SURFACE CHEMISTRY

CHEMISTRY

Single Correct Answer Type

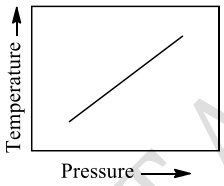
1. For adsorption of gas on solid surface, the plots of $\log x/m$ $vs.$ $\log P$ is linear with a slope equal to :
   a) K b) $\log K$ c) $1/nK$ d) $1/n$ (n being integer)
2. Which is not correct for catalyst? It :
   a) Enhances the rate of reaction in both directions
   b) Changes enthalpy of reaction
   c) Reduces activation energy of reaction
   d) Specific in nature
3. The magnitude of colligative properties in all colloidal dispersions is .....than solution :
   a) Higher b) Lower c) Both (a) and (b) d) None of these
4. Which one is hydrophobic in nature?
   a) Gelatin b) Sulphur c) Starch d) Protein
5. $2SO_2(g)+O_2(g) \xrightleftharpoons{V_2O_5}$ is an example for
   a) Neutralization reaction b) Homogeneous catalysis
   c) Heterogeneous catalysis d) Irreversible reaction
6. Decomposition of urea into NH_3 and CO_2 is followed by the action of enzyme :
   a) Urease b) Pepsin c) Trypsin d) None of these
7. Adsorption is accompanied by the evolution of heat. So, according to Le-Chatelier principle the amount of substance adsorbed should
   a) Increase with decrease in temperature b) Increase with increase in temperature
   c) Decrease with decrease in temperature d) Decrease with increase in temperature
8. Which one of the following equation represents Freundlich adsorption isotherm?
   a) $\frac{x}{m} = kp$ b) $\frac{x}{m} = kp^n$ c) $\log\frac{x}{m} = kp^n$ d) $\log\frac{x}{m} = kn\log p$
9. The number of moles of lead nitrate needed to coagulate 2 moles of colloidal $[AgI]I^-$ is
   a) 2 b) 1 c) 1/2 d) 2/3
10. Surfactant molecules or ions cluster together as micelles which
    a) Due to their hydrophilic tails tend to congregate
    b) Due to their hydrophobic heads provide protection
    c) Are colloid sized clusters of molecules
    d) None of the above
11. The temperature above which micelle formation occurs is :
    a) Critical temperature
    b) Charles' temperature
    c) Inversion temperature
    d) Kraft's temperature
12. By dividing the catalyst into fine powder there will be increase in
    a) Surface area b) Free valancies c) Active centres d) All of these
13. Washing soap can be prepared by saponifying alkali with oil of :
    a) Rose oil b) Paraffin oil c) Ground nut oil d) kerosene
14. Platinum is used as a catalyst in :
    a) Oxidation of ammonia to form nitric acid

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

15. A colloidal solution always has at least :
    a) One phase
    b) More than two phases
    c) A true solution
    d) Two phases
16. Milk can be preserved by adding a few drops of :
    a) Formic acid solution
    b) Formaldehyde solution
    c) Acetic acid solution
    d) Acetaldehyde solution
17. Addition of $FeCl_3$ to $K_4[Fe(CN)_6]$ in dilute and cold solution gives :
    a) Prussian blue sol b) $Fe_4[Fe(CN)_6]_3$ sol c) Positive sol d) All of these
18. Colloidal solution commonly used in treatment of skin diseases is :
    a) Colloidal sulphur b) Colloidal silver c) Colloidal gold d) Colloidal antimony
19. The substance that gets adsorbed on the surface of solid is called
    a) Adsorbate b) Adsorbent c) Micelle d) Absorbent
20. Which of the following is not correct?
    a) Enthalpy of physical adsorption is less compared to enthalpy of chemical adsorption
    b) Milk is an example of emulsion
    c) Physical adsorption increases with the increase in temperature
    d) Smoke is an aerosol
21. Which 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
22. Which of the following statements is incorrect?
    a) Physical adsorption occurs at very low temperature and chemisorptions occur at all temperature
    b) The magnitude of chemisorption decreases with rise in temperature and physisorption increases with rise in temperature
    c) Chemisorption is irreversible and physisorption is reversible
    d) In physisorption, the activation energy of desorption is very low and in chemisorption, the activation energy of desorption is very high
23. Which of the following has maximum coagulation power with ferric hydroxide sol?
    a) Cryolite b) $K_2C_2O_4$ c) $K_3[Fe(CN)]_6$ d) $K_4[Fe(CN)_6]$
24. The critical micelle concentration (CMC) is
    a) The concentration at which micellisation starts
    b) The concentration at which the true solution is formed
    c) The concentration at which one molar electrolyte is present per 1000 g of the solution
    d) The concentration at which $\Delta H = 0$
25. A dilute solution of litmus becomes colourless on shaking with charcoal. This is due to :
    a) Absorption b) Adsorption c) Chemical reaction d) Both (a) and (b)
26. Which of the following is an example for heterogeneous catalysis reaction?
    a) $2SO_2(g) + O_2(g) \xrightarrow{NO\,(g)} 2SO_3(g)$
    b) Hydrolysis of aqueous sucrose solution in the presence of aqueous mineral acid
    c) $2H_2O_2(l) \xrightarrow{pt(s)} 2H_2O(l) + O_2(g)$
    d) Hydrolysis of liquid in the presence of aqueous mineral acid

27. Which of the following is true in respect of adsorption?
    a) $\Delta G < 0; \Delta S > 0; \Delta H < 0$ b) $\Delta G < 0; \Delta S < 0; \Delta H < 0$
    c) $\Delta G > 0; \Delta S > 0; \Delta H < 0$ d) $\Delta G < 0; \Delta S < 0; \Delta H > 0$
28. Which is a homogeneous system?
    a) A solution of sugar in water
    b) Concrete
    c) Muddy water
    d) Bread
29. Which of the following is the most effective in the coagulation of gold sol?
    a) $NaNO_3$ b) $MgCl_2$ c) Na_3PO_4 d) $K_4[Fe(CN)_6]$
30. Which of the following is not a characteristic of chemisorption?
    a) ΔH is the order of 400 kJ b) Adsorption is irreversible
    c) Adsorption may be multimolecular layer d) Adsorption is specific
31. Select wrong statement.
    a) If a very small amount of $AlCl_3$is added to gold sol, coagulation occurs, but if a large quantity of $AlCl_3$is added, there is no coagulation.
    b) Organic ions are more strongly adsorbed on charged surfaces in comparison to inorganic ions.
    c) Both emulsifier and peptising agents stabilise colloids but their actions are different.
    d) Colloidal solutions are thermodynamically stable.
32. The size of colloidal particles is in between
    a) $10^{-7} - 10^{-9}$cm b) $10^{-9} - 10^{-11}$cm c) $10^{-5} - 10^{-7}$cm d) $10^{-2} - 10^{-3}$cm
33. The Brownian movement occurs in :
    a) Colloidal solution
    b) True solution
    c) Suspension having size < 500 mμ
    d) All of the above
34. Dyeing of fibre involves the process of :
    a) Adsorption b) Absorption c) Sorption d) All of these
35. Which adsorption takes place at low temperature?
    a) Physical b) Chemical c) Both (a) and (b) d) None of these
36. Term catalyst was given by
    a) Rutherford b) Berzilius c) Wohler d) Kolbe
37. The cotterells precipitator is used to :
    a) Neutralize charge on carbon particles in air in smoke
    b) Coagulate carbon atoms of smoke
    c) Bring in cataphoresis in carbon particles
    d) All of the above
38. 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
39. Multimolecular colloids are present in
    a) Soap solution b) Sol of proteins c) Sol of gold d) All of these
40. The rate of a certain biochemical reaction catalysed by an enzyme in human body is 10^4 times faster than when it carried out in the laboratory. The activation energy of this reaction :
    a) Is zero
    b) Is different in two cases
    c) Is the same in both the cases
    d) None of the above

41. At CMC (critical micelle concentration), the surfactant molecules undergo
    a) Dissociation b) Micelle formation c) Both (a) and (b) d) None of these
42. Activated charcoal is used to remove colouring matter from pure substances. It works by
    a) Oxidation b) Reduction c) Bleaching d) Adsorption
43. Lyophobic colloids are :
    a) Reversible colloids b) Irreversible colloids c) Protective colloids d) Gum, proteins
44. The size of the colloid particles is :
    a) > suspension particles
    b) < suspension particles
    c) < true solution particles
    d) None of these
45. Emulsions can be destroyed by
    a) The addition of an emulsifier which tend to form an emulsion of the same type
    b) Freezing
    c) Both (a) and (b)
    d) None of the above
46. Which characteristic of adsorption is wrong?
    a) Physical adsorption in general decreases with temperature
    b) Physical adsorption in general increases with temperature
    c) Physical adsorption is a reversible process
    d) Adsorption is limited to the surface only
47. Gelatin is often used as an ingredient in the manufacture of ice-cream. The reason for this is :
    a) To prevent the formation of a colloid
    b) To stabilize the colloid and prevent crystal growth
    c) To cause the mixture to solidify
    d) To improve the flavour
48. Blood contains :
    a) Positively charged particles
    b) Negatively charged particles
    c) Neutral particles
    d) Negatively as well as positively charged particles
49. The curve showing the variation of pressure with temperature for a given amount of adsorption is called



    a) Adsorption isobar b) Adsorption isotherm c) Adsorption isostere d) Adsorption isochore
50. When white light is passed through a colloidal solution containing fine suspended particles of gold, then the scattered light seen in a direction different from that of the incident light is :
    a) Yellow coloured b) Blue coloured c) Green coloured d) Red coloured
51. Emulsions of polyvinylacetate are used in :
    a) Polishes b) Latex paints c) Fire works d) Rayons
52. Peptization denotes
    a) Digestion of food b) Hydrolysis of proteins
    c) Breaking and dispersion into colloidal state d) Precipitation of solid from colloidal dispersion
53. Which characteristic is the most important factor in giving rise to peculiar properties of colloids?
    a) Large size
    b) Small size
    c) High charge density
    d) High ratio of surface are to the volume

