med.) 2001]

(a) Increase the rate of forward reaction

(b) Decrease the rate of backward reaction

(c) Alter the equilibrium constant of the reaction

(d) Allow the equilibrium to be achieved quickly

17. The catalyst used in the contact process for manufacturing of sulphuric acid is **[MP PMT 1987]**

(a) Copper (b) Iron/aluminium oxide

(c) Vanadium pentoxide (d) Platinized asbestos

18. For the functioning of enzymes which of the following statements is not correct **[MP PMT 2000]**

(a) An optimum temperature is needed

(b) An optimum pH is needed

(c) They are substrate specific

(d) They always increase activation energy

19. When a catalyst is added to a system the **[JIPMER 2000]**

(a) Value of equilibrium constant is decreased

(b) The rate of forward reaction is increased and that of backward reaction is decreased

(c) Equilibrium concentrations are unchanged

(d) Equilibrium concentrations are increased

20. A catalyst can affect reversible reaction by **[CPMT 2002]**

(a) Changing equilibrium

(b) Slowing forward reaction

(c) Attaining equilibrium in both direction

(d) None of these

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

In this reaction, dilute H_2SO_4 is called **[AFMC 1997]**

(a) Homogeneous catalysis (b)Homogeneous catalyst

(c) Heterogeneous catalysis (d)Heterogeneous catalyst

22. Which one of the following statement is wrong in case of enzyme catalysis **[MP PMT 1985, 2001]**

(a) Enzymes work best at an optimum temperature

(b) Enzymes work at an optimum pH

(c) Enzymes are highly specific for substances

(d) An enzyme raises activation energy

23. Which of the following catalyses the conversion of glucose into ethanol

[CPMT 1983, 84; CBSE PMT 1989; KCET 1993]

(a) Zymase (b) Invertase

(c) Maltase (d) Diastase

24. Which of the following is used as a catalyst in the manufacture of toluene from benzene with CH_3Cl **[KCET (Med.) 2002]**

[CPMT 1985]

(a) Ni (b) Anhydrous $AlCl_3$

(c) Pd (d) Pt

25. Hydrolysis of ethyl acetate is catalysed by aqueous

[MP PMT 2002]

(a) Na_2SO_4 (b) K_2SO_4

(c) H_2SO_4 (d) $BaSO_4$

26. Which of the following statements about a catalyst is true **[AIIMS 1996]**

(a) It lowers the energy of activation

(b) The catalyst altered during the reaction is regenerated

(c) It does not alter the equilibrium

(d) All of these

27. Which of the following statements is true for a catalyst

(a) It increases the energy of the reactants

(b) It decreases the energy of the products

(c) It decreases the energy of the reactants

(d) It does not change the enthalpy of the reactants

28. Which is not a characteristic of a catalyst **[AFMC 1992]**

(a) It changes the equilibrium constant

(b) It alters the reaction path

(c) It increases the rate of reaction

(d) It increases the average K.E. of the molecules

29. Which one of the following statements is correct in reversible reaction. A catalyst **[MP PET 1994; EAMCET 1987]**

(a) Increases the rate of forward reaction

(b) Decreases the rate of forward reaction

(c) Increases the rate of backward and forward reactions

(d) Alters the equilibrium constant of the reaction

30. A catalyst **[MNR 1987; UPSEAT 2002]**

(a) Increases the free energy change in the reaction

(b) Decreases the free energy change in the reaction

(c) Does not increase or decrease the free energy change in the reaction

(d) Can either increase or decrease the free energy change depending on what catalyst we use

31. Which one of the following changes when catalyst is used in a reaction

(a) Heat of reaction (b) Product of reaction

(c) Equilibrium constant (d) Activation energy

32. In the reversible reaction a catalyst is the substance which **[CBSE PMT 1992]**

(a) Increases the rate of the forward reaction

(b) Decreases the value of enthalpy change in the reaction

(c) Reduces the time required for reaching the equilibrium state in the reaction

(d) Decreases the rate of the reverse reaction

33. In the titration between oxalic acid and acidified potassium permanganate, the manganous salt formed catalyses the reaction. The manganous salt is **[KCET 1992]**

(a) A promoter (b) A positive catalyst

(c) An autocatalyst (d) None of these

34. Which one of the following statements is incorrect in the case of heterogeneous catalysis **[CPMT 199**

(a) The catalyst lowers the energy of activation

(b) The catalyst actually forms a compound with the reactant

(c) The surface of the catalyst plays a very important role

(d) There is no change in the energy of activation

35. Regarding criteria of catalysis which one of the following statements is not true **[CPMT 1990]**

(a) The catalyst is unchanged chemically at the end of the reaction

(b) A small quantity of catalyst is often sufficient to bring about a considerable amount of reaction

(c) In a reversible reaction the catalyst alters the equilibrium position

(d) The catalyst accelerates the reaction

36. Which of the following reaction is catalysed by enzyme maltase **[MP PMT 2003]**

(a) Starch $\rightarrow$ maltose

(b) Maltose $\rightarrow$ glucose

(c) Lactose $\rightarrow$ maltose

(d) Maltose $\rightarrow$ glucose + fructose

37. The efficiency of an enzyme in catalysing a reaction is due to its capacity

(a) To form a strong enzyme-substrate complex

(b) To decrease the bond energies of substrate molecule

(c) To change the shape of the substrate molecule

(d) To lower the activation energy of the reaction

38. A catalyst in a chemical reaction **[BHU 1998]**

(a) Does not initiate a reaction

(b) Increases the activation energy of the reaction

(c) Changes the equilibrium constant of a reaction

(d) Does not change the rate of the reaction

39. Platinized asbestos is used as a catalyst in the manufacture of H_2SO_4. It is an example of **[CPMT 1975]**

(a) Heterogeneous catalyst (b) Autocatalyst

(c) Homogenous catalyst (d) Induced catalyst

40. Catalyst used in hydrogenation of oils is **[CPMT 1975; MNR 1986; DPMT 1982, 85; BHU 1973, 87; EAMCET 1987; AFMC 1993; CET Pune 1998]**

(a) *Pt* (b) *Mo*

(c) *Fe* (d) *Ni*

41. Addition of catalyst in a system **[MP PMT 1992]**

(a) Increases equilibrium concentrations

(b) No effect on equilibrium concentrations

(c) Decreases equilibrium concentrations

(d) Increases rate of forward reaction and decreases rate of backward reaction

42. In which of the following processes, platinum is used as a catalyst **[NCERT 1978, 79]**

(a) Oxidation of ammonia to form nitric acid

(b) Hardening of oils
(c) Production of synthetic rubber
(d) Synthesis of methanol

43. Enzymes are **[CPMT 1974, 81]**
(a) Micro-organisms (b) Proteins
(c) Inorganic compounds (d) Moulds

44. Protons accelerate the hydrolysis of esters. This is an example of **[MP PMT 1987]**
(a) A heterogeneous catalysis
(b) An acid-base catalysis
(c) A promoter
(d) A negative catalyst

45. Which of the following processes does not involve a catalyst **[KCET 1991; AIIMS 1996]**
(a) Haber's process (b) Thermite process
(c) Ostwald process (d) Contact process

46. Which of the statement is wrong among the following **[AFMC 1993]**
(a) Haber's process of NH_3 requires iron as catalyst
(b) Friedel–Craft's reaction uses anhydrous $AlCl_3$
(c) Hydrogenation of oils uses iron as catalyst
(d) Oxidation of SO_2 to SO_3 requires V_2O_5

47. A catalyst is a substance which
(a) Increases the rate of a reaction
(b) Increases the amount of the products formed in a reaction
(c) Decreases the temperature required for the reaction
(d) Alters the speed of the reaction remaining unchanged chemically at the end of the reaction

48. In the Ostwald's process for the manufacture of HNO_3, the catalyst used is **[AMU 1982, 83; MP PET 1999]**
(a) Mo (b) Fe
(c) Ni (d) Pt

49. A biological catalyst is essentially **[NCERT 1978; AFMC 1998]**
(a) An amino acid (b) A carbohydrate
(c) The nitrogen molecule (d) An enzyme

50. A catalyst added to a reaction mixture
(a) Increases the equilibrium constant
(b) Decreases the equilibrium constant
(c) Does not change the equilibrium constant
(d) None of these

51. The components of Zigler Natta catalyst, used in the polymerisation of propylene, are
(a) $TiCl_3 + Al(C_2H_5)_3$ (b) $TiCl_4 + Al(C_2H_5)_3$
(c) $Ti(C_2H_5)_3 + AlCl_3$ (d) $Ti(C_2H_5)_4 + AlCl_3$

52. Which of the following statements regarding catalyst is not true **[CPMT 1983, 84; MNR 1993; KCET 1999]**
(a) A catalyst remains unchanged in composition and quantity at the end of the reaction
(b) A catalyst can initiate a reaction
(c) A catalyst does not alter the equilibrium in a reversible reaction
(d) Catalyst are sometimes very specific in respect of reaction

53. The enzyme ptylin used for the digestion of food is present in **[CPMT 1981]**
(a) Saliva (b) Blood
(c) Intestine (d) Adrenal glands

54. Amongst the following chemical reactions, the one representing homogeneous catalysis is **[MP PMT 1999]**
(a) $N_2(g)+3H_2(g)\xrightarrow{Fe}2NH_3(g)$
(b) $2SO_2(g)+O_2(g)\xrightarrow{2NO}2SO_3(g)+2NO(g)$
(c) $CO(g)+3H_2(g)\xrightarrow{Ni}CH_4(g)+H_2O$
(d) $2SO_2(g)+O_2(g)\xrightarrow{V_2O_5}2SO_3(g)$

55. Platinised asbestos helps in the formation of SO_3 form SO_2 and O_2. But, if even a small amount of As_2O_3 is present the platinised asbestos does not help in the formation of SO_3. As_2O_3 acts here as **[MP PMT**
(a) A positive catalyst (b) A negative catalyst
(c) An autocatalyst (d) A poison

56. Which of the following statements is wrong
(a) Catalysts can aid a rapid reaching of the equilibrium position, but do not change the position of the equilibrium
(b) Homogeneous catalysis generally involves an equilibrium reaction between at least one of the reactants and the catalyst
(c) Heterogeneous catalysis involves chemisorption on the surface of the catalyst
(d) Positive catalysts raise the energy of activation of the reaction they catalyse

57. Which one is *false* in the following statement **[MP PET 1997]**
(a) A catalyst is specific in its action
(b) A very small amount of the catalyst alters the rate of a reaction
(c) The number of free valencies on the surface of the catalyst increases on subdivision
(d) Ni is used as catalyst in the manufacture of ammonia

58. In the redox reaction
$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightleftharpoons 2Mn^{2+} + 10CO_2 + 8H_2O$$
The ion acting as autocatalyst is **[MP PMT 2003]**
(a) MnO_4^- (b) $C_2O_4^{2-}$
(c) H^+ (d) Mn^{2+}

59. In a homogeneous catalysis
(a) The catalyst and the reactants should be gases
(b) The catalyst and the reactants should form a single phase

(c) Catalyst and the reactants are all solids
(d) The catalyst and the reactions are all liquids

60. Which of the following statements is incorrect **[CPMT 1985]**
(a) Enzymes are in colloidal state
(b) Enzymes are catalysts
(c) Enzymes can catalyse any reaction
(d) Urease is an enzyme

61. Enzymes are **[BHU 1982]**
(a) Substances made by chemists to activate washing powder
(b) Very active vegetable catalysts
(c) Catalysts found in organism
(d) Synthetic catalysts

62. Catalyst used in the oxidation of $SO_2 \rightarrow SO_3$ **[AIIMS 1996]**
(a) Nickel (b) $ZnO.Cr_2O_3$
(c) V_2O_5 (d) Iron

