EXERCISE-I

Adsorption and Adsorption isotherm

1. Adsorption is multilayer in the case of
(A) Physical adsorption (B) Chemisorption
(C) Both (D) None of both

2. 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

3. The charge on As_2S_3 sol is due to the adsorbed
(A) H^+ (B) OH^-
(C) O^{2-} (D) S^{2-}

4. In the adsorption of acetic acid on activated charcoal, the acetic acid is an
(A) Adsorber (B) Absorber
(C) Adsorbent (D) Adsorbate

5. Sticking of one substance at the surface of another is called
(A) Absorption (B) Chemisorption
(C) Adsorption (D) Desorption

6. 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

7. 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

8. For the adsorption of a gas on a solid, the plot of log (x/m) versus log P is linear with slope equal to
(A) k (B) log k
(C) n (D) $1/n$

9. According to Langmuir adsorption isotherm, the amount of gas adsorbed at very high pressures
(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

10. Which of the following statement is not correct
(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

11. According to the adsorption theory of catalysis, the speed of the reaction increases because
(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

12. In Freundlich adsorption, isotherm adsorption is proportional to pressure P as
(A) P^0 (B) P
(C) P^n (D) $P^{1/n}$

13. 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

14. Which of the following is not a characteristic of chemisorption
(A) ΔH is of the order of 400 *kJ*
(B) Adsorption is irreversible
(C) Adsorption may be multimolecular layer
(D) Adsorption is specific

15. The viscosity of the solvent depends on
(A) Isothermic nature
(B) Solute - solute interaction
(C) Solute - solvent interaction
(D) Density of the liquid

16. Which of the following kinds of catalysis can be explained by the adsorption theory ?
(A) Homogeneous catalysis
(B) Acid base catalysis
(C) Heterogeneous catalysis
(D) Enzyme catalysis

17. Adsorption due to strong chemical forces is called
(A) Chemisorption
(B) Physiosorption
(C) Reversible adsorption
(D) Both (B) and (C)

18. In neutralisation of *KI* by $AgNO_3$ positive charge is due to absorption of
(A) Ag^+ ions (B) *Ag*
(C) *I* ions (D) Both (B) and (C)

19. Physical adsorption is inversely proportional to the
(A) Volume (B) Concentration
(C) Temperature (D) All of these

20. 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

Catalyst and Catalysis

21. The role of a catalyst in a reversible reaction is to
(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

22. The catalyst used in the contact process for manufacturing of sulphuric acid is
(A) Copper
(B) Iron/aluminium oxide
(C) Vanadium pentoxide
(D) Platinized asbestos

23. For the functioning of enzymes which of the following statements is not correct
(A) An optimum temperature is needed
(B) An optimum *pH* is needed
(C) They are substrate specific
(D) They always increase activation energy

24. When a catalyst is added to a system the
(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

25. A catalyst can affect reversible reaction by
(A) Changing equilibrium
(B) Slowing forward reaction
(C) Attaining equilibrium in both direction
(D) None of these

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

$+ \underset{\text{Glucose}}{C_6H_{12}O_6}(aq)$

In this reaction, dilute H_2SO_4 is called

(A) Homogeneous catalysis
(B) Homogeneous catalyst
(C) Heterogeneous catalysis
(D) Heterogeneous catalyst

27. Which one of the following statement is wrong in case of enzyme catalysis

(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

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

(A) Zymase (B) Invertase
(C) Maltase (D) Diastase

29. Which of the following is used as a catalyst in the manufacture of toluene from benzene with CH_3Cl

(A) Ni (B) Anhydrous $AlCl_3$
(C) Pd (D) Pt

30. Hydrolysis of ethyl acetate is catalysed by aqueous

(A) Na_2SO_4 (B) K_2SO_4
(C) H_2SO_4 (D) $BaSO_4$

31. Addition of catalyst in a system

(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

32. In which of the following processes, platinum is used as a catalyst

(A) Oxidation of ammonia to form nitric acid
(B) Hardening of oils
(C) Production of synthetic rubber
(D) Synthesis of methanol