54. Alum helps in purifying water by :
    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
55. If the dispersed phase is a liquid and the dispersion medium is a solid, the colloid is known as :
    a) A sol b) An emulsion c) A gel d) A foam
56. In physical adsorption gas molecules are bound on the solid surface by
    a) Chemical forces b) Electrostatic forces c) Graphical forces d) Van der Waals' forces
57. On adding 1 mL solution of 10% NaCl to 10 mL gold solution in the presence of 0.25 g of starch, the coagulation is just prevented. Starch has the gold number equal to :
    a) 0.25 b) 2.5 c) 250 d) 0.025
58. Hardy-Schulze rule states that :
    a) Non-electrolytes have better coagulating action on colloids than electrolytes
    b) Sols are coagulated by effective ions whose charge is opposite to that of sol and the ions of higher charge are much more effective than the ions of lower charge
    c) Charge of the ions has no effect on the coagulation of a sol
    d) Sols are coagulated only by those ions whose charge is similar to that of the sol
59. In homogeneous catalytic reactions, the rate of reaction :
    a) Depends upon the concentration of catalyst
    b) Independent of the concentration of catalyst
    c) Depends upon the free energy change
    d) Depends upon physical state of the catalyst
60. Catalysts are generally used in finely divided state because
    a) It avoids wastage of catalyst
    b) We can see its reaction
    c) It has more surface
    d) It has no effect on reaction rate
61. Which among the following statements is false?
    a) Adsorption may be monolayered or multilayered
    b) Particle size of adsorbent will not effect the amount of adsorption
    c) Increase of pressure increases the amount of adsorption
    d) Increase of temperature may decrease the amount of adsorption
62. Which of the following processes does not involve a catalyst?
    a) Ostwald process b) Contact process c) Thermite process d) None of these
63. Whipped cream is an example of :

	Dispersed phase	*Dispersion medium*
a)	Liquid	gas
b)	Gas	liquid
c)	Liquid	liquid
d)	Solid	liquid

64. Alloy is an example of
    a) Gel b) Solidified emulsion c) Solid solution d) Sol
65. Which of the following statements is correct about Langmuir's adsorption isotherm?
    a) It forms monolayer b) It is reversible in nature
    c) It occurs at low temperature d) None of the above
66. Zeolites :
    a) Are microporous aluminosilicates
    b) Have general formula $M_{x/n}[(AlO_2)_x(SiO_2)_4] \cdot mH_2O$

c) Have pore sizes between 260 pm to 740 pm
d) All of the above

67. Which of the following does not contain hydrophobic structure?
a) Linseed oil b) Linolin c) Glycogen d) Rubber

68. An increase in the concentration of adsorbate at the surface relative to its concentration in bulk phase is called :
a) Adsorption b) Enthalpy c) Absorption d) None of these

69. Which will not form colloidal solution?
(Where DP = Dispersion phase and DM = Dispersion medium)
a) DP-gas, DM-liq. b) DP-liquid DM-solid c) DP-gas, DM-gas d) DP-solid, DM-solid

70. In Langmuir's model of adsorption of a gas on a solid surface
a) The rate of dissociation of adsorbed molecules from the surface does not depend on the surface covered
b) The adsorption at a single site on the surface may involve multiple molecules at the same time
c) The mass of gas striking a given area of surface is proportional to the pressure of the gas
d) The mass of gas striking a given area of surface is independent of the pressure of the gas

71. The velocity of oxidation of oxalic acid by acidified $KMnO_4$increase as the reaction progress. It is an example of
a) Promoters b) Catalytic poisons c) Autocatalysis d) Inhibitors

72. Which electrolyte is least effective in causing coagulation of +ve ferric hydroxide sol?
a) KBr b) K_2SO_4 c) K_2CrO_4 d) $K_2[Fe(CN)_6]$

73. A colloidal system in which gas bubbles are dispersed in a liquid is known as
a) Foam b) Aerosol c) Sol d) Emulsion

74. The false statement for hydrophilic sols is :
a) They do not require electrolytes for stability
b) Coagulation is reversible
c) Viscosity is of the order of that of water
d) Surface tension is lower than that of dispersion medium

75. When a catalyst is added to a system the:
a) Equilibrium concentrations are increased
b) Equilibrium concentrations are unchanged
c) The rate of forward reaction is increased and that of backward reaction is decreased
d) Value of equilibrium constant is decreased

76. The simplest way, to check whether a system is a colloid, is by
a) Tyndall effect b) Brownian movement
c) Electrodialysis d) Finding out particle size

77. Micelles have
a) Same colligative property as that of common colloidal solution b) Lower colligative property as that of common colloidal solution
c) Higher colligative property as that of common colloidal solution d) None of the above

78. Which of the following represent homogeneous catalysis?
a) $\text{Oil} + H_2 \xrightarrow{\text{Ni}} \text{saturated fat}$ b) $N_2(g) + 3H_2(g) \xrightarrow{\text{Fe}} 2NH_3(g)$
c) $CH_3COOH + C_2H_5OH \xrightarrow[H_2SO_4]{H^+} CH_3COOC_2H_5 + H_2O$ d) All of the above

79. Detergent action of synthetic detergents is due to their :
a) Interfacial area
b) High molecular weight
c) Ionisation
d) Emulsifying properties

80. Ultramicroscope works on the principle of :
a) Light reflection b) Light absorption c) Light scattering d) Light polarization

81. The catalyst iron, employed in the Haber's process, contains molybdenum, the function of which is :
a) To increase the rate of combination of gases
b) To counterbalance for the presence of impurities in the gases
c) To act as a catalyst promoter and increase activity of catalyst
d) To make up for the adverse temperature and pressure conditions

82. An emulsifier is a substance which
a) Stabilises the emulsion b) Homogenises the emulsion
c) Coagulates the emulsion d) Accelerates the dispersion of liquid in liquid

83. The example(s) of anionic surfactants is/are
a) $C_{18}H_{37}NH_3Cl$ b) $C_{15}H_{31}COONa$ c) $R - C_6H_4 - SO_3Na$ d) $C_6H_{33}N(CH_3)_3Cl$

84. For adsorption of a gas on a solid, the plot of $\log\frac{x}{m}$ vs $\log p$ is linear with slope equal to (n being whole number)
a) K b) $\log k$ c) n d) $\frac{1}{n}$

85. A substance which promotes the activity of a catalyst is known as :
a) Initiator b) Catalyst c) Promoter d) Auto-catalyst

86. Adsorption of a gas on solid metal surface is spontaneous and exothermic, then :
a) H increases b) S increases c) G increases d) S decreases

87. Freundlich adsorption isotherm is
a) $\frac{x}{m} = kp^{1/n}$ b) $x = mkp^{1/n}$ c) $x/m = kp^{-n}$ d) All of these

88. Which of the following forms cationic micelles above certain concentration?
a) Urea b) Sodium dodecyl sulphate
c) Sodium acetate d) Cetyltrimethylammonium bromide

89. Catalyst in a reaction
a) Lowers the activation energy b) Increase the rate of reaction
c) Both (a) and (b) d) Initiates the reaction

90. The average size of the colloids is of the order :
a) 10^{-12} m to 10^{-19} m b) 10^{-7} m to 10^{-9} m c) 10^{-9} m to 10^{-12} m d) 10^{-6} m to 10^{-9} m

91. If (x/m) is the mass of adsorbate adsorbed per unit mass of adsorbent. $p$is the pressure of the adsorbate gas and a and b are constants, which of the following represents "Langmuir adsorption isotherm"?
a) $\log\left(\frac{x}{m}\right) = \log\left(\frac{a}{b}\right) + \frac{1}{a}\log p$ b) $\frac{x}{m} = \frac{b}{a} + \frac{1}{ap}$
c) $\frac{x}{m} = \frac{1+bp}{ap}$ d) $\frac{1}{(x/m)} = \frac{b}{a} + \frac{1}{ap}$

92. Tanning of leather is :
a) Colouring of leather by chemicals
b) Drying process to make the leather hard
c) Polishing of leather to make it look attractive
d) Coagulative hardening of the leather by chemicals

93. In a chemical reaction, catalyst
a) Decrease the energy of activation b) Increases the energy of activation
c) Does not change energy of activation d) None of the above

94. Which one of the following methods is commonly used for destruction of colloid?
a) Dialysis
b) Condensation
c) Filtration by animal membrane
d) By adding electrolyte

95. In multimolecular colloidal solutions, atoms or molecules are held together by :

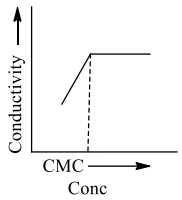
a) H-bonding b) van der waals' forces c) Ionic bonding d) Covalent bonding