63. Which requires catalyst **[AFMC 1987; MP PET 1999]**
(a) $S + O_2 \rightarrow SO_2$ (b) $2SO_2 + O_2 \rightarrow 2SO_3$
(c) $C + O_2 \rightarrow CO_2$ (d) All

64. The process which is catalysed by one of the products is called **[MP PET 1999; AIIMS 2000; J & K 2005]**
(a) Acid-base catalysis (b) Autocatalysis
(c) Negative catalysis (d) None of these

65. Adam's catalyst is **[Pb.CET 2001]**
(a) Platinum (b) Iron
(c) Molybdenum (d) Nickel

66. A catalyst remains unchanged at the end of the reaction regarding **[MP PET 1995]**
(a) Mass
(b) Physical state
(c) Physical state and chemical composition
(d) Mass and chemical composition

67. Wilhem Ostwald redefined the action of **[Kerala (Med.) 2002]**
(a) Anamers
(b) Isomers
(c) Catalyst
(d) Geometry of monomers

68. In a reversible reaction, a catalyst used
(a) Increases the speed of the forward reaction
(b) Decreases the speed of the backward reaction
(c) Does not alter the final state of equilibrium
(d) Increases the amount of the products formed

69. Enzyme activity is maximum at **[KCET 1989]**
(a) 300 K (b) 310 K
(c) 320 K (d) 330 K

70. A catalyst is used to **[Pb.CET 2000]**
(a) Increase the product
(b) Increase or decrease the rate of reaction
(c) Increase or decrease the products
(d) Decrease the products

71. The transition metal used as a catalyst is **[Pb. PMT 2004]**
(a) Nickel (b) Platinum
(c) Cobalt (d) All of these

72. Which of the following is true about catalyst **[Pb.CET 2000]**
(a) It initiates reaction
(b) It changes equilibrium point
(c) It increase average kinetic energy
(d) It accelerates the rate of reaction

73. Which of the following types of metals form the most efficient catalysts **[KCET 2005]**
(a) Alkali metals
(b) Alkaline earth metals
(c) Transition metals
(d) All of these

74. Formation of ammonia from H_2 and N_2 by Haber's process using Fe is an example of **[J & K 2005]**
(a) Heterogeneous catalysis (b)Homogeneous catalysis
(c) Enzyme catalysis (d) Non-catalytic process

Colloids, Emulsion, Gel and Their properties with application

1. Gold number is **[MP PET/PMT 1988]**
(a) The number of *mg* of lyophilic colloid which should be added to 10 *ml* of ferric hydroxide sol so as to prevent its coagulation by the addition of 1 *ml* of 10% sodium chloride solution
(b) The number of *mg* of lyophilic colloid which should be added to 10 *ml* of standard gold sol so as to prevent its coagulation by the addition of 1 *ml* of 10% *NaCl*
(c) The *mg* of gold salt to be added to a lyophilic colloid to coagulate it
(d) The *mg* of an electrolyte required to coagulate a colloid

2. Which of the following statement is wrong for lyophobic sol
(a) Dispersed phase is generally in organic material
(b) Can be easily coagulated by small addition of electrolyte
(c) Dispersed phase particles are poorly hydrated and colloid is stabilised due to charge on the colloidal particles
(d) Reversible in nature that is after coagulation can be easily set into colloidal form

3. Which of the following statements is not true for a lyophobic sol
(a) It can be easily solvated

(b) It carries charge

(c) The coagulation of this sol is irreversible in nature

(d) It is less stable in a solvent

4. As_2S_3 sol has a negative charge. Capacity to precipitate it is highest in **[CPMT 1982, 89, 93; DPMT 1983;MP PET 1999]**

(a) $AlCl_3$ (b) Na_3PO_4

(c) $CaCl_2$ (d) K_2SO_4

5. Starch dispersed in hot water is an example of

(a) Emulsion (b) Hydrophobic sol

(c) Lyophilic sol (d) Associated colloid

6. Which of the following is most effective in coagulating a ferric hydroxide sol **[MP PET 1993, 97; MP PMT 2000]**

(a) KCl (b) KNO_3

(c) K_2SO_4 (d) $K_3[Fe(CN)_6]$

7. Sky looks blue due to **[MNR 1986; MP PET 1992]**

(a) Dispersion effect (b) Reflection

(c) Transmission (d) Scattering

8. Which one is an example of gel

(a) Soap (b) Cheese

(c) Milk (d) Fog

9. The random or zig-zag motion of the colloidal particles in the dispersion medium is referred to as **[CPMT 1985; JIPMER 1997; MP PET 2000]**

(a) Electro-osmosis

(b) Electrophoresis

(c) Brownian movement

(d) Tyndall effect

10. Which of the following electrolytes is least effective in causing flocculation of ferric hydroxide sol **[MNR 1991; UPSEAT 1999]**

(a) $K_4[Fe(CN)_6]$ (b) K_2CrO_4

(c) KBr (d) K_2SO_4

11. If the dispersed phase is a liquid and the dispersion medium is a solid, the colloid is known as **[NCERT 1981; CBSE PMT 1989; KCET 1998]**

(a) A sol (b) An emulsion

(c) A gel (d) A foam

12. Zig-zag motion (eratic motion) of particles in colloid was observed by **[CPMT 1985]**

(a) Tyndall (b) Zsigmondy

(c) Robert brown (d) Thomas Graham

13. On addition of one ml solution of $10\% NaCl$ to 10 *ml* gold sol in the presence of 0.25 *gm* of starch, the coagulation is just prevented. Starch has the following gold number **[MP PET/PMT 1988]**

(a) 0.025 (b) 0.25

(c) 0.5 (d) 250

14. Tyndall effect would be observed in a **[CPMT 1973, 79, 90, 91, 94; MP PET 1999; MP PMT 1973, 89; DPMT 1982, 83; AFMC 1999]**

(a) Solution (b) Colloidal solution

(c) Precipitate (d) Solvent

15. Ferric hydroxide sol is positively charged colloid. The coagulating power of NO_3^-, SO_4^{2-} and PO_4^{3-} ions would be in the order

(a) $NO_3^- > SO_4^{2-} > PO_4^{3-}$ (b) $SO_4^{2-} > NO_3^- > PO_4^{3-}$

(c) $PO_4^{3-} > SO_4^{2-} > NO_3^-$ (d) $NO_3^- = SO_4^{2-} = PO_4^{3-}$

16. A colloidal solution can be purified by **[MP PET 1993; CPMT 1990; MP PMT 2001]**

(a) Filtration (b) Peptization

(c) Coagulation (d) Dialysis

17. Gold number is associated with

(a) Only lyophobic colloids

(b) Only lyophilic colloids

(c) Both lyophobic and lyophilic colloids

(d) None of these

18. Which of the following forms a colloidal solution in water **[MP PET 1990; CPMT 1988]**

(a) $NaCl$ (b) Glucose

(c) Starch (d) Barium nitrate

19. A negatively charged suspension of clay in water will need for precipitation the minimum amount of **[CPMT 1973]**

(a) Aluminium chloride (b) Potassium sulphate

(c) Sodium hydroxide (d) Hydrochloric acid

20. Difference between colloids and crystalloids is of **[CPMT 1979]**

(a) Particle composition (b) Particle size

(c) Concentration (d) Ionic character

21. The purification of the colloidal particles from crystalloid dimensions through semipermeable membrane is known as **[BHU 1979; MP PMT 1999; CBSE 1996; Pb. CET 2002]**

(a) Coagulation (b) Dialysis

(c) Ultrafiltration (d) Peptisation

22. The stability of lyophilic colloids is due to **[CPMT 1971, 81, 83, 93, 96; AFMC 1998; MP PMT 1990, 95; MP PET 1992]**

(a) Charge on their particles

(b) A layer of dispersion medium on their particles

(c) The smaller size of their particles

(d) The large size of their particles

23. Milk is a colloid in which **[MP PMT 1985, 2002; MP PET 2001; JIPMER (Med.) 2002]**

(a) A liquid is dispersed in liquid

(b) A solid is dispersed in liquid

(c) A gas is dispersed in liquid

(d) Some suger is dispersed in water

24. Smoke is an example of **[CPMT 1984; BIT 1992]**

(a) Gas dispersed in liquid (b)Gas dispersed in solid
(c) Solid dispersed in gas (d)Solid dispersed in solid

25. Gold number is minimum in case of **[MP PMT 1985]**
(a) Gelatin (b) Egg albumin
(c) Gum arabic (d) Starch

26. Movement of colloidal particles under the influence of electrostatic field is
[AMU 1985, 88,02; MP PMT 1987, 89; CPMT 1988,94; Roorkee 1995; MP PET 1992; AIIMS 2001; UPSEAT 2004]
(a) Electrophoresis (b) Electrolysis
(c) Dialysis (d) Ionisation

27. Which of the following substances gives a positively charged sol
(a) Gold (b) A metal sulphite
(c) Ferric hydroxide (d) An acidic dye

28. Light scattering in colloidal particles is
(a) Visible to naked eye
(b) Not visible by any means
(c) Visible under ordinary microscope
(d) Visible under ultra-microscope

29. Flocculation value is expressed in terms of **[MP PMT 1986]**
(a) millimole per litre (b) mole per litre
(c) gram per litre (d) mole per millilitre

30. Which of the following is an emulsifier
(a) Soap (b) Water
(c) Oil (d) $NaCl$

31. Suspensions are **[CPMT 1984]**
(a) Visible to naked eye
(b) Invisible through microscope
(c) Not visible by any means
(d) Invisible under electron microscope

32. Gelatin is mostly used in making ice cream in order to
[NCERT 1979; MP PET/PMT 1988]
(a) Prevent making of colloid
(b) To stabilise the colloid and prevent crystallisation
(c) To stabilise mixture
(d) To enrich the aroma

33. In emulsions, the dispersion medium and dispersed phase are
(a) Both solids
(b) Both gases
(c) Both liquids
(d) One is solid and other is liquid

34. Lyophilic sols are more stable than lyophobic sols because
[NCERT 1982, 83]
(a) The colloidal particles have positive charge
(b) The colloidal particles have no charge
(c) The colloidal particles are solvated
(d) There are strong electrostatic repulsions between the negatively charged colloidal particles

35. Which is the correct statement in case of milk
[CPMT 1977; MNR 1988; UPSEAT 2000, 01, 02]
(a) Milk is an emulsion of protein in water
(b) Milk is an emulsion of fat in water
(c) Milk is stabilised by protein
(d) Milk is stabilised by fat

36. Which of the following electrolytes have maximum coagulating power
(a) CCl_4 (b) $ZnCl_2$
(c) KCl (d) $NaCl$

37. Which one of the following is not a colloidal solution
[MADT Bihar 1983]
(a) Smoke (b) Ink
[CPMT 1983, 84; MP PMT 1990; MP PET 1992]
(c) Air (d) Blood

38. Detergent action of soap is due to
(a) Emulsification properties (b)
(c) Ionization (d) High molecular weight

39. When dispersion medium is water, the colloidal system is called **[MP PMT 1986]**
(a) Sol (b) Aerosol
(c) Organosol (d) Aquasol

40. When a freshly precipitated substance is converted into a colloidal solution with the help of a third substance, the process is known as
(a) Coagulation (b) Peptization
(c) Electrodispersion (d) Dialysis

41. Which of the following will have highest coagulating power for As_2S_3 colloid
[CPMT 1988; DPMT 1984; Pb. PMT 2001; Pb. CET 2004]
(a) PO_4^{-3} (b) SO_4^{-2}
(c) Na^+ (d) Al^{3+}

42. Which one of the following is a hydrophobic sol
[MP PET 1991]
(a) Starch solution
(b) Gum solution
(c) Protein solution
(d) Arsenic sulphide solution