33. Enzymes are

(A) Micro-organisms
(B) Proteins
(C) Inorganic compounds
(D) Moulds

34. Protons accelerate the hydrolysis of esters. This is an example of

(A) A heterogeneous catalysis
(B) An acid-base catalysis
(C) A promoter
(D) A negative catalyst

35. Which of the following processes does not involve a catalyst

(A) Haber's process (B) Thermite process
(C) Ostwald process (D) Contact process

36. Which of the statement is wrong among the following

(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

37. 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

38. In the Ostwald's process for the manufacture of HNO_3, the catalyst used is

(A) Mo (B) Fe
(C) Ni (D) Pt

39. A biological catalyst is essentially

(A) An amino acid
(B) A carbohydrate
(C) The nitrogen molecule
(D) An enzyme

40. 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

41. Enzymes are
(A) Substances made by chemists to activate washing powder
(B) Very active vegetable catalysts
(C) Catalysts found in organism
(D) Synthetic catalysts

42. Catalyst used in the oxidation of $SO_2 \rightarrow SO_3$
(A) Nickel (B) $ZnO.Cr_2O_3$
(C) V_2O_5 (D) Iron

43. Which requires catalyst
(A) $S + O_2 \rightarrow SO_2$ (B) $2SO_2 + O_2 \rightarrow 2SO_3$
(C) $C + O_2 \rightarrow CO_2$ (D) All

44. The process which is catalysed by one of the products is called
(A) Acid-base catalysis (B) Autocatalysis
(C) Negative catalysis (D) None of these

45. Adam's catalyst is
(A) Platinum (B) Iron
(C) Molybdenum (D) Nickel

46. A catalyst remains unchanged at the end of the reaction regarding
(A) Mass
(B) Physical state
(C) Physical state and chemical composition
(D) Mass and chemical composition

47. Wilhem Ostwald redefined the action of
(A) Anamers
(B) Isomers
(C) Catalyst
(D) Geometry of monomers

48. 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

49. Enzyme activity is maximum at
(A) 300 K (B) 310 K
(C) 320 K (D) 330 K

50. A catalyst is used to
(A) Increase the product
(B) Increase or decrease the rate of reaction
(C) Increase or decrease the products
(D) Decrease the products

Colloids, Emulsion, Gel and Their properties with application

51. A colloidal solution can be purified by
(A) Filtration (B) Peptization
(C) Coagulation (D) Dialysis

52. Gold number is associated with
(A) Only lyophobic colloids
(B) Only lyophilic colloids
(C) Both lyophobic and lyophilic colloids
(D) None of these

53. Which of the following forms a colloidal solution in water
(A) $NaCl$ (B) Glucose
(C) Starch (D) Barium nitrate

54. A negatively charged suspension of clay in water will need for precipitation the minimum amount of
(A) Aluminium chloride
(B) Potassium sulphate
(C) Sodium hydroxide
(D) Hydrochloric acid

55. Difference between colloids and crystalloids is of
(A) Particle composition (B) Particle size
(C) Concentration (D) Ionic character

56. The purification of the colloidal particles from crystalloid dimensions through semipermeable membrane is known as
(A) Coagulation (B) Dialysis
(C) Ultrafiltration (D) Peptisation

57. The stability of lyophilic colloids is due to
(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

58. Milk is a colloid in which
(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

59. Smoke is an example of
(A) Gas dispersed in liquid
(B) Gas dispersed in solid
(C) Solid dispersed in gas
(D) Solid dispersed in solid

60. Gold number is minimum in case of
(A) Gelatin (B) Egg albumin
(C) Gum arabic (D) Starch

61. Which of the following will have highest coagulating power for As_2S_3 colloid
(A) PO_4^{-3} (B) SO_4^{-2}
(C) Na^+ (D) Al^{3+}

62. Which one of the following is a hydrophobic sol
(A) Starch solution
(B) Gum solution
(C) Protein solution
(D) Arsenic sulphide solution

63. Purification of colloids is done by the process of
(A) Electrophoresis
(B) Electrodispersion
(C) Peptization
(D) Ultra-filteration

64. Which of the following terms is not related with colloids
(A) Dialysis
(B) Ultrafiltration
(C) Wavelength
(D) Brownian movement