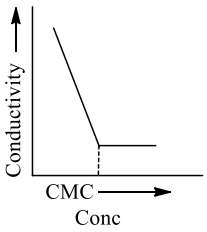
96. In autocatalysis
    a) Reactant act as catalyst
    b) One of the product acts as catalyst
    c) Vessel acts as catalyst
    d) All of the above are incorrect
97. One of the reasons for greater reactivity of finely divided platinum catalyst is that it has :
    a) Particles which are almost atomic in dimensions
    b) Particle size which can spread easily through whole reactants
    c) Much larger surface area
    d) A physical state only in which it can react quickly
98. The potential difference between the fixed charged layer and the diffused layer having opposite charge is called :
    a) Zeta potential b) Streaming potential c) Dorn potential d) Colloidal potential
99. The protecting power of lyophilic colloidal sol is expressed in terms of :
    a) Critical miscelle concentration
    b) Oxidation number
    c) Coagulation value
    d) Gold number
100. Rate of physical adsorption increase with
    a) Decrease in surface area
    b) Decrease in temperature
    c) Decrease in pressure
    d) Increase in temperature
101. Size of colloidal particles is in the range
    a) 0.05 mμ-0.1 mμ b) 25 μ − 30 μ c) 0.1 μ − 1 mμ d) 10 μ − 20 μ
102. Brownian motion of sol particle is the .....property of sol :
    a) Electrical b) Optical c) Kinetic d) Colligative
103. Which of the following statements is correct for Tyndall effect?
    a) Scattering and polarizing of light by small suspended particles is called Tyndall effect
    b) Tyndall effect of colloidal particles is due to dispersion of light
    c) Tyndall effect is due to refraction of light
    d) $Zig - zag$ motion of suspended particles
104. Which is an emulsion?
    a) Boot polish b) Lipstic c) Shampoo d) All of these
105. The process which is catalysed by one of the products formed during the reaction is known as :
    a) Autocatalysis b) Anticatalysis c) Negative catalysis d) Acid catalysis
106. Lyophilic sols are more stable than lyophobic sols because the particles
    a) Are positively charged
    b) Are negatively charged
    c) Are solvated
    d) Repel each other
107. Which is the property of hydrophilic sols?
    a) High concentration of dispersed phase can be easily attained
    b) Coagulation is reversible
    c) The charge on particles depends on the pH of the medium and it may be positive, negative
    d) All of the above
108. Which is not a colloidal solution of a liquid in another liquid?
    a) Photographic emulsions
    b) Soap in water
    c) Homogenised milk
    d) Latex
109. Gold numbers is associated with
    a) Electrophoresis b) Protective colloids c) Tyndall effects d) Isotonic solutions
110. Which of the following will be the most effective in the coagulation of $Fe(OH)_3$ sol?
    a) KCN b) $BaCl_2$ c) NaCl d) $Mg_3(PO_4)_2$
111. Which of the following statement(s) is/are true?

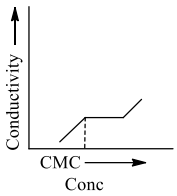
a) Gelatin molecules (hydrophilic sol) are attracted to water molecules by London forces and hydrogen bonding
b) In hydrophobia sols, there is a lack of attraction between the dispersed phase and the continuous phase
c) Hydrophobia sols are basically unstable
d) All of the above

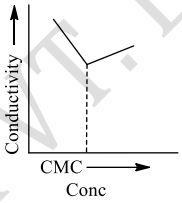
112. Which can adsorb larger volume of hydrogen gas?
a) Colloidal solution of palladium
b) Finely divided nickel
c) Finely divide platinum
d) Colloidal $Fe(OH)_3$

113. Which graph is correct for critical micelle concentration (CMC)?

a) 

b) 

c) 

d) 

114. A colloidion solution is one which contains :
a) Cellulose nitrate in a alcohol-ether
b) Cellulose in water
c) Sucrose in water
d) None of the above

115. Which explains the effect of a catalyst on the rate of reversible reaction?
a) It provides a new reaction pathway with a lower activation energy
b) It moves the equilibrium position to the right
c) It increases the kinetic energy of the reacting molecules
d) It decreases the rate of the reverse reaction

116. Solvent loving colloids are :
a) Lyophobic colloid b) Lyophilic colloid c) Hydrophobic colloid d) None of these

117. Pd can adsorb 900 times its volume of hydrogen. This is called :
a) Absorption b) Adsorption c) Occlusion d) Both (a) and (c)

118. Which of the following is a wrong statements for physisorption?
a) It is a reversible reaction b) Reaction requires an energy of activation
c) The value of adsorption enthalpy is low d) It generally occurs at a low temperature

119. The function of negative catalyst is :
a) To remove the active intermediate from the reaction
b) To terminate the chain reaction
c) Both (a) and (b)
d) None of the above

120. A liquid which markedly scatters a beam of light (visible in dark room) but leaves no residue when passed through a filter paper is best described as :
a) A suspension b) Sol c) True solution d) None of these

121. Modern theory of heterogeneous catalysis is :
a) Intermediate compound formation theory
b) Adsorption theory
c) A combination of two theories, *i. e.*, intermediate compound formation and adsorption theory
d) None of the above

122. Which of the following acts as a catalyst?
a) Metals with variable valency b) Metals with non-variable valency
c) Non-metals with fixed valency d) Inert gases

123. Silver iodide is used for producing artificial rain because AgI :
    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
124. Shape selective catalysts are so called because of
    a) The shape of the catalyst
    b) The specificity of the catalyst
    c) The size of the pores of catalyst which can trap selective molecules only
    d) Their use for only some selected reaction
125. Which one of the following is a property of physisorption?
    a) None-specific nature b) High specificity c) Irreversibility d) All of these
126. Medicines are more effective if they are used in :
    a) Colloidal state b) Solid state c) Solution state d) None of these
127. Catalyst used in Friedel-Craft's reaction is
    a) Iron b) Finally divided nickel
    c) V_2O_5 d) Anhydrous $AlCl_3$
128. Milk contains a protein that is very good for health. The protein is :
    a) Caffeine b) Calciferol c) Keratin d) Casein
129. Which statement is not correct?
    a) Physical adsorption is due to van der Waals' forces
    b) Physical adsorption decreases at high temperature and low pressure
    c) Physical adsorption is reversible
    d) Adsorption energy for a chemical adsorption is generally lesser than that of physical adsorption
130. Identify the gas which is readily adsorbed by activated charcoal
    a) N_2 b) SO_2 c) H_2 d) O_2
131. Which one of the following will have highest coagulating power for As_2S_3 colloid?
    a) Al^{3+} b) PO_4^{3-} c) SO_4^{2-} d) Na^+
132. The separation of colloidal particles (or purification of sol) from particles of molecular dimensions is known as :
    a) Photolysis b) Dialysis c) Pyrolysis d) Peptization
133. Dust storm is :
    a) Dispersion of solid in gas
    b) Dispersion of a gas in solid
    c) Dispersion of solid in solid
    d) Dispersion of a gas in liquid
134. The catalyst used in the manufacture of nitric acid by Ostwald's process is :
    a) Mo b) Pt c) V_2O_5 d) Fe
135. Tyndall effect would be observed in
    a) Solvent b) Solution c) Colloidal solution d) Precipitate
136. Plot of $\log x/m$ against $\log p$ is a straight line inclined at an angle of 45°. When the pressure is 0.5 atm and Freundlich parameter, k is 10, the amount of solute adsorbed per gram of adsorbent will be ($\log 5 = 0.6990$)
    a) 1 g b) 2 g c) 3 g d) 5 g
137. On adding few drops of dil HCl to freshly precipitated ferric hydroxide, a red coloured solution is obtained. This phenomenon is known as
    a) Peptisation b) Dialysis c) Protective action d) Dissolution
138. At CMC, the surfactant molecules undergoes :
    a) Association b) Aggregation c) Micelle formation d) All of these
139. A biological catalyst is

a) An amino acid
b) A carbohydrate
c) The nitrogen molecule
d) An enzyme

140. An example of dispersion of a liquid in a gas is
a) Milk
b) Vegetable oil
c) Foam
d) Mist

141. Which of the following is not correct?
a) Milk is a naturally occurring emulsion
b) Gold sol is a lyophilic sol
c) Physical adsorption decreases with rise in temperature
d) Chemical adsorption is unilayered

142. In contact process of manufacture of H_2SO_4, the catalyst used is
a) Iron
b) V_2O_5
c) Chromium
d) Oxides of nitrogen

143. The catalyst used in the chamber process of sulphuric acid is :
a) Platinum
b) Nitric oxide
c) Nickel
d) Vanadium pentoxide

144. Isoelectric point refers to the H^+ ion concentration at which the colloidal particles :
a) Coagulate
b) Become electrically neutral
c) Can move to either electrode when subjected to an electric field
d) Reverse their electrical charge

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

146. Sedimentation potential is the reverse of
a) Electroosmosis
b) Electrophoresis
c) Electrokinetic potential
d) Dorn potential

147. During the adsorption of krypton on activated charcoal at low temperature
a) $\Delta H > 0$ and$\Delta\, S < 0$
b) $\Delta H < 0$ and $\Delta\, S < 0$
c) $\Delta H > 0$ and $\Delta\, S > 0$
d) $\Delta H < 0$ and $\Delta S > 0$

148. A catalyst in finely divided state is more efficient because in this state
a) In has larger activation energy
b) It can react with one of the reactants more efficiently
c) It has large surface area
d) All of the above

149. Cow milk, an example of natural emulsion is stabilised by
a) Fat
b) Water
c) Casein
d) Mg^{2+}ions

150. Identify the correct statements regarding enzymes.
a) Enzymes are specific biological catalysts that can normally function at very high temperatures ($T \sim 1000$ K)
b) Enzymes are normally heterogeneous catalysts that are very specific in their action.
c) Enzyme are specific biological catalysts that cannot be poisoned
d) Enzyme are specific biological catalysts that possess well defined active sites