43. Purification of colloids is done by the process of
[CPMT 1988]
(a) Electrophoresis (b) Electrodispersion
(c) Peptization (d) Ultra-filteration

44. Which of the following terms is not related with colloids
[CPMT 1985, 87, 88]
(a) Dialysis (b) Ultrafiltration
(c) Wavelength (d) Brownian movement

45. When dispersed phase is liquid and dispersion medium is gas, then the colloidal system is called **[CPMT 19**
(a) Smoke (b) Clouds
(c) Emulsion (d) Jellies

46. Tyndall phenomenon is exhibited by **[CPMT 1985]**
(a) $NaCl$ solution (b) Starch solution
(c) Urea solution (d) $FeCl_3$ solution

47. The colloidal solution of gelatin is known **[CPMT 1984]**

(a) Solvent loving sol (b) Reversible sol
(c) Hydrophilic colloids (d) All of these

48. The zig-zag motion of colloidal particles is due to
(a) Small size of colloidal particles
(b) Large size of colloidal particles
(c) The conversion of potential energy into kinetic energy
(d) Bombardment on colloidal particles by molecules of dispersion medium

49. Which is a natural colloidal **[DPMT 1985]**
(a) Sodium chloride (b) Urea
(c) Canesugar (d) Blood

50. Sodium stearate forms in water
(a) True solution (b) A suspension
(c) An emulsion (d) A colloidal solution

51. Blood contains
(a) Positively charged particles
(b) Negatively charged particles
(c) Neutral particles
(d) Negatively as well as positively charged particles

52. Brownian motion is due to **[MNR 1987; CPMT 1987; UPSEAT 2001, 02]**
(a) Temperature fluctuation within the liquid phase
(b) Attraction and repulsion between charge on the colloidal
(c) Impact of molecules of the dispersion medium on the colloidal particles
(d) Convective currents

53. Milk can be preserved by adding a few drops of **[MADT Bihar 1981]**
(a) Formic acid solution
(b) Formaldehyde solution
(c) Acetic acid solution
(d) Acetaldehyde solution

54. When a colloidal solution is observed under a microscope we can see **[CPMT 1985]**
(a) Light scattered by colloidal particles
(b) Size of colloidal particles
(c) Shape of colloidal particles
(d) Relative size of the colloidal particles

55. Property of the colloidal solution is due to
(a) Nature of dispersed phase
(b) Nature of dispersion medium
(c) Physical state of dispersed phase
(d) Temperature of the system

56. Which of the following has minimum value of flocculating power **[MP PET 1989, 90]**
(a) Pb^{+2} (b) Pb^{+4}
(c) Sr^{+2} (d) Na^{+}

57. According to Graham, colloids are those substances which are
(a) Insoluble in water
(b) In solution do not pass through filter paper
(c) Of definite size of particles
(d) Separated from crystalloids by parchment paper

58. The reason for exhibiting Tyndall effect by the colloidal particle is **[CPMT 1980, 86; MP PMT 1989]**
(a) Reflection of light (b) Refraction of light
(c) Polarisation of light (d) Scattering of light

59. Which of the following shows the maximum hydrophobic behaviour **[NCERT 1982]**
(a) Glycerine (b) Stearic acid
(c) Glucose (d) Adenine

60. A liquid aerosol is a colloidal system of **[MP PMT 1987]**
(a) A liquid dispersed in a solid
(b) A liquid dispersed in a gas
(c) A gas dispersed in a liquid
(d) A solid dispersed in a gas

61. The blue colour of water in the sea is due to **[NCERT 1983]**
(a) Refraction of blue light by the impurities in sea water
(b) Reflection of blue sky by sea water
(c) Scattering of blue light by water moleules
(d) Absorption of other colours except the blue colour by water molecules

62. Butter is a colloid. It is formed when **[MNR 1982; MP PET 1991; MP PMT 1994; CPMT 2002]**
(a) Fat is dispersed in solid casein
(b) Fat globules are dispersed in water
(c) Water is dispersed in fat
(d) Casein is suspended in H_2O

63. Colloidal solution cannot be obtained from two such substances which are
(a) Insoluble in each other (b)In same physical state
(c) In different physical state (d)

64. Which of the following reactions leads to the formation of a substance in the colloidal state **[MP PMT 1984; MP PET/PMT 1988]**
(a) $Cu + HgCl_2 \rightarrow CuCl_2 + Hg$
(b) $2HNO_3 + 3H_2S \rightarrow 3S + 4H_2O + 2NO$
(c) $2Mg + CO_2 \rightarrow 2MgO + C$
(d) $Cu + CuCl_2 \rightarrow Cu_2Cl_2$
(in presence of excess of HCl)

65. Lyophobic colloids are **[MP PMT 1986; DPMT 1996]**
(a) Reversible colloids (b) Irreversible colloids
(c) Protective colloids (d) Gum proteins

66. Substances whose solutions can readily diffuse through parchment membranes are
(a) Colloids (b) Crystalloids
(c) Electrolytes (d) Non-electrolytes

67. Size of colloidal particles varies from **[CPMT 1982, 90, 93, 97; CBSE PMT 1996;**

MP PMT 1995; AIIMS 2002; KCET 2004]

(a) 10^{-7} to $10^{-9}\ m$ (b) 10^{-9} to $10^{-17}\ m$

(c) 10^{-5} to $10^{-7}\ m$ (d) 10^{-4} to $10^{-10}\ m$

68. Which of the following pairs of ions would be expected to form precipitate when their dilute solution are mixed

[CPMT 1976]

(a) Na^+, SO_3^{2-} (b) NH_4^+, CO_3^{2-}

(c) Na^+, S^{-2} (d) Fe^{+3}, PO_4^{-3}

69. Jelly is a form of

(a) Suspension (b) Colloidal solution

(c) Supersaturated solution (d) True solution

70. Bleeding is stopped by the application of ferric chloride. This is because

(a) Ferric chloride seal the blood cells.

(b) Blood starts flowing in the other direction

(c) Blood is coagulated and blood vessel is sealed

(d) None of these

71. The colloidal particles can pass through

(a) Filter paper as well as animal membrane

(b) Animal membrane but not through filter paper

(c) Filter paper but not through animal membrane

(d) Semipermeable membrane

72. The emulsifying agent in milk is

(a) Lactic acid (b) Casein

(c) Lactose (d) Fat

73. Butter is **[MP PMT 1990]**

(a) A gel (b) An emulsion

(c) A sol (d) Not a colloid

74. An emulsion is a colloidal dispersion of **[BCECE 2005]**

(a) A liquid in a gas (b) A liquid in a liquid

(c) A solid in a liquid (d) A gas in a solid

75. The colloidal solution of mercury in water can be easily obtained by

(a) Mechanical precipitation (b) Bredig's arc method

(c) Repeated washing (d) Ultrasonic dispersion

76. The rate of dialysis depends upon

(a) Nature of colloidal substance

(b) Temperature of the solution

(c) Both of these

(d) None of these

77. An emulsifier **[MP PET 1995]**

(a) Accelerates the dispersion

(b) Homogenises the emulsion

(c) Stabilizes the emulsion

(d) Aids the flocculation of emulsion

78. The difference between a lyophilic and lyophobic colloid is in their

(a) Particle size

(b) Behaviour towards dispersion medium

(c) Filtrability

(d) None of these

79. When a substance comes in colloidal state the surface area of the particles

(a) Increases

(b) Decreases

(c) Remains unchanged

(d) First increases then decreases

80. Which of the impurity can be separated from a solution by electrodialysis

(a) Alcohol (b) Alum

(c) Sugar (d) Parchment paper

81. The reason for the stability of a lyophobic sol is

(a) Brownian movement

(b) Tyndall effect

(c) Electric charge

(d) Brownian movement and electric charge

82. For coagulating As_2S_3 colloidal sol, which of the following will have the lowest coagulation value

[MP PMT 1996; DCE 2000]

(a) $NaCl$ (b) KCl

(c) $BaCl_2$ (d) $AlCl_3$

83. Some substances behave as electrolytes in dilute solutions and as colloids in their concentrated solutions. Their colloidal forms are said to form **[AMU 200**

(a) Emulsions (b) Gels

(c) Micelles (d) Sols

84. Which one can act as semipermeable membrane

[Pb. PMT 2002]

(a) Phenol layer (b) $Ca_3(PO_4)_2$

(c) $Cu_2Fe(CN)_6$ (d) All of these

85. In which particles can pass through semipermeable membrane

(a) Molecules of solvent (b) Complex ions

(c) Simple ions (d) Molecules of solute

86. Silver iodide is used for producing artificial rain because AgI

[NCERT 1984]

(a) Is easy to spray at high altitudes

(b) Is easy to synthesize

(c) Has crystal structure similar to ice

(d) Is insoluble in water

87. Surface water contains **[AFMC 2003]**

(a) Salt

(b) Salt and organic compound

(c) Organic compounds

(d) Suspended impurities

88. Gelatin is mixed in ice-cream

(a) As a coagulant (b) For taste

(c) For colour (d) As a protective colloid

89. Which of the following is an example of `water in oil' type emulsion

(a) Butter (b) Milk
(c) Cream (d) Face cream

90. In which of the following Tyndall effect is *not* observed **[MP PET/PMT 1998]**
(a) Suspensions (b) Emulsions
(c) Sugar solution (d) Gold sol

91. Which of the following is a lyophilic colloid **[MP PET/PMT 1998]**
(a) Milk (b) Gum
(c) Fog (d) Blood

92. Which characteristic is true in respect of colloidal particle **[CPMT 1993; UPSEAT 2000]**
(a) They always have two phases
(b) They are only in liquid state
(c) They can't be electrolysed
(d) They are only hydrophilic

93. Gold number is a measure of the **[MP PMT 1989; MP PET 1989,90; DCE 1999; BHU 1999; CBSE PMT 1989]**
(a) Protective action by a lyophilic colloid on a lyophobic colloid
(b) Protective action by a lyophobic colloid on a lyophilic colloid
(c) Number of mg of gold in a standard red gold sol
(d) Stability of gold sol

94. Sulphur sol contains **[UPSEAT 2002]**
(a) Discrete sulphur atoms
(b) Discrete sulphur molecules
(c) Large agreegates of sulphur molecules
(d) Water dispersed in solid sulphur

95. Pick out the statement which is not relevant in the discussion of colloids
(a) Sodium aluminium silicate is used in the softening of hard water
(b) Potash alum is used in shaving rounds and as antiseptic in medicine
(c) Artificial rain is caused by throwing electrified sand on the clouds from an aeroplane
(d) Deltas are formed at a place where the river pours its water into the sea

96. Surface tension of lyophilic sols is
(a) Lower than H_2O (b) More than H_2O
(c) Equal to H_2O (d) None of these

97. When excess of electrolyte is added to a colloid it **[CBSE PMT 1989]**
(a) Coagulates (b) Precipitates
(c) Gets diluted (d) Does not change

98. The shape of colloidal particles is
(a) Sphere like (b) Rod like
(c) Disc like (d) Thread like
(e) All of these

99. Colloidal solution of arsenious sulphide is coagulated by **[MP PMT 1992]**
(a) Addition of electrolyte
(b) Addition of non-electrolyte
(c) Addition of solid As_2S_3
(d) None of these

100. Different colloidal particles of gold having different colours, obtained from different methods due to **[MP PET 1989; UPSEAT 2001, 02; EAMCET 2003]**
(a) Variable valency of gold
(b) Different concentration of gold particles
(c) Different types of impurities
(d) Different radius of colloidal particles

101. Which one of the following is lyophilic colloid **[MP PET 1989]**
(a) Gelatin (b) Sulphur
(c) Gold (d) Carbon

102. Which one of the following properties of colloids is related with scattering of light **[MP PMT 1989]**
(a) Diffusion (b) Peptization
(c) Tyndall effect (d) Brownian movement