65. When dispersed phase is liquid and dispersion medium is gas, then the colloidal system is called
(A) Smoke (B) Clouds
(C) Emulsion (D) Jellies

66. Tyndall phenomenon is exhibited by
(A) $NaCl$ solution (B) Starch solution
(C) Urea solution (D) $FeCl_3$ solution

67. The colloidal solution of gelatin is known
(A) Solvent loving sol (B) Reversible sol
(C) Hydrophilic colloids (D) All of these

68. 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

69. Which is a natural colloidal
(A) Sodium chloride (B) Urea
(C) Canesugar (D) Blood

70. Sodium stearate forms in water
(A) True solution
(B) A suspension
(C) An emulsion
(D) A colloidal solution

71. Substances whose solutions can readily diffuse through parchment membranes are
(A) Colloids (B) Crystalloids
(C) Electrolytes (D) Non-electrolytes

72. Size of colloidal particles varies from
(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 $10^{-10}\ m$

73. Which of the following pairs of ions would be expected to form precipitate when their dilute solution are mixed
(A) Na^+, SO_3^{2-} (B) NH_4^+, CO_3^{2-}
(C) Na^+, S^{-2} (D) Fe^{+3}, PO_4^{-3}

74. Jelly is a form of
(A) Suspension
(B) Colloidal solution
(C) Supersaturated solution
(D) True solution

75. 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

76. 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

77. The emulsifying agent in milk is
(A) Lactic acid (B) Casein
(C) Lactose (D) Fat

78. Butter is
(A) A gel (B) An emulsion
(C) A sol (D) Not a colloid

79. An emulsion is a colloidal dispersion of
(A) A liquid in a gas (B) A liquid in a liquid
(C) A solid in a liquid (D) A gas in a solid

80. 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

81. Which of the following is a lyophilic colloid
(A) Milk (B) Gum
(C) Fog (D) Blood

82. Which characteristic is true in respect of colloidal particle
(A) They always have two phases
(B) They are only in liquid state
(C) They can't be electrolysed
(D) They are only hydrophilic

83. Gold number is a measure of the
(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

84. Sulphur sol contains
(A) Discrete sulphur atoms
(B) Discrete sulphur molecules
(C) Large agreegates of sulphur molecules
(D) Water dispersed in solid sulphur

85. 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

86. Which one of the following is lyophilic colloid
(A) Gelatin (B) Sulphur
(C) Gold (D) Carbon

87. Which one of the following properties of colloids is related with scattering of light
(A) Diffusion
(B) Peptization
(C) Tyndall effect
(D) Brownian movement

88. 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

89. The coagulation power of an electrolyte for arsenious sulphide decreases in the order
(A) Na^{+}, Al^{+3}, Ba^{+2} (B) $PO_4^{-3}, SO_4^{-2}, Cl^{-}$
(C) Al^{+3}, Ba^{+2}, Na^{+} (D) $Cl^{-}, SO_4^{-2}, PO_4^{-3}$

90. Size of colloidal particle is
(A) 1 *nm* (B) 1 – 100 *nm*
(C) > 100 *nm* (D) > 1000 *nm*

91. Tyndall effect is more pronounced in
(A) Hydrophilic sols (B) Hydrophobic sols
(C) Starch solution (D) Both (B) and (C)

92. 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

93. 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

94. When sugar is added to a colloidal solution it brings about
(A) Ionization (B) Coagulation
(C) Peptization (D) None of these

95. Colloidal solutions of metals like gold, silver and platinum are generally prepared by using
(A) Peptization
(B) Bredig's arc method
(C) Exchange of solvent
(D) Oxidation method

96. Liquid–liquid sols are known as
(A) Aerosols (B) Emulsions
(C) Foam (D) Gel

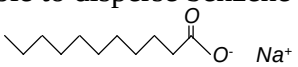
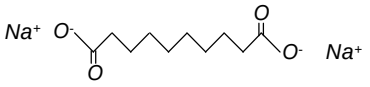
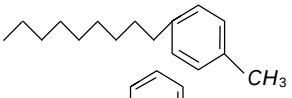
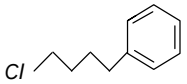
97. Tyndall effect depends upon the
(A) Charge on the colloidal particles
(B) Osmotic pressure of colloidal solution
(C) Difference between the refractive indices of dispersed phase and dispersion medium
(D) Size of colloidal particles