151. $BaSO_4$ acts as .....for Pd in Rosenmund's reaction:
a) Promoter
b) Poison
c) Autocatalyst
d) None of these

152. Which is not shown by sols?
a) Adsorption
b) Tyndall effect
c) Flocculation
d) Paramagnetism

153. Bredig arc method cannot be used to prepare colloidal solution of :
a) Pt
b) Fe
c) Ag
d) Au

154. The reaction between alkali and fat is called :
a) Saponification
b) Hydrolysis
c) Distillation
d) dehydration

155. A colloidal system involves :

a) A state of dissolution b) A state of dispersion c) A state of suspension d) None of these

156. Conversion of milk into curd is made by the enzyme :
a) Diastase b) Invertase c) Micoderma bacilli d) Lactic bacilli

157. Identify the gas which is readily adsorbed by activated charcoal
a) H_2 b) N_2 c) SO_2 d) O_2

158. Which is not correct for heterogeneous catalysis?
a) The catalyst decreases the energy of activation
b) The surface of catalyst plays an important role
c) The catalyst actually forms a compound with reactants
d) There is no change in the energy of activation

159. The phenomenon observed when a beam of light is passed through a colloidal solution is
a) Cataphoresis b) Delectrophoresis c) Coagulation d) Tyndall effect

160. Isoelectric point is the pH at which colloidal particles
a) Become electrically charged b) Can move towards respective electrodes
c) Coagulate d) None of the above

161. In homogeneous catalysis
a) The reactant, catalyst and products are in the same phase
b) The catalyst and reactants are in the same phase
c) The catalyst and products are in the same phase
d) The reactants and products are in the same phase

162. The enzyme which can catalyse the conversion of glucose of ethanol is :
a) Zymase b) Invertase c) Maltase d) diastase

163. The addition of alcohol to a saturated aqueous solution of calcium acetate first forms a sol and then sets to a gelatinous mass called solid alcohol which is a :
a) Solid sol b) Aerosol c) Solid form d) gel

164. Colloidal solution commonly used in treatment of eye disease is :
a) Colloidal sulphur b) Colloidal silver c) Colloidal gold d) Colloidal antimony

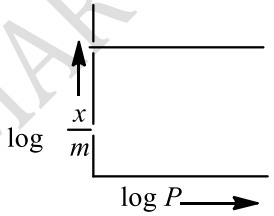
165. In Zeigler-Natta polymerisation of ethylene, the active species is :
a) $AlCl_3$ b) Et_3Al c) CH_2CH_2 d) Ti^{III}

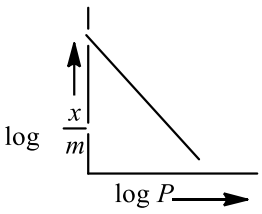
166. If liquid is dispersed in solid medium, this is called
a) Sol b) Emulsion c) Liquid aerosol d) gel

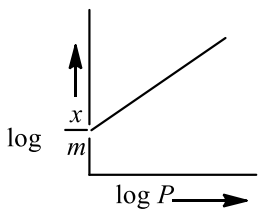
167. In which of these processes platinum is used as a catalyst?
a) Oxidation of ammonia to form HNO_3 b) Hardening of oils
c) Protection of synthetic rubber d) Synthesis of methanol

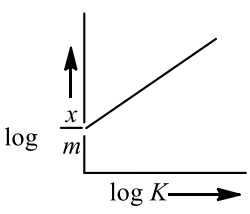
168. Which is the characteristic of catalyst?
a) It changes equilibrium point b) It initiates the reaction
c) It alters the rate of reaction d) It increases average KE of molecules

169. Which one of the following graphs represents Freundlich adsorption isotherm?

a) 

b) 

c) 

d) 

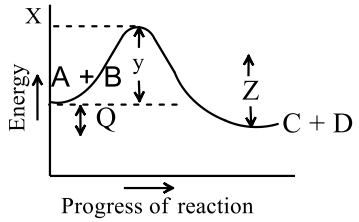
170. ZSM-5 is used to convert :

a) Alcohol to petrol b) Benzene to toluene c) Toluene to benzene d) Heptane to toluene

171. Which acts as inhibitor for knocking in combustion of petrol?
a) $(C_2H_5)_4$ Pb b) $Ni(CO)_4$ c) Both (a) and (b) d) None of these

172. Which of the following electrolytes is least effective in coagulation ferric hydroxide solution?
a) KBr b) K_2SO_4 c) K_2CrO_4 d) $K_4[Fe(CN)_6]$

173. Mark the correct statement about given graph :



a) X is threshold energy level
b) Y and Z are energy of activation for forward and backward reaction respectively.
c) Q is heat of reaction and reaction is exothermic
d) All of the above

174. From the following which is not an emulsifier?
a) Agar b) Milk c) Gum d) Soap

175. According to Langmuir adsorption isotherm the amount of gas adsorbed at very high pressure :
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

176. The enzyme ptyalin used for digestion of food is present in :
a) Saliva b) Blood c) Intestine d) Adrenal glands

177. Flocculation value is expressed in terms of :
a) Millimole per litre b) Mole per litre c) Gram per litre d) Mole per millilitre

178. Formation of ammonia from $H_2$and N_2 by Haber's process using Fe is an example of
a) Heterogeneous catalysis b) Homogeneous catalysis
c) Enzyme catalysis d) Non-catalytic process

179. Identify the correct statement for the adsorption of a real gas on charcoal at 1 atm and 15°C
a) Gases which are small in molecular size are adsorbed more
b) Decrease in pressure increases the extent of adsorption
c) Gases which are easily liquefiable are adsorbed more in quantity
d) Gas which has a behaviour similar to an inert gas is adsorbed more

180. Which statement about enzymes is not correct?
a) Enzymes are in colloidal state
b) Enzymes are catalysts
c) Enzymes can catalyse any reacion
d) Urease is an enzyme

181. Gold number is the index for :
a) Protective power of lyophilic colloid
b) Purity of gold
c) Metallic gold
d) Electroplated gold

182. Emulsions are normally prepared by shaking vigorously the two components together with same kind of emulsifying agent to stabilize the product. The emulsifying agent may be
a) Soap b) Surfactant c) Lyophilic solution d) All of these

183. Choose the incorrect statement
a) Non-ionic surfactant molecules cluster together in clumps
b) Ionic surfactants tend to disrupt by electrostatic repulsions between head groups

c) Micelles look like flattered spherical structure at CMC
d) None of the above

184. The cementation process is :
a) Gel formation b) Emulsion formation c) Either of them d) None of them

185. In which of the following, Tyndall effect is not observed?
a) Smoke b) Emulsion c) Sugar solution d) Gold sol

186. Enzymes are
a) Microorganism b) Proteins
c) Inorganic compounds d) Moulds

187. Adsorption is multilayer in the case of
a) Physical adsorption b) Chemisorption c) Both (a) and (b) d) None of these

188. There is formation of an electrical double layer of opposite charges on the surface of colloidal particles, so a potential develops which is known as
a) Electrokinetic potential b) Zeta potential
c) Streaming potential d) Colloidal potential

189. Which of the following is wrong?
a) A catalyst remain unchanged at the end of chemical reaction
b) A catalyst is specific in action
c) A catalyst does not changes the state of equilibrium in a chemical reaction
d) A catalyst can start a reaction

190. Which requires catalyst :
a) $S + O_2 \longrightarrow SO_2$ b) $2SO_2 + O_2 \longrightarrow 2SO_2$ c) $C + O_2 \longrightarrow CO_2$ d) All of these

191. Which of the following impurities present in colloidal solution cannot be remove by electrodialysis?
a) Sodium chloride b) Potassium sulphate c) Urea d) Calcium chloride

192. The minimum energy level necessary to permit a reaction to occur is :
a) Internal energy b) Threshold energy c) Activation energy d) Free energy

193. The movement of sol particles under an applied electric field is called :
a) Electrodeposition b) Electrodialysis c) Electroosmosis d) Electrophoresis

194. The arsenious sulphide sol has negative charge. The maximum coagulating power for precipitating it is of :
a) 0.1 N $Zn(NO_3)_2$ b) 0.1 N Na_3PO_4 c) 0.1 N $ZnSO_4$ d) 0.1 N $AlCl_3$

195. Among the electrolytes Na_2SO_4, $CaCl_2$, $Al_2(SO_4)_3$ and NH_4Cl, the most effective coagulation agent for Sb_2S_3 sol is
a) Na_2SO_4 b) $CaCl_2$ c) $Al_2(SO_4)_3$ d) NH_4Cl

196. An example of solid-solid system is :
a) Smoke b) Cake c) Synthetic gems d) Pumice stone

197. 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) $\frac{V_C}{V_S} \approx 10^3$ b) $\frac{V_C}{V_S} \approx 10^{-3}$ c) $\frac{V_C}{V_S} \approx 10^{23}$ d) $\frac{V_C}{V_S} \approx 1$

198. The volume of colloidal particles V_c as compared to the volume of solute particles in true solution V_s could be :
a) ~1 b) $\sim 10^3$ c) $\sim 10^2$ d) $\sim 10^{-3}$

199. Mention the type of reaction to obtain Au(sol).
Reaction,
$2AuCl_3 + 3HCHO + 3H_2O \rightarrow 2Au(sol) + 3HCOOH + 6HCl$
a) Hydrolysis b) Oxidation
c) Reduction d) Double decomposition

200. On addition of 1mL solution of 10% NaCl to 10mL gold solution in the presence of 0.025 g of starch, the coagulation is prevented because starch has the following gold numbers
a) 25 b) 0.025 c) 0.25 d) 2.5