103. Which one of the following is a hydrophilic colloidal sol
(a) Barium hydroxide sol (b)Arsenic sulphide sol
(c) Starch solution (d) Silver chloride sol

104. The coagulation power of an electrolyte for arsenious sulphide decreases in the order **[JIPMER 1997]**
(a) Na^+, Al^{+3}, Ba^{+2} (b) $PO_4^{-3}, SO_4^{-2}, Cl^-$
(c) Al^{+3}, Ba^{+2}, Na^+ (d) $Cl^-, SO_4^{-2}, PO_4^{-3}$

105. Size of colloidal particle is **[KCET 2005] [BCECE 2005]**
(a) 1 nm (b) 1 – 100 nm
(c) > 100 nm (d) > 1000 nm

106. The concentration of electrolyte required to coagulate a given amount of As_2S_3 sol is minimum in the case of **[KCET 2003]**
(a) Magnesium nitrate
(b) Potassium nitrate
(c) Potassium sulphate
(d) Aluminium nitrate **[MP PMT 1992]**

107. When a strong beam of light is passed through a colloidal solution, the light will **[BHU 1996; JIPMER 1997]**
(a) Give a rainbow
(b) Be scattered
(c) Be reflected
(d) Absorbed completely

108. A cleared solution which is again converted into colloidal solution, the process is called **[DPMT 1996]**
(a) Peptisation (b) Electrolytic addition

(c) Electrophoresis (d) None of these

109. In dialysis, colloidal particles are separated from **[DPMT 1996]**

(a) Solvent
(b) Dispersed phase
(c) Ions of electrolytes
(d) Particles of dispersion medium

110. Colour of colloidal solution is due to **[CPMT 1996]**

(a) Different size of colloidal particles
(b) Due to formation of complex
(c) Due to formation of hydrated crystal
(d) None of these

111. Which of the following is property of colloid **[CPMT 1996]**

(a) Scattering of light (b) They show attraction
(c) Dialysis (d) Emulsion

112. The size of particles in suspension, true solution and colloidal solution varies in the order **[BHU 1997]**

(a) Suspension > Colloidal > True solution
(b) Suspension > (Colloidal + True solution)
(c) True solution > Suspension > Colloidal
(d) None of these

113. Which of the following represents surfactant molecule **[JIPMER 1997]**

(a) $C_{17}H_{36}$ (b) $C_{17}H_{25}COO^{-}Na^{+}$
(c) H_2O (d) None of these

114. In lyophilic sols the attraction of sol particles towards the medium is due to

(a) Covalent bond (b) Vander Waal's force
(c) Hydrogen bond (d) None of these

115. If some gelatin is mixed in colloidal solution of gold, then it does

(a) Coagulation of gold
(b) Peptization of gold
(c) Protection of gold sol
(d) Protection of gelatin

116. Emulsifiers are generally

(a) Soap (b) Synthetic detergents
(c) Lyophilic sols (d) All of these

117. In shaving cream, the dispersion medium is

(a) Liquid (b) Gas
(c) Solid (d) None of these

118. The minimum quantity of sodium chloride which is necessary to precipitate 10 litres of sol in two hours is 0.585 *gm*. The flocculation value of sodium chloride is

(a) 0.585 (b) 0.0585
(c) 0.1 (d) One

119. Which one is an example of miceller system

(a) Soap + water (b) Protein + water
(c) Rubber + benzene (d) $As_2O_3 + Fe(OH)_3$

120. "Delta" at the rivers are formed due to

(a) Peptization (b) Coagulation
(c) Hydrolysis (d) Precipitation

121. Tyndall effect is more pronounced in

(a) Hydrophilic sols (b) Hydrophobic sols
(c) Starch solution (d) Both (b) and (c)

122. Emulsifier is mixed to

(a) Increase the stability of emulsion
(b) Decrease the stability of emulsion
(c) Change oil into water like emulsion
(d) None of these

123. White of an egg is partly coagulated by heating which can be again obtained back by some pepsin and little HCl. This process is called

(a) Peptization (b) Coagulation
(c) Precipitation (d) None of these

124. When sugar is added to a colloidal solution it brings about

(a) Ionization (b) Coagulation
(c) Peptization (d) None of these

125. Colloidal solutions of metals like gold, silver and platinum are generally prepared by using **[DPMT 1984]**

(a) Peptization (b) Bredig's arc method
(c) Exchange of solvent (d) Oxidation method

126. Liquid–liquid sols are known as **[CPMT 1999]**

(a) Aerosols (b) Emulsions
(c) Foam (d) Gel

127. Tyndall effect depends upon the

(a) Charge on the colloidal particles
(b) Osmotic pressure of colloidal solution
(c) Difference between the refractive indices of dispersed phase and dispersion medium
(d) Size of colloidal particles

128. Which one of the sols acts as protective colloid **[MP PMT 1990; MP PET 1990, 92; RPET 2003]**

(a) As_2S_3 (b) Gelatin
(c) Au (d) $Fe(OH)_3$

129. The example of heteropolar sol is

(a) Starch sol in water (b) Rubber sol in water
(c) Protein sol in water (d) Sulphur sol

130. In Bredig's arc method some alkali is added because

(a) It increases electrical conductance
(b) To obtain molecular colloid
(c) To obtain colloidal particles of same size
(d) To stabilise the sol

131. Which one of the following is not a colloid **[BIT 1992]**

(a) Milk (b) Blood
(c) Solution of urea (d) Ice cream

132. Milk is an example of **[BIT 1992; CPMT 1994; MP PET 1996; BHU 1996]**

(a) Pure solution (b) Emulsion
(c) Gel (d) Suspension

133. Dialysis is the process of separation of

(a) Suspended particles from colloids

(b) Suspended particles from crystalloids
(c) Colloidal particles from crystalloids
(d) Colloidal particles from gel

134. Minimum concentration of electrolyte which can precipitate any sol is **[BIT 1992]**
(a) Peptization value (b) Gold number
(c) Avogadro's number (d) Flocculation value

135. Whipped cream is an example of

	Dispersion medium	Dispersed phase
(a)	Gas	Liquid
(b)	Liquid	Gas
(c)	Liquid	Liquid
(d)	Liquid	Solid

136. Milk is **[MP PMT 1995;CPMT 1988; MP PET 1991; MNR 1982]**
(a) Dispersed fats in oil (b)Dispersed fats in water
(c) Dispersed water in fats (d) Dispersed water in oil

137. A coagulating agent frequently added to water to remove the suspended and colloidal impurities is
(a) Mohr salt (b) Alum
(c) Bleaching powder (d) Copper sulphate

138. $Fe(OH)_3$ when treated with $FeCl_3$ solution a reddish-brown solution is formed. The process involved is **[AFMC 1982]**
(a) Dispersion (b) Exchange of solvent
(c) Peptization (d) None of these

139. Alum purifies muddy water by
(a) Dialysis (b) Absorption
(c) Coagulation (d) Forming a true solution

140. Which of the following statements is not true for a lyophilic sol
(a) It can be easily solvated
(b) It carries no charge
(c) Coagulation of this sol is reversible in nature
(d) It is not very stable in a solvent

141. High concentration of gelatin in water on heating gives colloidal solution, which is called
(a) Foam (b) Gel
(c) Gas (d) Air

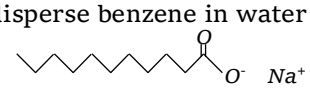
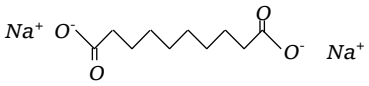
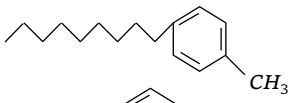
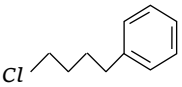
142. Size of colloidal particle is **[CPMT 1988; MP PMT 1991; RPET 2000]**
(a) 1 to 10 Å (b) 20 to 50 Å
(c) 10 to 1000 Å (d) 1 to 280 Å

143. Which one is Freundlich's equation
(a) $\frac{x}{m} = \log K + \frac{1}{n}\log P$ (b) $\frac{x}{m} = \exp(-KP)$
(c) $\frac{x}{m} = KP^2$ (d) $\log\frac{x}{m} = \log K + \frac{1}{n}\log C$

144. Ferric chloride is applied to stop bleeding cut because
(a) Fe^{3+} ion coagulates blood, which is a negatively charged sol
(b) Fe^{3+} ion coagulates blood, which is a positively charged sol
(c) Cl^- coagulates blood, which is a positively charged sol
(d) Cl^- ion coagulates blood, which is a negatively charged sol

145. At the critical micelle concentration, the surfactant molecules **[MNR 1978] [CBSE PMT 1998]**
(a) Decompose
(b) Dissociate
(c) Associate
(d) Become completely soluble

146. The decomposition of H_2O_2 can be slowed down by the addition of small amount of phosphoric acid which act as **[JIPMER 2000]**
(a) Promoter (b) Inhibitor
(c) Detainer (d) Stopper

147. Which of the following molecules is most suitable to disperse benzene in water **[AIIMS 2005]**
(a) 
(b) 
(c) 
(d) 

148. Luminosity observed as a result of scattering of light by particles is observed in **[RPET 2000]**
(a) Suspension (b) Colloidal solution
(c) True solution (d) None of these

149. Which of the following makes the lyophilic solution unstable **[MP PMT 1994]**
(a) Dialysis
(b) Addition of electrolyte
(c) Addition of alcohol
(d) Addition of alcohol and electrolyte both

150. A detergent is a **[CPMT 1993]**
(a) Cleaning agent (b) Drug
(c) Catalyst (d) Vitamin

151. Gold number is related with **[MP PET 2000]**
(a) Colloids (b) Radioactivity
(c) Gas equation (d) Kinetic energy

152. Small liquid droplets dispersed in another liquid is called **[Pb. PMT 2000]**
(a) Gel (b) Emulsion
(c) Suspension (d) True solution

153. Which of the following is used for the destruction of colloids **[CBSE PMT 2000]**

(a) Dialysis (b) Condensation

(c) By ultrafiltration (d) By adding electrolyte

154. An example of an associated colloid is **[CBSE PMT 2000; MP PET 2000]**

(a) Milk (b) Soap solution

(c) Rubber latex (d) Vegetable oil

155. The movement of colloidal particles towards the oppositely charged electrodes on passing electricity is known as **[AFMC 2000]**

(a) Cataphoresis (b) Tyndall effect

(c) Brownian movement (d) None of these

156. Tyndall effect is shown by **[Pb. PMT 1999]**

(a) Sol (b) Solution

(c) Plasma (d) Precipitation

157. Colloidal solutions of gold prepared by different methods have different colours owing to **[JIPMER 1999]**

(a) The difference in the size of the colloidal particles

(b) The fact that gold exhibits a variable valency of + 1 and + 3

(c) Different concentrations of gold

(d) Presence of different types of foreign particles depending upon the method of preparation of the colloid

158. Which of the following colloids are formed when hydrogen sulphide gas is passed through a cold solution of arsenious oxide

(a) As_2S_3 (b) As_2O_3

(c) As_2S (d) As_2H_2

159. The simplest way to check whether a system is colloidal, is **[KCET (Med.) 2002]**

(a) Tyndall effect (b) Electro dialysis

(c) Brownian movement (d) Finding out particle size

160. Fog is an example of colloidal system **[MNR 1985; NCERT 1985; CPMT 1988; MP PMT 1991; MP PET 1996; UPSEAT 1999, 2000]**