98. Which one of the sols acts as protective colloid
(A) As_2S_3 (B) Gelatin
(C) Au (D) $Fe(OH)_3$

99. The example of heteropolar sol is
(A) Starch sol in water
(B) Rubber sol in water
(C) Protein sol in water
(D) Sulphur sol

100. 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

101. The decomposition of H_2O_2 can be slowed down by the addition of small amount of phosphoric acid which act as
(A) Promoter (B) Inhibitor
(C) Detainer (D) Stopper

102. Which of the following molecules is most suitable to disperse benzene in water
(A) 
(B) 
(C) 
(D) 

103. Luminosity observed as a result of scattering of light by particles is observed in
(A) Suspension (B) Colloidal solution
(C) True solution (D) None of these

104. Which of the following makes the lyophilic solution unstable
(A) Dialysis
(B) Addition of electrolyte
(C) Addition of alcohol
(D) Addition of alcohol and electrolyte both

105. A detergent is a
(A) Cleaning agent (B) Drug
(C) Catalyst (D) Vitamin

106. Gold number is related with
(A) Colloids (B) Radioactivity
(C) Gas equation (D) Kinetic energy

107. Small liquid droplets dispersed in another liquid is called
(A) Gel (B) Emulsion
(C) Suspension (D) True solution

108. Which of the following is used for the destruction of colloids
(A) Dialysis
(B) Condensation
(C) By ultrafiltration
(D) By adding electrolyte

109. An example of an associated colloid is
(A) Milk (B) Soap solution
(C) Rubber latex (D) Vegetable oil

110. The movement of colloidal particles towards the oppositely charged electrodes on passing electricity is known as
(A) Cataphoresis (B) Tyndall effect
(C) Brownian movement (D) None of these

111. 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

112. Which of the following ions can cause coagulation of proteins
(A) Ag^+ (B) Na^+
(C) Mg^{++} (D) Ca^{++}

113. Light scattering takes place in
(A) Solutions of electrolyte
(B) Colloidal solutions
(C) Electrodialysis
(D) Electroplating

114. 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

115. 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

116. 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

117. 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

118. A colloidal system in which gas bubbles are dispersed in a liquid is known as
(A) Foam (B) Sol
(C) Aerosol (D) Emulsion

119. 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
(A) Peptisation (B) Dialysis
(C) Protective action (D) Dissolution

120. Surface tension of lyophilic sols is
(A) Lower than that of H_2O
(B) More than that of H_2O
(C) Equal to that of H_2O
(D) None of these

121. Gold number is maximum for the lyophilic sol is
(A) Gelatin (B) Haemoglobin
(C) Sodium oleate (D) Potato starch

122. Which of the following is the best protective colloid
(A) Gelatin (Gold No. = 0.005)
(B) Gum arabic (Gold No. = 0.15)
(C) Egg albumin (Gold No. = 0.08)
(D) None of these

123. 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
(A) $A > B > C > D$ (B) $B > A > C > D$
(C) $D > C > B > A$ (D) $C > A > B > D$

124. A catalyst is a substance which
(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

125. Cod liver oil is
(A) An emulsion (B) Solution
(C) Colloidal solution (D) Suspension

126. Paste is
(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

127. A precipitate is changed to colloidal solution by the following process
(A) Dialysis (B) Ultrafiltration
(C) Peptization (D) Electrophoresis

128. An aerosol is a
(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

129. Lyophilic sols are
(A) Irreversible sols
(B) They are prepared from inorganic compound
(C) Coagulated by adding electrolytes
(D) Self–stabilizing

130. The volume of a colloidal particle, V_C as compared to the volume of a solute particle in a true solution v_S, could be
(A) $\frac{V_C}{V_S} \simeq 1$ (B) $\frac{V_C}{V_S} \simeq 10^{23}$
(C) $\frac{V_C}{V_S} \simeq 10^{-3}$ (D) $\frac{V_C}{V_S} \simeq 10^{3}$