201. The movement of colloidal particles towards their respective electrodes in the presence of an electric field

is known as

a) Electrolysis
b) Brownian movement
c) Dialysis
d) Electrophoresis

202. Lyophilic sols are

a) Irreversible sols
b) They are prepared from inorganic compounds
c) Coagulated by adding electrolytes
d) Self-stabilising

203. Clouds, mist, fog and aerosols are colloidal solutions of :

a) Solid in a gas
b) Gas in a solid
c) Liquid in a gas
d) Gas in a liquid

204. 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

205. In the titration between oxalic acid and acidified potassium permanganate, the manganous salt formed during the reaction catalyses the reaction. The manganous salt acts as :

a) A promoter
b) A positive catalyst
c) An autocatalyst
d) None of these

206. In Freundlich Adsorption isotherm, the value of $1/n$ is :

a) 1 in case of physical adsorption
b) 1 in case of chemisorption
c) Between 0 and 1 in all cases
d) Between 2 and 4 in all cases

207. Purple of cassius is

a) Colloidal solution of Au
b) Colloidal solution of Pt
c) Colloidal solution of Ag
d) Colloidal solution of As

208. Freundlich equation for adsorption of gases (in amount of Xg) on a solid(in amount of mg)at constant temperature can be expressed as

a) $\log\frac{X}{m} = \log p + \frac{1}{n}\log k$
b) $\log\frac{X}{m} = \log k + \frac{1}{n}\log p$
c) $\frac{X}{m} \propto p^n$
d) $\frac{X}{m} = \log p + \frac{1}{n}\log k$

209. Which acts as poison to finely divided Fe in Haber's process for the manufacture of NH_3?

a) CO_2
b) NO
c) CO
d) N_2

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

a) Peptization
b) Coagulation
c) Diffusion
d) None of these

211. The curve showing the variation of adsorption with pressure at constant temperature is called

a) An isostere
b) Adsorption isotherm
c) Adsorption isobar
d) None of these

212. Tyndall effect shown by colloids is due to

a) Scattering of light by the particles
b) Movement of particles
c) Reflection of light by the particles
d) Coagulation of particles

213. Negative catalyst or inhibitor is one :

a) Which retards the rate of reaction
b) Takes the reaction in forward direction
c) Promotes the side reaction
d) None of the above

214. Which is not a colloid?

a) Chlorophyll
b) Egg white
c) Ruby glass
d) Milk

215. Which forms micelles in aqueous solution above certain concentration?

a) Glucose
b) Dodecyl trimethyl ammonium chloride

c) Urea
d) Pyridinium chloride

216. Cod liver oil is :
a) Fat dispersed in water
b) Water dispersed in fat
c) Water dispersed in oil
d) Fat dispersed in fat

217. Colour of colloids depend on which of the factors?
a) Size b) Mass c) Charge d) Nature

218. Colloidal gold is given by injection to act as
a) Disinfectant b) Anticancer agent
c) Germ killer d) Tonic to raise vitality of human systems

219. The outcome of internal liquid of gels on shear is called :
a) Synerisis b) Thixotropy c) Swelling d) None of these

220. A catalyst in the finely divided form is most effective because :
a) Less surface area is available
b) More active centres are formed
c) More energy gets stored in the catalyst
d) None of the above

221. Gold numbers of protective colloids A, B, C and D are 0.50, 0.01, 0.10, and 0.005, respectively. The correct order of their protective powers is
a) $D < A < C < B$ b) $C < B < D < A$ c) $A < C < B < D$ d) $B < D < A < C$

222. The coagulation of 10 cm^3 of gold sol is completely prevented by addition of 0.025 g of starch to it. The gold number of starch is
a) 0.025 b) 0.25 c) 2.55 d) 25

223. 50 mL of 1 M oxalic acid is shaken with 0.5g wood charcoal. The final concentration of the solution after adsorption is 0.5 M. What is the amount of oxalic acid absorbed per gram of carbon?
a) 3.15 g b) 3.45 g c) 6.30 g d) None of these

224. Colloidal sol is :
a) True solution b) Suspension c) Heterogeneous sol d) Homogeneous sol

225. The blue colour of the water of the sea is due to :
a) Refraction of the blue light by the impurities in sea water
b) Reflection of blue light by sea water
c) Scattering of blue light by sol paricles
d) Absorption of other colours except the blue colour by water molecules

226. The spontaneous outcome of internal liquid from gels is called :
a) Synerisis b) Thixotropy c) Swelling d) None of these

227. Solid aerosol is an example of colloidal system of :
a) Liquid dispersed in gas
b) Gas dispersed in gas
c) Solid dispersed in gas
d) Solid dispersed in liquid

228. Which is more powerful to coagulate the negative colloid?
a) $ZnSO_4$ b) Na_3PO_4 c) $AlCl_3$ d) $K_4[Fe(CN)_6]$

229. Which is used as catalyst to retard the oxidation of chloroform?
a) H_2O b) C_2H_5OH c) Glycerol d) H_2SO_4

230. Micelle is a term used for the aggregates formed in solution by
a) Colloidal electrolyte b) Colloidal non-electrolyte
c) Non associated colloids d) None of the above

231. Which reaction characteristics are changing by the addition of a catalyst to a reaction at constant

temperature?
(i)activation energy (ii)Equilibrium constant (iii)Reaction entropy (iv)Reaction enthalpy
a) (i) only b) (iii) only c) (i) and (ii) only d) All of these

232. The colour of sky is due to
a) Transmission of light
b) Wavelength of scattered light
c) Adsorption of light by atmospheric gases
d) All of the above

233. Egg albumin is :
a) Reversible colloid b) Lyophilic colloid c) Protective colloid d) All of these

234. How many layers are adsorbed in chemical adsorption?
a) One b) Two c) Many d) Zero

235. Blood may be purified by
a) Dialysis b) Electro-osmosis c) Coagulation d) Filtration

236. Who coined the term catalysis and awarded Nobel Prize?
a) Berzelius b) Kolbe c) Wholer d) Rutherford

237. The sky looks blue due to
a) Dispersion effect b) Reflection effect c) Transmission effect d) Scattering effect

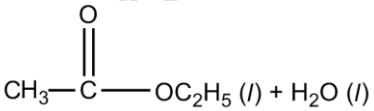
238. Fermentation of starch to give alcohol takes place in presence of :
a) Enzymes b) CO_2 c) Air d) N_2

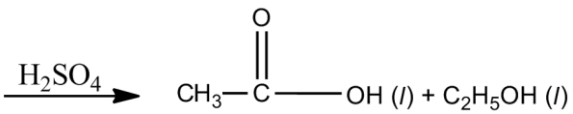
239. Efficiency of catalyst depends on
a) Concentration b) Molecular mass c) Size of particles d) None of these

240. The amount of gas adsorbed physically on charcoal increases with :
a) Temperature and pressure
b) Temperature and decreases with pressure
c) Pressure and decreases with temperature
d) None of the above

241. Which statement is wrong?
a) The catalyst does not alter the equilibrium of a reaction
b) Reaction with higher activation energy has higher rate constant
c) In the endothermic reaction, the activation energy of the reaction is higher than that of heat of reaction
d) Half-life period of a first order reactions is independent of initial concentration

242. During hydrogenation of oils, catalyst commonly used is :
a) Pd or $CuCl_2$ b) Finely divided Ni c) Fe d) V_2O_5

243. Which of the following reactions is an example of heterogeneous catalysis?
a) $O_3 + O \xrightarrow{Cl} 2O_2$(gas phase)
b) $2CO(g) + O_2(g) \xrightarrow{NO} 2CO_2(g)$
c) 



d) $CO(g) + 2H_2(g) \xrightarrow{Cu,ZnO-Cr_2O_3} CH_3OH(l)$

244. Which is not a macromolecule?
a) Palmitate b) Starch c) DNA d) Insulin

245. Physical adsorption increases when
a) Temperature increases
b) Temperature decreases
c) Temperature remains constant
d) Temperature increases above 60°C

246. Soap removes grease by :
a) Adsorption b) Emulsification c) Coagulation d) None of these

247. Which of the following is correct according to adsorption isotherm?

a) $\frac{x}{m} \propto p^0$ b) $\frac{x}{m} \propto p^1$ c) $\frac{x}{m} \propto p^{1/n}$ d) All of these

248. Which of the following statements is incorrect regarding physisorptions?
a) It occurs because of van der Waals' forces
b) More easily liquefiable gases are adsorbed readily
c) Under high pressure it results into multimolecular layer on adsorbent surface
d) Enthalpy of adsorption ($\Delta H_{\text{adsorption}}$) is slow and positive

249. In which process, a catalyst is not used?
a) Deacon's process b) Solvay's process c) Chamber process d) Haber's process

250. Hydrolysis of urea is an example of
a) Homogeneous catalysis b) Heterogeneous catalysis
c) Biochemical catalysis d) Zeolite catalysis

251. Which of the following is a heterogeneous catalysis?
a) $2C_2H_5OH \xrightarrow{\text{Conc } H_2SO_4} C_2H_5OC_2H_5 + H_2O$ b) $2CO + O_2 \xrightarrow{NO} CO_2$
c) $SO_2 + \frac{1}{2}O_2 \xrightarrow{NO_2} SO_3$ d) $SO_2 + \frac{1}{2}O_2 \xrightarrow{V_2O_5} SO_3$