(a) Liquid dispersed in gas (b)Gas dispersed in gas

(c) Solid dispersed in gas (d)Gas dispersed in liquid

161. In the measurement of gold number, the useful electrolyte is

(a) $AuCl_3$ (b) $NaCl$

(c) $AlCl_3$ (d) $FeCl_3$

162. Blood may be purified by **[MP PMT 2000]**

(a) Dialysis (b) Electro-osmosis

(c) Coagulation (d) Filtration

163. The stability of lyophilic colloidal sol is due to

(a) Both charge and solvation

(b) Only solvation

(c) Only charge

(d) None of these

164. The impurities present in rain water possess ..... charge

(a) Positive (b) Negative

(c) Zero (d) Positive and negative

165. Sodium lauryl sulphate is **[RPET 2003]**

(a) Cationic sol (b) Anionic sol

(c) Neutral sol (d) None of these

166. Which of the following statement is false

(a) Every solid substance can be brought into colloidal state

(b) Colloidal particles carry electrical charges

(c) Every solid substance can be made to behave like a lyophilic colliod

(d) Addition of electrolytes causes flocculation of colloidal particles

167. Which is a colloid **[CPMT 1984]**

(a) Sugar solution (b) Urea solution

(c) Silicic acid (d) $NaCl$ solution

168. Alum helps in purifying water by **[AIEEE 2002]**

(a) Forming Si complex with clay particles

(b) Sulphate part which combines with the dirt and removes it

(c) Aluminium which coagulates the mud particles

(d) Making mud water soluble

169. Maximum coagulation power is in **[CPMT 2000]**

(a) Na^+ (b) Ba^{++}

(c) Al^{+++} (d) Sn^{++++}

170. Which of the following is not an emulsion **[MP PET 2003]**

(a) Butter (b) Ice cream

(c) Milk (d) Cloud

171. Colloidal solution of gold cannot be prepared by

(a) Bredig's arc method (b) Mechanical dispersion

(c) Reduction of gold chloride (d) Exchange of solvents

172. Which of the following ions can cause coagulation of proteins **[KCET 2000]**

(a) Ag^+ (b) Na^+

(c) Mg^{++} (d) Ca^{++}

173. Light scattering takes place in **[MP PMT 1991; BHU 2000; AFMC 2001; Kerala PET 2002]**

(a) Solutions of electrolyte (b)Colloidal solutions

(c) Electrodialysis (d) Electroplating

174. Which of the following can stabilize gold sol from coagulation by $NaCl$ solution

(a) $Fe(OH)_3$ (b) Gelatin

(c) As_2S_3 (d) None of these

175. At isoelectric point

(a) Colloidal sol becomes highly stable

(b) Precipitation of a colloidal sol takes place

(c) Colloidal particles becomes uncharged
(d) Peptization can be carried out

176. Which one is an example of multimolecular colloid system
(a) Soap dispersed in water (b)Protein dispersed in water
(c) Gold dispersed in water (d)Gum dispersed in water

177. Metals like *Pt* and *Pd* can adsorb large volume of hydrogen under specific conditions. Such adsorbed hydrogen by the metal is known as
(a) Occluded hydrogen (b) Absorbed hydrogen
(c) Reactive hydrogen (d) Atomic hydrogen

178. A colloidal system in which gas bubbles are dispersed in a liquid is known as **[MP PMT 1993]**
(a) Foam (b) Sol
(c) Aerosol (d) Emulsion

179. On adding few drops of dilute HCl or $FeCl_3$ to freshly precipitated ferric hydroxide a red coloured colloidal solution is obtained. The phenomenon is known as **[NCERT 1981; AFMC 1982; MP PMT 1989, 97]**
(a) Peptisation (b) Dialysis
(c) Protective action (d) Dissolution

180. Surface tension of lyophilic sols is **[MP PMT 2002]**
(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

181. Which of the following is not true of a detergent molecule **[JIPMER 2002]**
(a) It has a non-polar organic part and a polar group
(b) It is not easily biodegraded
(c) It is a sodium salt of fatty acid
(d) It is a surface active agent

182. Which of the following can act as protective colloids
(a) Hydrophobic sols (b) Hydrophilic sol
(c) Gold sol (d) None of these

183. Which of the following substances is not used for preparing lyophilic sols **[MP PET 2002]**
(a) Starch (b) Gum
(c) Gelatin (d) Metal sulphide

184. Hydrophilic sols are
(a) Reversible (b) Irreversible
(c) Unstable (d) None of these

185. Soap essentially forms a colloidal solution in water and removes the greasy matter by
(a) Absorption (b) Emulsification
(c) Coagulation (d) None of these

186. Toilet soap is a mixture of **[UPSEAT 2001]**
(a) Calcium and sodium salts of fatty acids
(b) Fatty acids and glycerol
(c) Sodium salts of fatty acids
(d) Potassium salt of fatty acids

187. Gold sol is an electronegative sol. The amount of electrolyte required to coagulate a certain amount of gold sol is minimum in the case of
(a) $CaCl_2$ (b) $NaCl$
(c) $AlCl_3$ (d) Na_2SO_4

188. In the case of small cuts, bleeding is stopped by applying potash alum. Here alum acts as **[KCET (Med.) 200**
(a) Fungicide (b) Disinfectant
(c) Germicide (d) Coagulating agent

189. If gold number of *A,B,C* and *D* are 0.005, 0.05, 0.5 and 5 respectively, then which of the following will have the highest protective power **[Pb. CET 2001; CPM**
(a) *A* (b) *B*
(c) *C* (d) *D*

190. Bredig arc method can not be used to prepare colloidal solution of which of the following **[AFMC 2004]**
(a) *Pt* (b) *Fe*
(c) *Ag* (d) *Au*

191. Gold number is maximum for the lyophilic sol is **[BVP 2004]**
(a) Gelatin (b) Haemoglobin
(c) Sodium oleate (d) Potato starch

192. Which of the following is the best protective colloid **[UPSEAT 2004]**
(a) Gelatin (Gold No. = 0.005)
(b) Gum arabic (Gold No. = 0.15)
(c) Egg albumin (Gold No. = 0.08)
(d) None of these

193. The gold number of *A, B C* and *D* are 0.04, 0.002, 10 and 25 respectively. Protective power of *A, B, C* and *D* are in order **[DCE 2003]**
(a) $A > B > C > D$ (b) $B > A > C > D$
(c) $D > C > B > A$ (d) $C > A > B > D$

194. A catalyst is a substance which **[Pb. CET 2004]**
(a) Is always in the same phase as in the reactions
(b) Alters the equilibrium in a reaction
(c) Does not participate in the reaction but alters the rate of reaction
(d) Participates in the reaction and provide an easier pathway for the same

195. Cod liver oil is **[MHCET 2004]**
(a) An emulsion (b) Solution
(c) Colloidal solution (d) Suspension

196. Paste is **[MHCET 2004]**
(a) Suspension of solid in a liquid
(b) Mechanical dispersion of a solid in liquid
(c) Colloidal solution of a solid in solid
(d) None of these

197. A precipitate is changed to colloidal solution by the following process **[UPSEAT 2004]**
(a) Dialysis (b) Ultrafiltration
(c) Peptization (d) Electrophoresis

198. An aerosol is a **[UPSEAT 2004]**

(a) Dispersion of a solid or liquid in a gas
(b) Dispersion of a solid in a liquid
(c) Dispersion of a liquid in a liquid
(d) Solid solution

199. Lyophilic sols are **[IIT 2005]**
(a) Irreversible sols
(b) They are prepared from inorganic compound
(c) Coagulated by adding electrolytes
(d) Self–stabilizing

200. 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 **[AIEEE 2005]**

(a) $\frac{V_C}{V_S} \simeq 1$ (b) $\frac{V_C}{V_S} \simeq 10^{23}$
(c) $\frac{V_C}{V_S} \simeq 10^{-3}$ (d) $\frac{V_C}{V_S} \simeq 10^{3}$

201. The disperse phase in colloidal iron (III) hydroxide and colloidal gold is positively and negatively charged, respectivley. Which of the following statements is NOT correct **[AIEEE 2005]**
(a) Magnesium chloride solution coagulates, the gold sol more readily than the iron (III) hydroxide sol
(b) Sodium sulphate solution causes coagulation in both sols
(c) Mixing the sols has no effect
(d) Coagulation in both sols can be brought about by electrophoresis

202. The surface tension of which of the following liquid is maximum ? **[CBSE PMT 2005]**
(a) H_2O (b) C_6H_6
(c) CH_3OH (d) C_2H_5OH

203. Which one of the following forms micelles in aqueous solution above certain concentration ? **[CBSE PMT 2005]**
(a) Urea
(b) Dodecyl trimethyl ammonium chloride
(c) Pyridinium chloride
(d) Glucose

204. Alum is a water purifier because it **[KCET 2005]**
(a) Coagulates the impurities
(b) Softens hard water
(c) Gives taste
(d) Destroys the pathogenic bacteria

205. An emulsifier is a substance which **[KCET 2005]**
(a) Stabilises the emulsion
(b) Homogenises the emulsion
(c) Coagulates the emulsion
(d) Accelerates the dispersion of liquid in liquid

206. Muddy water can be purified through coagulation using **[J & K 2005]**
(a) Common salt (b) Alums
(c) Sand (d) Lime

207. Fog is a colloidal solution of **[J & K 2005]**
(a) Solid in gas (b) Liquid in gas
(c) Gas in liquid (d) Gas in solid

208. Lyophilic sols are more stable than lyophobic sols because their particles are **[Karala CET 2005]**
(a) Positively charged (b) Negatively charged
(c) All soluble (d) Attract each other
(e) Are heavier

209. Oils and fats are obtained by saponification of potassium stearate. Its formula is $CH_3-(CH_2)_{16}-COO^-K^+$. Lyophobic end of atom is (CH_3) and lyophilic end is COO^-K^+. potassium stearate is example of **[Kerala CET 2005]**
(a) Lyophobic colloids (b) Lyophilic colloids
(c) Poly molecular colloids (d)
(e) Combined colloids or Miscells

Critical Thinking

Objective Questions

1. Which of the following is contributed towards the extra stability of lyophilic colloids
(a) Hydration (b) Charge
(c) Colour (d) Tyndall effect

2. Which of the following methods is used for sol destruction **[CPMT 1988]**
(a) Condensation
(b) Dialysis
(c) Diffusion through animal membrane
(d) Addition of an electrolyte

3. A catalyst is a substance which **[IIT 1983]**
(a) Increases the equilibrium concentration of the product
(b) Changes the equilibrium constant of the reaction
(c) Shortens the time to reach equilibrium
(d) Supplies energy to the reaction

4. The decomposition of hydrogen peroxide can be slowed by the addition of a small amount of acetamide. The latter acts as a
(a) Detainer (b) Stopper
(c) Promoter (d) Inhibitor

5. The ability of an ion to bring about coagulation of a given colloid depends upon **[CPMT 1980; MP PET/PMT 198**
CBSE PMT 1997; MP PMT 1989; MP PET 1994]
(a) Its size
(b) The magnitude of its charge only
(c) The sign of its charge
(d) Both the magnitude and the sign of its charge

6. Which one of the following is an incorrect statement for physisorption
(a) It is a reversible process

(b) It requires less heat of adsorption
(c) It requires activation energy
(d) It takes place at low temperature

7. Which is not colloidal **[CPMT 1984; MP PET 1989, 91]**
(a) Chlorophyll (b) Egg
(c) Ruby glass (d) Milk

8. Which one of the following is **not** a surfactant **[AIIMS 2003]**

(a) $CH_3-(CH_2)_{15}-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{N^+}}-CH_3Br^-$