252. Milk is
a) Fat dispersed in water b) Fat dispersed in milk
c) Fat dispersed in fat d) Water dispersed in milk

253. 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 the above

254. Which of the following reactions lead to the formation of colloidal solution?
a) $Cu + HgCl_2 \rightarrow CuCl_2 + Hg$ b) $2HNO_3 + 3H_2S \rightarrow 3S + H_2O + 2NO$
c) $2Mg + CO_2 \rightarrow 2MgO + C$ d) $Cu + CuCl_2 \rightarrow 2CuCl$

255. The coagulation of sol particles or sol destruction may be brought in by :
a) Cataphoresis
b) Adding oppositively charged sol
c) Adding electrolyte
d) All of the above

256. Which is an example of a heterogeneous catalysis?
a) Formation of SO_3 in the chamber process
b) Formation of SO_3 in the contact process
c) Hydrolysis of an ester in the presence of H^+ ions
d) Combination of H_2 and Cl_2 in the presence of moisture

257. A negatively charged suspension of clay in water needs for precipitation the minimum amount of :
a) Aluminium chloride b) Potassium sulphate c) Sodium hydroxide d) Hydrochloric acid

258. The Brownian motion is due to:
a) Temperature fluctuations within the liquid phase
b) Attraction and repulsion between charges on the colloidal particles
c) Impact of the molecules of the dispersion medium on the colloidal particles
d) Convective currents

259. What will be the Freundlich adsorption isotherm equation at high pressure?
a) $\frac{x}{m} = k$ b) $\frac{x}{m} = kp^{1/n}$ c) $\frac{x}{m} = kp$ d) None of these

260. An example for autocatalysis is
a) Oxidation of NO to NO_2 b) Oxidation of SO_2 to SO_3
c) Decomposition of $KClO_3$ to KCl and O_2 d) Oxidation of oxalic acid by acidified $KMnO_4$

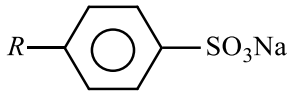
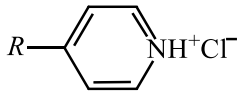
261. The action of enzymes in living system is to
a) Supply energy to tissues b) Create immunity
c) Circulate oxygen d) Enhance the rate of biochemical reactions

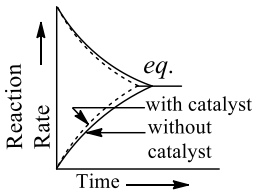
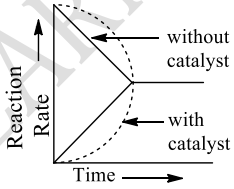
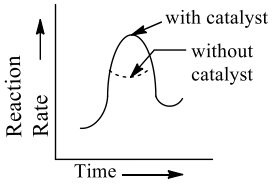
262. According to the adsorption theory of catalysis, the speed of the reaction increases because
    a) The concentration of reactant molecules at the active centres of the catalyst becomes high due to adsorption
    b) In the process of adsorption, the activation energy of the molecules becomes large
    c) Adsorption produces heat which increases the speed of the reaction
    d) Adsorption lowers the activation energy of the reaction
263. A catalyst :
    a) Alter the reaction mechanism
    b) Decreases the activation energy
    c) Increases collision frequency
    d) Increases the average kinetic energy of reacting species
264. The addition of 1% alcohol to chloroform acts as
    a) Auto-catalyst b) Bio-catalyst c) Positive catalyst d) Negative catalyst
265. Which of the following does not form anionic micelle?
    a) $C_{12}H_{25}COONa$ b) $C_{12}H_{25}SO_4Na$ c) $C_{12}H_{25}SO_3Na$ d) $C_{12}H_{25}(NH_3)_3Cl$
266. Which of the following is not a method of preparation of colloidal solution?
    a) Electrical dispersion b) Peptization
    c) Coagulation d) Mechanical dispersion
267. The density of gold is 19 g/cm^3. If 1.9×10^{-4} g of gold is dispersed in 1 L 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
    a) 1.9×10^{12} b) 6.3×10^{14} c) 6.3×10^{10} d) 2.4×10^{6}
268. According to Freundlich adsorption isotherm, which of the following is correct?
    a) $\frac{x}{m} \propto p^1$ b) $\frac{x}{m} \propto p^{1/n}$
    c) $\frac{x}{m} \propto p^0$ d) All of the above are correct for different ranges of pressure
269. Catalytic poisoners are usually the same as :
    a) Poison for human body
    b) Enzyme for human body
    c) Vitamins for human body
    d) None of the above
270. The reactions in which catalyst and reactant have one phase are known as :
    a) Gaseous reactions
    b) Homogeneous catalytic reactions
    c) Heterogeneous catalytic reactions
    d) None of the above
271. Mutarotation of glucose is an example of :
    a) Acid-base catalysis
    b) Homogeneous catalysis
    c) Both (a) and (b)
    d) None of these
272. Air can oxidize sodium sulphite in aqueous solution but cannot do so in the case of sodium arsenite. If however, air is passed through a solution containing both sodium sulphite and sodium arsenite then both are oxidized. This is an example of :
    a) Positive catalysis b) Negative catalysis c) Induced catalysis d) Autocatalysis
273. Which statement is not correct?
    a) All the soaps are detergents
    b) Detergents possess cleansing action in addition to surface activity
    c) All the surfactants are detergents
    d) Surfactants possess surface activity
274. Which of the following is mismatched?

Dispersed Phase	Dispersed medium	Specific name			
a) Liquid	liquid	emulsion	b) Solid	solid	solid sol
c) Liquid	gas	aerosol	d) Gas	solid	foam

275. Gold number of few colloids are given below,
Gelatin = 0.005 Starch = 25
Egg albumin = 0.08 Gum Arabic = 0.10
Which is best protective colloid?
a) Gelatin b) Starch c) Egg albumin d) Gum arabic

276. Which gas is adsorbed strongly by charcoal?
a) CO b) N_2 c) H_2 d) NH_3

277. Non-electrolyte colloidal surfactants is :
a) $C_{17}H_{35}COONa$
b) 
c) $C_nH_{2n+1}(OCH_2CH_2)_xOH$
d) 

278. Which graph is correctly represented the action of catalysts?
$X + Y \rightleftharpoons A + B$
a) 
b) 
c) 
d) All of these

279. In which of the following reactions colloids are not prepared by the double decomposition method?
a) $2H_3AsO_4 + 3H_2S \rightarrow As_2S_3 + 6H_2O$ b) $3K_4[Fe(CN)_6] + 4FeCl_3 \rightarrow Fe_4[Fe(CN)_6]_3 + 12KCl$
c) $Mg(CN)_2 + H_2S \rightarrow HgS + 2HCN$ d) $Cu + HgCl_2 \rightarrow CuCl_2 + Hg$

280. Which statement is wrong?
a) Haber's process of NH_3 requires iron as catalyst
b) Friedel-Crafts reaction requires anhydrous $AlCl_3$
c) Hydrogenation of oils requires iron as catalyst
d) Oxidation of SO_2 to SO_3 requires V_2O_5

281. Which of the following cannot form the micelles?
a) Sodium benzoate b) Sodium lauryl sulphate
c) Sodium alkyl benzene sulphonate d) Sodium oleate

282. Which is an emulsifier?
a) Soap b) Oil c) NaCl d) Water

283. Which of the following has maximum value of flocculating power?
a) Pb^{2+} b) Pb^{4+} c) Sr^{2+} d) Na^{+}

284. Which is not lyophilic colloid?
a) Milk b) Gum c) Fog d) blood

285. Which is not correct?

a) Every solid substance can be brought in colloidal state
b) Every solid substance can be made to behave like a lyophobic colloid
c) Addition of electrolytes coagulates the sol
d) Colloidal particles carry charges

286. Which of the following types of catalysis can be explained by the adsorption theory?
a) Homogeneous catalysis
b) Acid-Base catalysis
c) Heterogeneous catalysis
d) Enzyme catalysis

287. Which type of metals form effective catalysts?
a) Alkali metals b) Transition metals c) Alkaline earth metals d) Radioactive metals

288. Milk is an example of which of the following?
a) True solution b) Gel c) Suspension d) Emulsion

289. The decomposition of H_2O_2 may be checked by adding a small quantity of phosphoric acid. This is an example of :
a) Neutralization b) Negative catalysis c) Positive catalysis d) Catalytic poisoning

290. Zeolites are :
a) Water softener b) Catalyst c) Both (a) and (b) d) None of these

291. Which one of the following is a lyophilic colloidal solution?
a) Smoke b) Gold sol
c) Starch aqueous solution d) Cloud

292. In temporary poisoning, catalytic poisons act by :
a) Coagulating the catalyst
b) Chemically combining with any one of the reactants
c) Chemically combining with the catalyst
d) Getting physically adsorbed on the active centres of the catalyst

293. If x is amount of adsorbate and m is amount of adsorbent, which of the following relations is related to adsorption process?
a) $\frac{x}{m} = P \times T$
b) $x/m = f(P)$ at constant T
c) $x/m = f(T)$ at constant P
d) $P = f(T)$ at constant (x/m)

294. Which is adsorbed into maximum amount by activated charcoal?
a) N_2 b) CO_2 c) Cl_2 d) O_2

295. Fog is a colloidal solution of
a) Solid in gas b) Liquid in gas c) Gas in liquid d) Gas in solid

296. A catalyst is a substance which :
a) Increases equilibrium constant of reaction
b) Changes the equilibrium conc.of reaction
c) Shortens the time to reach equilibrium
d) Supplies the energy of the reaction

297. Ferric chloride is applied to stop bleeding because
a) Fe^{3+} ions coagulate negatively charged blood solution
b) Fe^{3+} ions coagulate positively charged blood solution
c) Cl^- ions coagulate positively charged blood solution
d) Cl^- ions coagulate negatively charged blood solution

298. The formation of colloid from suspension is
a) Peptisation b) Condensation c) Sedimentation d) Fragmentation

299. Which is not a colloidal solution of gas in liquid?
a) Froths

b) Foams with tiny bubbles
c) Mist
d) Whipped cream

300. In chemical reaction, catalyst
a) Alters the amount of the products
b) Lowers the activation energy
c) Decreases the ΔH of forward reaction
d) Increases the ΔH of forward reaction

301. Which equation represents Freundlich adsorption isotherm (physical adsorption is basis of this theory)?
a) $\frac{x}{m} = K(P)^{1/n}$ where x is amount of gas adsorbed on mass $'m'$ at pressure P
b) $\log\frac{x}{m} = \log K + \frac{1}{n}\log P$
c) $\frac{x}{m} = KP$ at low pressure and $\frac{x}{m} = K$ at high pressure
d) All of the above

302. The catalyst used in the contact process of sulphuric acid is :
a) Copper
b) Iron
c) Vanadium pentoxide or Pt (asbestos)
d) Ni

303. When adsorption of oxalic acid is carried out on activated charcoal, the activated charcoal is known as
a) Adsorbate
b) Adsorbent
c) Adsorber
d) All of these

304. The basic principal of cottrell's precipitator is
a) Le-Chatelier's principle
b) Peptisation
c) Neutralisation of charge on colloidal particles
d) Scattering of light

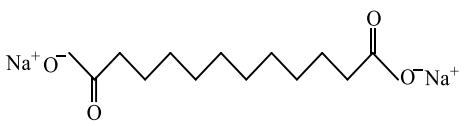
305. The equation for Freundlich adsorption isotherm is
a) $\frac{x}{m} = kp^{1/n}$
b) $x = mkp^{1/n}$
c) $x/m = kp^{-n}$
d) All of these

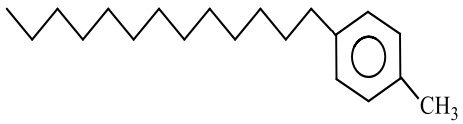
306. Butter is a colloid form in which :
a) Fat is dispersed in solid casein
b) Fat globules are dispersed in water
c) Water is dispersed in fat
d) Suspension of casein is in water

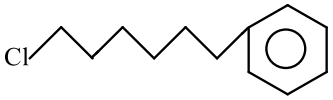
307. Peptization involves
a) Precipitation of colloidal particles
b) Disintegration of colloidal aggregates
c) Evaporation of dispersion medium
d) Impact of molecules of the dispersion medium on the colloidal particles

308. In negative catalysis
a) The speed of chemical reaction slows down
b) Speed of the chemical reaction remain the same
c) Speed of the chemical reaction increases
d) None of the above

309. Gold number :
a) May be defined as the milligram of the dry material of which the hydrophilic sol is prepared and which when added to 10 mL of red gold sol, will prevent it from coagulation on the addition of 1 mL of 10 per cent sodium chloride solution
b) May be defined as the milligram of the dry material of which the hydrophilic sol is prepared and which when added to 1 mL of red gold sol will prevent it from coagulation on the addition of 10 mL of 10 per cent sodium chloride solution
c) May be defined as the milligram of the dry material of which the hydrophilic sol is prepared and which when added to 1 mL of red gold sol will prevent it from coagulation on the addition of 1 mL of 1 per cent sodium chloride solution
d) None of the above

310. Which of the following is not a property of colloidal solution?
    a) Heterogeneity
    b) Particle size > 100 mm
    c) Tyndall effect
    d) Brownian movement
311. Lyophilic sols are more stable than lyophobic sols because :
    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
312. On adding 1 mL of solution of 10% NaCl to 10mL of gold sol in the presence of 0.25g of starch, the coagulation is just prevented. The gold number of starch is
    a) 0.25 b) 0.025 c) 2.5 d) 250
313. Associated colloid among the following is
    a) Enzyme b) Proteins c) Cellulose d) Sodium stearate
314. $KClO_3$ on heating decomposes into KCl and O_2. If some MnO_2 is added the reaction goes much faster because :
    a) MnO_2 decomposes to give oxygen
    b) MnO_2 provides heat by reacting
    c) Better contact is provided by MnO_2
    d) MnO_2 acts as a catalyst
315. Which of the following is incorrect for electrophoresis?
    a) In electrophoresis, solution migrates either to anode or to the cathode depending upon the positively or negatively charged solution
    b) Electrophoresis is a useful method for finding the charge of a solution
    c) Electrophoresis with a high potential is helpful in destroying an emulsion
    d) Colloids are uncharged particles and do not migrate towards the electrodes when electric field is applied
316. Blue colour of the sky and red colour of the sunsets are due to
    a) Scattering of light from the sun
    b) Scattering of light from particles of dust in the atmosphere
    c) Refraction of blue light by impurities in sea water
    d) Scattering of light due to ozone layer
317. $AlCl_3$ in Friedel-Crafts reaction acts as :
    a) Oxidizing agent b) Reducing agent c) Acid catalyst d) None of these
318. Potassium stearate is obtained by the saponification of an oil or fat. It has the formula
    $CH_3 - (CH_2)_{16} - COO^-K^+$
    The molecular has a lyophobic end $[CH_3]$ and a lyophilic end COO^-K^+.
    Potassium stearate is an example for
    a) Lyophobic colloid
    b) Lyophilic colloid
    c) Multimolecular colloid
    d) Associated colloid or micelle
319. The coagulating power of an electrolyte for arsenioussulphide decreases in order
    a) $Na^+ > Al^{3+} > Ba^{2+}$ b) $PO_4^{3-} > SO_4^{2-} > Cl^-$ c) $C\bar{l} > SO_4^{2+} > PO_4^{3-}$ d) $Al^{3+} > Ba^{2+} > Na^+$
320. A biological catalyst is
    a) The N_2 molecule b) An enzyme c) An amino acid d)
321. Which of the following is most suitable to disperse benzene in water?
    a) 
    b) 

c) 

d) 

322. In colloid particles, range of diameter is
a) 1 to 100 nm b) 1 to 1000 cm c) 1 to 1000 mm d) 1 to 100 km

323. Catalysis is a phenomenon in which
a) A substance alters the speed of the chemical reaction
b) Heat is evolved in a chemical reaction
c) The reaction is induced by light
d) None of the above

324. Among the following, the surfactant that will form micelles in aqueous solution at the lowest molar concentration at ambient conditions, is
a) $CH_3(CH_2)_{15}N^+(CH_3)_3Br^-$ b) $CH_3(CH_2)_{11}OSO_3^-Na^+$
c) $CH_3(CH_2)_6COO^-Na^+$ d) $CH_3(CH_2)_{11}N^+(CH_3)_3Br^-$

325. When a sulphur sol is evaporated sulphur is obtained. On mixing with water sulphur sol is not formed. The sol is
a) Lyophilic b) Reversible c) Hydrophobic d) Hydrophilic

326. Which is correct in the case of van der Waals' adsorption?
a) High temperature, low pressure b) Low temperature, high pressure
c) Low temperature, low pressure d) All of the above

327. Sulphur colloid is prepared by
a) Mechanical dispersion b) Oxidation
c) Electrical dispersion d) Reduction

328. The precipitate of $Fe(OH)_3$ in presence of water containing some $FeCl_3$ becomes colloidal on gentle shaking. This is an example of
a) Electroosmosis b) Coagulation c) Peptization d) Electrophoresis

329. Cod liver oil is
a) An emulsion b) Solution c) Colloidal solution d) Suspension

330. Animal charcoal is used in decolourising colour of liquids because it is a good
a) Adsorbate b) Adsorbent c) Oxidising agent d) Reducing agent

331. Which of the following electrolyte will have maximum flocculation value for $Fe(OH)_3$ sol?
a) NaCl b) Na_2S c) $(NH_4)_3PO_4$ d) K_2SO_4

332. Which of the following is a lyophobic colloidal solution?
a) Aqueous starch solution b) Aqueous protein solution
c) Gold sol d) Polymer solutions in some organic solvents

333. Which is an example of auto-catalyst?
a) Hydrolysis of methyl acetate
b) Decomposition of TNG
c) Oxidation of oxalic acid by $KMnO_4$
d) All of the above

334. Pd can adsorb in the space between its atoms, 900 times its volume of hydrogen. This process is called
a) Absorption b) Desorption c) Adsorption d) Chemisorptions

335. The gold number of gelatin, haemoglobin and sodium acetate are 0.005, 0.05 and 0.7 respectively. The protective actions will be in order
a) Gelatin < haemoglobin < sodium acetate b) Gelatin > haemoglobin > sodium acetate
c) Haemoglobin > gelatin > sodium acetate d) Sodium acetate > gelatin > haemoglobin

336. A catalyst is a substance which
a) Increases the equilibrium constant of the reaction

b) Increases equilibrium concentration of products
c) Does not alter the reaction mechanism
d) Changes the activation energy of the reaction

337. The extent of adsorption of a gas on a solid depends on
a) Nature of the gas
b) Pressure of the gas
c) Temperature of the gas
d) All of these

338. Which of the following statements is false for enzyme?
a) pH affects their work
b) Temperature affect their work
c) They always increase E_a
d) Their reactivity is specific

339. Fog is a colloidal solution of
a) Liquid particles dispersed in gas
b) Gaseous particles dispersed in a liquid
c) Solid particles dispersed in liquid
d) Solid particles dispersed in gas