(b) $CH_3-(CH_2)_{14}-CH_2-NH_2$

(c) $CH_3-(CH_2)_{16}-CH_2OSO_2^-Na^+$

(d) $OHC-(CH_2)_{14}-CH_2-COO^-Na^+$

9. Size of colloidal particles is **[CPMT 1984; MP PMT 1990, 92]**
(a) $0.1\,m\mu$ to $0.001\,m\mu$ (b) $10\,\mu$ to $20\,\mu$
(c) $0.05\,m\mu$ to $0.1\,m\mu$ (d) $25\,\mu$ to $30\,\mu$

10. Which of the following electrolytes is most effective in the coagulation of gold solution **[KCET 1996]**
(a) $NaNO_3$ (b) $K_4[Fe(CN)_6]$
(c) Na_3PO_4 (d) $MgCl_2$

11. A catalyst is used in a reaction to **[CPMT 1972, 75, 97; DPMT 1982]**
(a) Change the nature of reaction products
(b) Increase the reaction yield
(c) Decrease the need for reactants
(d) Decrease the time required for the reaction

12. Which one of the following is not represented by sols **[MP PMT 1992]**
(a) Absorption (b) Tyndall effect
(c) Flocculation (d) Paramagnetism

13. Example of intrinsic colloid is
(a) Glue (b) Sulphur
(c) Fe (d) As_2S_3

14. Colloidal solution of arsenious sulphide can be prepared by **[AMU 1985]**
(a) Electrodispersion method
(b) Peptization
(c) Double decomposition
(d) Hydrolysis]

15. The capacity to bring about coagulation increases with
(a) Ionic radii (b) Atomic radii
(c) Valency of an ion (d) Size of an ion

16. Gold number gives **[NCERT 1987; MNR 1987; UPSEAT 2002; Kurukshetra CET 2002; MP PMT 2004]**
(a) The amount of gold present in the colloid
(b) The amount of gold required to break the colloid
(c) The amount of gold required to protect the colloid
(d) None of these

17. Point out the *false* statement **[MP PET 1997]**
(a) Brownian movement and Tyndall effect is shown by colloidal systems
(b) Gold number is a measure of the protective power of a lyophilic colloid
(c) The colloidal solution of a liquid in liquid is called is gel
(d) Hardy–Schulze rule is related with coagulation

18. Which of the following does not contain a hydrophobic structure **[NCERT 1983]**
(a) Linseed oil (b) Lanolin
(c) Glycogen (d) Rubber

19. The function of gum-arabic in the preparation of indian ink is
(a) Coagulation (b) Peptization
(c) Protective action (d) Absorption

20. Identify the gas which is readily adsorbed by activated charcol **[KCET 2004]**
(a) N_2 (b) SO_2
(c) H_2 (d) O_2

21. The density of gold is $19\ g/cm^3$. If $1.9\times10^{-4}\,g$ of gold is dispersed in one litre of water to give a sol having spherical gold particles of radius 10 *nm*, then the number of gold particles per mm^3 of the sol will be **[Pb.CET 2004]**
(a) 1.9×10^{12} (b) 6.3×10^{14}
(c) 6.3×10^{10} (d) 2.4×10^{6}

22. Which of the following forms cationic miscelles above certain concentration
(a) Urea
(b) Cetyltrimethylammonium bromide
(c) Sodium dodecyl sulphate
(d) Sodium acetate

A R Assertion & Reason
For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below :

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(c) If assertion is true but reason is false.
(d) If the assertion and reason both are false.
(e) If assertion is false but reason is true.

1. Assertion : When a finely divided active carbon or clay is stirred into a dilute

solution of a dye, the intensity of colour in the solution is decreased.

Reason : The dye is adsorbed on the solid surface.

2. Assertion : The enthalpy of physisorption is greater than chemisorption.

Reason : Molecules of adsorbate and adsorbent are held by van der Waals forces in physisorption and by chemical bonds in chemisorption.

3. Assertion : Silica gel is used for drying air.

Reason : Silica gel adsorbs moisture from air.

4. Assertion : According to Freundlich: $\frac{x}{m}k.P^{1/n}$.

Reason : The isotherm shows variation of the amount of gas adsorbed by the adsorbent with temperature.

5. Assertion : A reaction cannot become fast by itself unless a catalyst is added.

Reason : A catalyst always increases the speed of a reaction.

6. Assertion : ZSM – 5 is used as a catalyst in petrochemical industries.

Reason : Zeolites are three dimensional network silicates in which some silicon atoms are replaced by aluminium atoms.

7. Assertion : Lyophilic colloids are called as reversible sols.

Reason : Lyophilic sols are liquid loving.

8. Assertion : Colloidal sols scatter light while true solutions do not.

Reason : The particles in the colloidal sol more much slower than that of the true solution.

9. Assertion : Colloidal particles show Brownian movement.

Reason : Brownian movement arises because of the impact of the molecules of the dispersion medium with the colloidal particles.

10. Assertion : For the coagulation of sols carrying positive charge, PO_4^{3-} ions are more efficient than SO_4^{2-} or Cl^- ions.

Reason : This follows Hardy – Schulze rule.

11. Assertion : An emulsion becomes stable if soap is added to it .

Reason : Soap contains hydrophilic and hydrophobic parts.

12. Assertion : Deep electric shock causes death of an animal.

Reason : Electric shock coagulate the blood. **[AIIMS 1995]**

13. Assertion : A catalyst is more effective in finely divided form.

Reason : Finely divided form has more surface area. **[AIIMS 1998]**

14. Assertion : NH_3 absorb more readily over activated charcoal than CO_2.

Reason : NH_3 is non-polar. **[AIIMS 2000]**

15. Assertion : Sky appears blue colour.

Reason : Colloidal particles of dust scatter blue light. **[AIIMS 2000]**

16. Assertion : Physical absorption of molecules takes place on surface only.

Reason : In this process, the bonds of the absorbed molecules are broken.**[AIIMS 2002**

17. Assertion : The micelle formed by sodium stearate in water has $-COO^-$ groups at the surface.

Reason : Surface tension of water is reduced by the addition of stearate.**[AIIMS 2003]**

18. Assertion : Aqueous gold colloidal solution is red in colour.

Reason : The colour arises due to scattering of light by colloidal gold particles.**[AIIMS 20**

19. Assertion : Increase in surface area, increase in rate of evaporation.

Reason : Stronger the intermolecular attractive forces, fast is the rate of evaporation at a given temperature.

Answers

Adsorption and Adsorption isotherm

1	b	2	a	3	b	4	a	5	a
6	b	7	c	8	b	9	b	10	d

11	a	12	a	13	d	14	d	15	c
16	c	17	d	18	d	19	a	20	b
21	a	22	c	23	c	24	b	25	a
26	a	27	d	28	b	29	b	30	c
31	a	32	d	33	b	34	c	35	d
36	c	37	a	38	a	39	c	40	c
41	d	42	a	43	a	44	c	45	d
46	d	47	d						

Catalyst and Catalysis

1	c	2	d	3	d	4	a	5	d
6	b	7	d	8	a	9	d	10	c
11	c	12	b	13	a	14	b	15	c
16	d	17	c	18	d	19	c	20	c
21	b	22	d	23	a	24	b	25	c
26	d	27	d	28	a	29	c	30	c
31	d	32	c	33	c	34	d	35	c
36	b	37	d	38	a	39	a	40	d
41	b	42	a	43	b	44	b	45	b
46	c	47	d	48	d	49	d	50	c
51	b	52	b	53	a	54	b	55	d
56	d	57	d	58	d	59	b	60	c
61	c	62	c	63	b	64	b	65	a
66	d	67	c	68	c	69	b	70	b
71	d	72	d	73	c	74	a		

Colloids, Emulsion, Gel and Their properties with application

1	b	2	d	3	a	4	a	5	c
6	d	7	d	8	b	9	c	10	c
11	c	12	c	13	d	14	b	15	c
16	d	17	b	18	c	19	a	20	b
21	b	22	b	23	a	24	c	25	a
26	a	27	c	28	d	29	a	30	a
31	a	32	b	33	c	34	c	35	b
36	b	37	c	38	a	39	d	40	b
41	d	42	d	43	d	44	c	45	b
46	b	47	d	48	d	49	d	50	d
51	b	52	c	53	b	54	a	55	c
56	d	57	d	58	d	59	d	60	b
61	c	62	c	63	d	64	b	65	b
66	b	67	a	68	d	69	b	70	c
71	c	72	b	73	a	74	b	75	d
76	b	77	c	78	b	79	a	80	b
81	d	82	d	83	c	84	c	85	a
86	c	87	d	88	d	89	a	90	c
91	b	92	a	93	a	94	c	95	a
96	a	97	a	98	e	99	a	100	d
101	a	102	c	103	c	104	c	105	b
106	d	107	b	108	d	109	c	110	a
111	a	112	a	113	b	114	c	115	c
116	d	117	a	118	d	119	a	120	b
121	b	122	a	123	a	124	d	125	b
126	b	127	c	128	b	129	c	130	d
131	c	132	b	133	c	134	d	135	b
136	b	137	b	138	c	139	c	140	d
141	b	142	c	143	d	144	a	145	c
146	b	147	c	148	b	149	d	150	a
151	a	152	b	153	d	154	b	155	a
156	a	157	a	158	a	159	a	160	a
161	b	162	a	163	a	164	b	165	a
166	c	167	c	168	c	169	d	170	d
171	d	172	a	173	b	174	b	175	c
176	c	177	a	178	a	179	a	180	a
181	c	182	b	183	d	184	a	185	b
186	d	187	c	188	d	189	a	190	b
191	d	192	a	193	b	194	c	195	a
196	a	197	c	198	a	199	d	200	d
201	c	202	a	203	b	204	a	205	a
206	b	207	b	208	c	209	e		

Critical Thinking Questions

1	a	2	d	3	c	4	d	5	d
6	c	7	a	8	b	9	a	10	b
11	d	12	d	13	a	14	c	15	c
16	d	17	c	18	d	19	c	20	b
21	d	22	d						

Assertion & Reason

1	a	2	e	3	a	4	c	5	d
6	b	7	b	8	b	9	a	10	a
11	a	12	a	13	a	14	c	15	a
16	d	17	b	18	a	19	c		

Answers and Solutions

Adsorption and Adsorption isotherm

1. (b) Chemical adsorption is irreversible due to formation of new bonds and compounds.

2. (a) Chemical adsorption increases with temperature.

6. (b) When the temperature is raised, the viscosity of liquid decreases, this is because increase in temperature increases the average kinetic energy of molecules which overcome the attractive force between them.

13. (d) Charge on As_2S_3 sol is due to the adsorbed sulphide ion.

19. (a) According to langmuir Adsorption isotherm the amount of gas adsorbed at very high pressures reaches a constant limiting volume.

21. (a) According to definition of adsorbent.

24. (b) Adsorption increase when temperature decreases (Adsorption $\propto$ 1/Temperature)

25. (a) In chemical adsorption, one layers are adsorbed.

26. (a) Adsorption of a gas on solid independent of the pressure start fast and after some time becomes slow.

27. (d) Chemisorption first increases and then decreases with temperature.

28. (b) Adsorption is an exothermic process.

32. (d) $\log x/m = \log k + \frac{1}{n}\log p$; this is Freundlich isotherm. Thus $p \propto \frac{1}{n}$.

36. (c) Heterogeneous catalysis can be explained by the adsorption theory.

37. (a) Adsorption due to strong chemical bond is called chemical adsorption or chemisorption or Langmuir adsorption.

39. (c) Physical adsorption decreases with increase of temperature.

40. (c) $W = \frac{126 \times 1 \times 50}{1000} \Rightarrow 6.3$

(Molecular weight of oxalic acid $\Rightarrow$163)

$0.5\ gm \rightarrow \frac{6.3}{2}$

$1\ gm \rightarrow \frac{6.3}{2 \times 0.5} \times 1 \Rightarrow 6.3\ gm.$

41. (d) Noble gases are adsorbed by coconut charcoal. The adsorption of different noble gases occur at different temperatures, hence charcoal is used to separate these gases. Helium is not adsorbed by charcoal (as it is very difficulty liquifiable gas).

42. (a) Animal charcoal is a good adsorbate. The impurities adsorbs on its surface and thus it decolourises colour of liquids.

43. (a) Since adsorption is an exothermic process (taking place with the evolution of heat) therefore in accordance with Lechatelier's principle, the magnitude of physical adsorption will decrease with the increase in temperature. In case of chemisorption the adsorption first increase and then decreases with increase in temperature.

44. (c) Concentration of the solution decreases because acetic acid gets adsorbed on charcoal.

45. (d) $\frac{x}{m} = kp^{1/n}$ or $x = m \cdot kp^{1/n}$ or $x/m = kp^{-n}$

All of these equation represent freundlich adsorption isotherm.

47. (d) It has been observed that the surface of a solid (or liquid) has the tendency to attract and retain the molecules of other immiscible phase with which it is brought into contact. These molecules remian only at the surface and do not go deeper into the bulk. This tendency of accumulation of molecular species at the surface than in the bulk of a solid (or liquid) it termed adsorption.

Catalyst and Catalysis

3. (d) A catalyst does not take part in the reaction but can speed it up. It can be recovered after the reaction.

4. (a) $\underset{(g)}{N_2} + \underset{(g)}{3H_2} \xrightarrow[Mo\ \text{promoter}]{Fe\ \text{Catalyst}} \underset{(g)}{2NH_3}$

5. (d) $2KClO_3 \xrightarrow{MnO_2} 2KCl + 3O_2$

6. (b) $2SO_2 + O_2 \xrightarrow[As_2O_3(poison)]{Pt(Catalyst)} 2SO_3$

7. (d) It is a shape-selective catalyst.

8. (a) All substance have average energy and before the reaction occurs energy of the reactant should be higher than the average energy. We also know that catalyst lower the activation energy. Therefore, rate of reaction is increased.

9. (b) $2SO_2 + O_2 \xrightarrow{NO} 2SO_3$

12. (b) Transition metals are most efficient catalysts due to half filled *d*-orbitals.

16. (d) An increase in rate of reaction in forward direction by a catalyst for a reaction in equilibrium brings in an increase in concentration of products and thus rate of backward reaction also increase to same

magnitude and so allow the equilibrium to be achieved quickly.

17. (c) $\underset{(g)}{2SO_2} + \underset{(g)}{O_2} \xrightarrow{V_2O_5} \underset{(g)}{2SO_3}$

19. (c) Catalyst never change the equilibrium constant.

21. (b) Because reactant and catalyst are present in same physical state.

23. (a) $\underset{\text{Glucose}}{C_6H_{12}O_6} \xrightarrow[\text{Enzyme}]{\text{Zymase}} 2\underset{\text{Ethanol}}{C_2H_5OH} + 2CO_2$

24. (b) $C_6H_6 + CH_3Cl \xrightarrow[AlCl_3]{\text{Anhydrous}} C_6H_5CH_3 + HCl$

25. (c) $CH_3COOC_2H_5 + HOH \xrightarrow[\text{Catalyst}]{\text{Conc. } H_2SO_4}$

$CH_3COOH + C_2H_5OH$

27. (d) Catalyst does not depend on the enthalpy of the reactants.

30. (c) Catalyst does not depend on the free energy change in the reaction.

31. (d) Activation energy changes when catalyst is used in a reaction.

32. (c) In the reversible reaction a catalyst is the substance which reduces the time required for reaching the equilibrium state in the reaction.

36. (b) $\text{Maltose} \xrightarrow[\text{enzyme}]{\text{Maltase}} \text{Glucose}$

37. (d) Efficiency of catalysing property is inversely proportional of activation energy.

39. (a) $\underset{\text{(g)}}{2SO_2} + \underset{\text{(g)}}{O_2} \xrightarrow[\underset{\text{(s)}}{\text{Asbestose}}]{\text{Platinized}} 2SO_3$; Example of heterogeneous catalyst.

40. (d) $\text{Oil} + H_2 \xrightarrow{Ni} \text{Ghee}$.

41. (b) Catalyst is not effect on equilibrium concentrations.

42. (a) $4NH_3 + 5O_2 \xrightarrow[1100\ K]{Pt\ guage} 4NO \xrightarrow{O_2} 4NO_2$

$\xrightarrow{2H_2O+O_2} 4HNO_3$

48. (d) $4NH_3 + 5O_2 \xrightarrow[1100\ K]{Pt\ guage} 4NO \xrightarrow{O_2} 4NO_2$

$\xrightarrow{2H_2O+O_2} 4HNO_3$

51. (b) $\underset{\text{Propylene}}{nCH_3 - CH = CH_2} \xrightarrow{(CH_3CH_2)_3Al + TiCl_4}$

$$\underset{\text{Polypropylene}}{\left[-CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - \right]_n}$$

53. (a) Ptyline (enzyme) is present in saliva.

54. (b) $\underset{(g)}{2SO_2} + \underset{(g)}{O_2} \xrightarrow{2\ NO(g)} \underset{(g)}{2SO_3} + 2NO_{(g)}$, reactants and catalyst present in same phase.

55. (d) $2SO_2 + O_2 \xrightarrow[As_2S_3\,(\text{Poison})]{\text{Platinised asbestos(catalyst)}} 2SO_3$

58. (d) Mn^{++} is a product in reaction so it is auto catalyst (according to definition).

62. (c) $\underset{}{2SO_2} + \underset{}{O_2} \xrightarrow[\text{(Catalyst)}]{V_2O_5} \underset{}{2SO_3}$

63. (b) $\underset{(g)}{2SO_2} + \underset{(g)}{O_2} \xrightarrow[\text{Asbestos(promoter)}]{\text{Pt Catalyst}} 2SO_3(g)$

65. (a) Generally transition elements acts as catalysts. Adam's catalyst is another name of platinum.

69. (b) Enzyme activity is maximum at 310*K*.

70. (b) Catalyst is a substance which changes the rate of reaction without affecting the overall energetics of the reaction.

71. (d) *Ni*, *Pt* and *Co* all three transition metals are used as a catalysts.

72. (d) Catalyst is a substance which changes the rate of reaction without affecting the overall energetics of the reaction.

73. (c) Many of the *d*-block (transition) elements and their compounds act as catalyst. Catalytic property is probably due to the utilisation of $(n-1)d$ orbitals or formation of interstitial compounds.

74. (a)The catalytic process in which the reactants and the catalyst are in different phases is known as heterogenous catalysis.

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

The reactants are in gaseous state while the catalyst is in solid state.

Colloids, Emulsion, Gel and Their properties with application

4. (a) Negatively charged As_2S_3 sol coagulated most effectively by $AlCl_3$. This is because oppositely charged Al^{+++} ions have maximum charge.

$As^{3+} > Ca^{2+} > Na^{+}$

6. (d) $K_3[Fe(CN)_6]$ is most effective in coagulating a ferric hydroxide sol.

7. (d) Sky looks blue due to scattering of light by dust particles present in the atmosphere.

10. (c) *KBr* is least effective in causing flocculation of ferric hydroxide sol due to minimum charge at $(KBr)\ Br^-$

11. (c) $\underset{\text{(Dispersed phase)}}{\text{Liquid}} + \underset{\text{(Dispersion medium)}}{\text{Solid}} = \underset{\text{(Colloid)}}{\text{Gel}}$ (e.g. Butter)

13. (d) By definition gold number of starch is the amount of starch in *mg* added to 10 *ml* standard gold sol which prevents the coagulation of gold on adding 1 *ml* of *10% NaCl* solution. So the amount of starch is 0.25*g* = 250 *mg*. Hence gold number is 250.

15. (c) According to Hardy schulze rule the ions having opposite charge to sol particle cause coagulation and greater the valency of

oppositely charged ion more is the coagulating power ($PO_4^{3-} > SO_4^{2-} > NO_3^-$).

17. (b) Gold number is associated with only lyophilic colloids due to protective nature.

19. (a) Negatively charged sols require minimum amount of electrolyte having higher valence of cation.

22. (b) Lyophilic possesses solvent loving nature and thus a thin layer of dispersed phase is formed round sol particles.

23. (a) Milk is a colloid of liquid (H_2O) dispersed in liquid (fat).

24. (c) Smoke is an example of solid dispersed in gas.

26. (a) Movement of (charged) colloidal particles under the influence of electrostatic field is called electrophoresis due to opposite charge.

27. (c) $Fe(OH)_3$ gives a positively charged sol as it adsorbs Fe^{3+} ions from $FeCl_3$ solution.

29. (a) Flocculation value is expressed in terms of millimole per litre.

32. (b) Gelatin is a protective colloid.

36. (b) $ZnCl_2$ has maximum coagulation power due to more charge on the Zn

37. (c) Air is not a colloidal solution because it is a homogeneous mixture.

43. (d) In Purification separation of colloids from crystalloids is done by the process of ultra-filtration.

45. (b) $\underset{\text{(liquid)}}{\text{dispersed phase}} + \underset{\text{(gas)}}{\text{dispersion medium}} = \underset{\text{(clouds)}}{\text{colloidal system}}$

46. (b) Tyndall phenomenon is exhibited by starch solution because starch solution is a colloidal solution.

53. (b) Milk can be preserved by adding a few drops of *HCHO* solution. *HCHO* is an emulsifier.

55. (c) Properties of the colloidal solution depend upon physical state of dispersed phase and mol. wt.

57. (d) According to Graham, colloids are separated from crystalloids by parchment paper.

60. (b) Liquid aerosol involves liquid dispersed in gas, e.g. cloud, fog, mist etc.

64. (b) $2HNO_3 + 3H_2S \rightarrow \underset{(Sol)}{3S} + 4H_2O + 2NO$

65. (b) Lyophobic colloids are irreversible colloids.

66. (b) Crystalloids are diffuse through parchment membranes.

67. (a) Colloidal particles range between 10^{-7} to $10^{-9}\ m$ or 10^{-5} to $10^{-7}\ cm$.

70. (c) Fe^{3+} ion coagulates –ve sol particles of blood and seals the cut.

79. (a) When a substance comes in colloidal state the surface area of the particles increases due to small size than substance.

80. (b) Alum can be separated from a solution by electrodialysis due to alum give Al^{3+} ion in solution.

82. (d) The amount of electrolyte required to coagulate a fixed amount of a solution depends upon the valency of the flocculation ion. The flocculating power of the various ions follows the following order, larger the valency lesser will be coagulating value. $Al^{3+} > Mg^{2+} > Na^+$, hence lowest coagulation value is of $AlCl_3$.

88. (d) Gelatin is a protective colloid in ice-cream.

90. (c) Tyndall effect is not observed in sugar solution due to homogeneous nature.

92. (a) Dispersion medium and dispersed phase are phase of colloid.

99. (a) As_2S_3 is coagulated by addition of electrolyte due to opposite charge.

104. (c) According to Hardy-Schulze rule.

111. (a) Scattering of light is a property of colloid.

115. (c) Some gelatin is mixed in colloidal solution of gold to form ppt of gold (peptization of gold). Because formation of layer on colloidal particle.

120. (b) "Delta" at the rivers are formed due to coagulation between sea water (+ve charged particles) and river water (–ve charged particles)

121. (b) Tyndall effect expressed by hydrophobic sols.

129. (c) Protein sol in water is a example of heteropolar sol.

130. (d) For stabilise the sol.

131. (c) Solution of urea is not a colloid.

135. (b) $\underset{\text{(Dispersion medium)}}{\text{Liquid}} + \underset{\text{(Dispersed phase)}}{\text{Gas}} = \underset{\text{Colloidal solution}}{\text{Whipped cream}}$

137. (b) Alum is a coagulating agent, frequently added to water to remove impurities from water because impurities contain negative charge and alum give positive charge particle for coagulation.

139. (c) Alum is purifies muddy water by coagulation due to opposite charge.

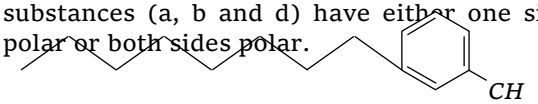
142. (c) The particle size is in the order $10\,Å - 1000\,Å$.

144. (a) $FeCl_3$ is a electrolyte give Fe^{3+} and blood contain negatively colloid so stop bleeding due to coagulation.

145. (c) AT (CMC) critical micellization concentration, the surfactant molecules associate to form miscelles. For soap CMC is 10^{-3} *mol/litre*

146. (b) Inhibitors are also known as negative catalyst.

147. (c) Benzene is non polar in nature. As we know that non-polar disperses more to non-polar substances. Therefore, meta-metyl nonylbenzene being nonpolar from both sides will disperse more to benzene. All other substances (a, b and d) have either one side polar or both sides polar.



non-polar end (metamethyl nonylbenzene) non-polar

$\equiv H_{19}C_9 - C_6H_4 - CH_3$

151. (a) The protective action of different colloids is expressed in terms of Gold number.

156. (a) Tyndall effect may be defined as the scattering of light by the colloidal particles present in a colloidal sol.

158. (a) It is due to adsorption of S^{2-} ions on the surface of the colloidal particles and H^+ ions in the diffused layer.

168. (c) Alum helps in purifying water by Al^{3+} ions which coagulate the negative mud particles.

169. (d) Sn^{+4} contain maximum coagulation power (coagulation power $\propto$ number of charge on ion)

170. (d) It is liquid in gas colloidal solution.

175. (c) Colloidal particles becomes uncharged at isoelectric point.

176. (c) Example of multimolecular colloid system is a gold dispersed in water.

179. (a) The phenomenon of converting of fresh mass into colloidal state by the action of solute or solvent is known as peptization.

180. (a) Surface tension of lyophilic sol is lower than that of the dispersion medium (i.e. H_2O in this case.)

182. (b) Hydrophilic sol can act as protective colloids for hydrophobic solution.

183. (d) Metal sulphide is not used for preparing lyophilic sol.

185. (b) According to definition emulsification.

186. (d) Toilet soap is a mixture of potassium salt of higher fatty acids.

187. (c) Coagulation is governed by Hardy Schulze rule.

189. (a) Protective power $\propto \frac{1}{\text{Gold number}}$

Gold number of *A* is least, therefore, it has the highest protective power.

190. (b) Bredig's arc method is suitable for the preparation of colloidal solution of metal like gold silver, platinum etc. An arc is struck between the metal electrode under the surface of water containing some stabilizing agent such as a trace of *KOH*. However, *Fe* does not react with alkalies that is why it is not obtained by Bredig's arc method.

191. (d) Gold number shows the protective power of a lyophilic solution. Lesser the gold number, greater will be the protecting power of that colloid. Gelatin is one of the best protective colloid. Among the given colloids, potato starch has maximum gold number.

192. (a) Protective power $\propto \frac{1}{\text{Gold number}}$

Thus gelatin is the best protective colloid.

193. (b) Protective power $\propto \frac{1}{\text{Gold number}}$

Hence, the correct order of protective power is $B > A > C > D$.

194. (c) A catalyst does not participate in the reaction but alters the rate of reaction.

195. (a) A colloid of liquid in liquid is called emulsion cod liver oil is such an emulsion.

196. (a) Suspension of solid in a liquid.

197. (c) By the peptization, precipitate is changed to colloidal solution.

198. (a) An aerosol is a dispersion of a solid or liquid in a gas.

199. (d) Lyophilic sols are self stabilizing because these sols are reversible and are highly hydrated in the solution.

200. (d) $\frac{V_c}{V_s} = \frac{10^{-5}}{10^{-7}} \approx 10^3$

204. (a) Alum contains many cations and water has many anionic impurities. On adding alum coagulates the suspended impurities and make water fit for drinking purposes.

205. (a) For the stabilisation of an emulsion a third component called emulsifying agent is usually added. The emulsifier forms an interfacial film between suspended particles and the medium.

206. (b) Alum is added to muddy water so as to destroy the bacteria as well as to coagulate the suspended impurities.

207. (b) Fog is an example of aerosol where the dispersed phase is liquid and dispersionmedium is gas.

208. (c) Lyophilic sols, are more stable than Lyophobic sols because after vaporization its remaining residue, convert into colloidal state after the addition of solvent.

209. (e) The substance, whose molecules associate with given solvent to form colloidal particle known as association colloidal. The molecule of soap & detergent are generally smaller than colloidal particle. These molecules associate in concentration solution to form colloidal size particle. These association of soap & detergent known as miscelle.

Critical Thinking Questions

1. (a) Lyophillic means liquid loving hence hydration is contributed toward the extra stability of lyophillic colloids.

2. (d) Traces of electrolytes are essential for stabilising the sales hence for sales destruction addition of electrolytes are required.

3. (c) A catalyst is a substance which alters the rate of reaction and shortens the time to reach equilibrium.

4. (d) Inhibitors are also catalysts but they slow down the rate of reaction.

5. (d) The ability of an ion to bring about coagulation of a given calloid depend upon both the magnitude and sign of its charge.

6. (c) Physiorption is a process in which the particles of adsorbate are held to the surface of adsorbent by physical forces hence does not requires activation energy.

7. (a) Egg is a calloid of solid and liquid; Ruby glass is a colloid of solid and solid. Milk is a colloid of liquid and liquid but chlorophyll is a complex of magnesium.

8. (b) Surfactant are those which have charge on their tail e.g., cetyltrimethyl ammonium bromide.

$$CH_3-(CH_2)_{15}-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{N^+}}}}-CH_3-Br^-$$

Surfactants are those, which dissociate in water to yield positively charged ion.

9. (a) The size of colloidal particles is of the order $0.1m\mu$ to $0.001m\mu$.

10. (b) $K_4[Fe(CN)_6]$ is most effective in the coagulation of gold-solution.

11. (d) A catalyst is used to decrease the time required for the reaction hence it can decease or increase the rate of reaction.

12. (d) Absorption, Tyndall effect and flocculation all are related to sol but paramagnetism is not represented by sol.

13. (a) On shaking with the dispersion medium, colloids directly form the colloidal sol. Hence they are called intrinsic colloids. *i.e.*, glue.

14. (c) Arsenious sulphide can be prepared by double decomposition

$$As_2O_3+3H_2S\rightarrow As_2S_3+3H_2O$$

15. (c) The amount of electrolyte required to coagulate a fixed amount of a sol depends upon the valency of flocculating ion.

16. (d) Gold no. is a measure of protective power of a lyophillic colloid.

17. (c) The colloidal solution of liquid in liquid is called emulsion not gel.

18. (d) Linseed oil, lanolin and Glycogen attract water hence contain a hydrophobic structure but rubber does not attract water and does not contain a hydrophobic structure.

19. (c) Gum-arabic has protective power hence the function of it ion in preparation of indian ink is protective action.

20. (b) Easily liquefiable gases like SO_2, NH_3, CO_2 are adsorbed to a greater extent than the elemental gases like N_2, O_2, H_2.

21. (d) Volume of the gold dispersed in one litre

$$\text{water} = \frac{\text{Mass}}{\text{Density}} = \frac{1.9\times10^{-4}\ gm}{19\ gm\ cm^{-3}} = 1\times10^{-5}\ cm^{-3}$$

Radius of gold sol particle $= 10\ nm$

$= 10\times10^{-9}\ m \quad = 10\times10^{-7}\ cm = 10^{-6}\ cm$

Volume of the gold sol particle $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\times\frac{22}{7}\times(10^{-6})^3 \quad = 4.19\times10^{-18}\ cm^3$

No. of gold sol particle in

$1\times10^{-5}\ cm^3 = \frac{1\times10^{-5}}{4.19\times10^{-18}}$

$= 2.38\times10^{12}$

No. of gold sol particle in one mm^3

$= \frac{2.38\times10^{12}}{10^6} = 2.38\times10^6$

22. (d) Sodium acetate forms cationic micelles in the molecule of soap and detergent the negative ions aggregate to form a micelle of colloidal size. The negative ion has a long hydrocarbon chain and a polar group $(-COO^-)$ at one end.

Assertion & Reason

1. (a) Both assertion and reason are true and reason is the correct explanation of assertion.

The surface of a solid (or liquid) tends to attract and retain other molecules when it is brought in contact with a gas or a solution.

2. (e) Assertions is false but reason is true.

The enthalpy of chemisorption is of the order of $200\ kJmol^{-1}$ while for physical adsorption it is of the order of $20\ kJmol^{-1}$.

3. (a) Both assertion and reason are true and reason is the correct explanation of assertion .

4. (c) Assertion is true but reason is false.

Freundlich adsorption isotherm gives an empirical relation ship between the quantity of gas adsorbed by unit mass of solid adsorbent and pressure at a particular temperature.

5. (d) Both assertion and reason are false.

There are reactions in which one of the products acts as catalyst (autocatalysis) and no catalyst is added.

6. (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

ZSM – 5 converts alcohols directly into gasoline (petrol) by dehydrating them so that a mixture of hydrocarbons is formed.

7. (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

If the dispersion medium is separated from the dispersed phase, the lyophilic sol can be reconstituted by simply remixing with the dispersion medium. That is why these sols are also called reversible sols.

8. (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

The size of colloidal particles is large enough to scatter light while particles of a true solution are too small to scatter light.

9. (a) Both assertion and reason are true and reason is the correct explanation of assertion.

The impact of the molecules of the dispersion medium on the colloidal particle are unequal leading to zig-zag motion *i.e.,* Brownian movement.

10. (a) Both assertion and reason are true and reason is the correct explanation of assertion.

According to Hardy – Schulze rule : Coagulating power of an electrolyte is directly proportional to the fourth power of the valency of the ions causing coagulation.

11. (a) Both assertion and reason are true and reason is the correct explanation of assertion.

Soap coats the drops of an emulsion and checks them from coming together and the emulsion is thus stabilised.

12. (a) It is fact that deep electric shock causes death of an animal and the reason for this is that blood is coagulated by electric shock. Therefore, here both assertion and reason are true.

13. (a) A catalyst is more effective in finely divided form because finely divided form has more surface area. Therefore there is an increase in active centres on the surface.

14. (c) NH_3 absorbs more readily over activated charcoal than CO_2 it is correct. The reason is the polar nature of NH_3 due to which it readily absorb. Hence assertion is true but reason is false.

15. (a) The sky appears blue because the colloidal particles of dust, dirt in air scatter blue light to the maximum extent. Here both assertion and reason are correct and reason is the correct explanation of assertion.

16. (d) The assertion that physical absorption of molecules takes place on surface only is false. Actually absorption takes place on the whole body. In physical absorption the bonds of absorption molecules are not broken. Hence, both assertion and reason are false.

17. (b) Here both assertion and reason are correct but reason is not a correct explanation of assertion. Micelle is formed if molecules with polar and nonpolar ends assemble in bulk to give nonpolar interior and polar exterior.

18. (a) Both assertion and reason are true and reason is the correct explanation of assertion. Scattering of light is the main phenomenon of colloidal particles. In which colloidal particles scatter a particular wavelengths light.

19. (c) It is true that if we increase the surface area the rate of evaporation also increase as evaporation is always takes place from the surface. But if the intermolecular attraction is stronger than the rate of evaporation is slower.