340. The activity and selectivity of zeolites as catalyst is based on :
a) Their pore size
b) Size of their cavities on the surface
c) Both (a) and (b)
d) None of the above

341. Gold number gives
a) The amount of gold present in the colloid
b) The amount of gold required to protect the colloid
c) The amount of gold required to break the colloid
d) None of the above

342. Amongst the following chemical reaction, the one representing homogeneous catalysis is
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) $2SO_2(g) + O_2(g) \xrightarrow{V_2O_5} 2SO_3(g)$

343. Which of the following represents the phenomenon of syneresis?
a) Formation of a sol from a gel
b) Migration of colloid in an electric field
c) Separation of the dispersed phase from the gel
d) Process of converting gel into true solution

344. Silica get is commonly used as :
a) Wetting agent
b) Drying agent
c) Solvent
d) catalyst

345. Which has least gold number?
a) Gelatin
b) Starch
c) Albumin
d) Blood

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

347. Which is not correct regarding the adsorption of a gas on surface of a solid?
a) Enthalpy and entropy change is negative
b) Adsorption is more for some specific substance
c) On increasing temperature, adsorption increase progressively
d) It is a reversible reaction

348. Efficiency of a catalyst depends on its:
a) Particle size
b) Solubility
c) Molecular weight
d) None of these

349. Choose the incorrect statement
a) If the mutual affinity between the dispersed phase and the dispersion medium is small, the system will be lyophobic
b) If the mutual affinity between the dispersed phase and dispersion medium is great, the system will be lyophilic

c) In a system, when water is the dispersion medium, the system may be hydrophobic or hydrophilic
d) Ionic surfactant molecules cluster together in clumps

350. The colloidal system of a solid dispersed in liquid medium, is called
a) Aerosol b) Sol c) Gel d) Foam

351. Which of the following statements is incorrect?
a) Emulsions are prepared by shaking two liquid components, say oil and water and adding some emulsifying agent
b) Water-in-oil emulsions are formed when the emulsifying agent at the interface is chiefly in the water phase
c) Water-in-oil emulsions are formed when the emulsifying agent at the interface is chiefly in the oil phase
d) Gems and gels mixed together to give emulsion

352. Hydrolysis of cane sugar is catalysed by :
a) H^+ b) Mineral acids c) Enzymes d) All of these

353. When a catalyst increases the rate of a chemical reaction, the rate constant :
a) Increases b) Decreases c) Remains constant d) Becomes infinite

354. The charge on As_2S_3 sol is due to the adsorption of :
a) H^+ b) OH^- c) O_2^- d) S^{2-}

355. Platinum is not used as a catalyst in the :
a) Oxidation of CH_3OH to HCHO
b) Oxidation of SO_2 to SO_3
c) Combination of H_2 and I_2 to form HI
d) Synthesis of NH_3 from N_2 and H_2

356. A catalyst alter the rate of reaction by
a) Altering enthalpy b) Altering internal energy
c) Altering energy of activation d) All of the above

357. The name aquadag refers for :
a) Cu in water sol b) Pt in water sol c) Graphite in water sol d) None of these

358. Active charcoal is a good catalyst because
a) Made up of carbon atoms b) Is very reactive
c) Has more adsorption power d) Has inert nature toward reagent

359. 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

360. Which of the following reaction is an example for homogeneous catalysis?
a) $2H_2O_2(l) \xrightarrow{MnO_2(s)} 2H_2O(l) + O_2(g)$ b) $2SO_2(g) + O_2(g) \xrightarrow{V_2O_5(s)} 2SO_3(g)$
c) $2CO(g) + O_2(g) \xrightarrow{NO(g)} 2CO_2(g)$ d) $H_2(g) + C_2H_4(g) \xrightarrow{Ni\ (s)} C_2H_6(g)$

361. The correct statement in case of milk :
a) Milk is an emulsion of fat in water
b) Milk is an emulsion of protein in water
c) Milk is stabilized by protein
d) Milk is stabilized by fat

362. Which of the following acts as protective colloid?
a) Silica gel b) Gelatin c) Sodium acetate d) None of these

363. When dilute aqueous solution of $AgNO_3$(excess) is added to KI solution, positively charged sol of AgI is formed due to adsorption of of
a) NO_3^- b) O_2^- c) Ag^+ d) K^+

364. Colloidal solution of arsenious sulphide can be prepared by :
a) Electrodispersion method
b) Peptization
c) Double decomposition

d) hydrolysis

365. Chemisorption is :
   a) Multimolecular in nature
   b) Reversible
   c) Often highly specific and directional
   d) Not very specific

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

367. Alum purify muddy water by
   a) Dialysis
   b) Adsorption
   c) Coagulation
   d) Forming a true solution

368. The continuous phase contains the dispersed phase throughout, example is
   a) Water in milk
   b) Fat in milk
   c) Water droplets in mist
   d) Oil in water

369. A catalyst is used
   a) To balance the reaction
   b) To vaporise the compound
   c) To alter the velocity of reaction
   d) To kill the enzymes

370. In the formation of SO_3 by SO_2 and O_2 using NO as catalyst, the catalytic action of NO is evidenced by :
   a) Green vapours
   b) Violet vapours
   c) Brown vapours
   d) None of these

371. A catalytic poison is
   a) Heterogeneous catalyst
   b) Autocatalyst
   c) Induced catalyst
   d) An inhibitor

372. Which does not show Tyndall effect?
   a) Emulsion
   b) Blood
   c) Milk
   d) Sugar solution

373. Catalytic poisoners act by :
   a) Coagulating the catalyst
   b) Getting adsorbed on the active centres on the surface of catalyst
   c) Chemical combination with any one of the reactants
   d) None of the above

374. Peptization is a process of :
   a) Precipitating colloidal particles
   b) Purifying colloidal particles
   c) Dispersing the precipitate into colloidal state
   d) None of the above

375. Gas masks containing activated charcoal to remove poisonous gases from atmosphere acts on the principle of :
   a) Adsorption
   b) Absorption
   c) Sorption
   d) All of these

376. 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 a styptic in medicine
   c) Artificial rain is caused by throwing electrified sand on the clouds from an aeroplane
   d) Deltas are formed at place where the river pours its water into the sea

377. Some types of gels like gelatin liquefy on shaking, thereby changing into sols. The sols on standing changes back into gel. The process is known as :
   a) Synerisis
   b) Thixotropy
   c) Peptisation
   d) Imbibition

378. Which is an example of negative catalysis?
   a) $2H_2O_2 \xrightarrow{Pt} 2H_2O + O_2$
   b) $N_2 + 3H_2 \xrightarrow{Fe} 2NH_3$

c) $2KClO_3 \xrightarrow{MnO_2} 2KCl + 3O_2$ d) $4CHCl_3 + 3O_2 \xrightarrow{C_2H_5OH} 4COCl_2 + 2Cl_2 + 2H_2O$

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

380. Catalyst :
a) Lowers activation energy
b) Increase activation energy
c) May increase or may decrease activation energy
d) Brings out equilibrium

381. If dispersion medium is water, the colloidal system is called :
a) Sol b) Aerosol c) Organosol d) Aquasol

382. The phenomenon in which adsorption and absorption takes place simultaneously is called:
a) Desorption
b) Sorption
c) Both (a) and (b)
d) None of these

383. Adsorption is accompanied by
a) ΔS of system is negative b) Decrease in enthalpy of system
c) $T\Delta S$ for the process is negative d) All of the above

384. Which is not a property of hydrophilic sols?
a) High concentrations of dispersed phase can be easily attained
b) Coagulation is reversible
c) Viscosity and surface tension are about the same as of dispersion medium
d) The charge of the particle depends on the pH values of the dispersion medium; it may be positive, negative

385. Which one of the following does not involve coagulation?
a) Formation of delta regions b) Peptization
c) Treatment of drinking water by potash alum d) Clotting of blood by the use of ferric chloride

386. Which is the wrong pair?
(i) Starch solution : sol (ii) Aq. NaCl : true solution (iii) milk : emulsion (iv) Aq. $BaSO_4$: true solution
a) (i) b) (iii) c) (iv) d) (ii)

387. Which reaction gives colloidal solution?
a) $Cu + HgCl_2 \longrightarrow CuCl_2 + Hg$
b) $2HNO_3 + 3H_2S \longrightarrow 3S + 4H_2O + 2NO$
c) $2Mg + CO_2 \longrightarrow 2MgO + C$
d) $Cu + CuCl_2 \longrightarrow Cu_2Cl_2$

388. Which is universally correct for catalyst?
a) A catalyst remains unchanged chemically at the end of chemical reaction
b) A catalyst takes part in a chemical reaction
c) All kinds of catalysts undergo catalytic poisoning
d) A catalyst physically changes at the end of reaction

389. A catalyst
a) Lowers the activation energy b) Changes the rate constant
c) Changes the product d) Itself destroys in the reaction

390. Hydrolysis of maltose ($C_{12}H_{22}O_{11}$) by maltase gives :
a) Glucose b) Fructose c) Both (a) and (b) d) None of these

391. Platinized asbestos used as a catalyst in the manufacture of H_2SO_4 is an example of :
a) Heterogeneous catalyst
b) Autocatalyst
c) Homocatalyst
d) Induced catalyst

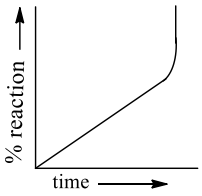
392. In Haber's process for manufacture of ammonia, the reaction is usually carried at about 500°C. If a temperature of about 250°C was used then
   a) A catalyst would be of no use at all at this temperature
   b) The rate of formation of ammonia would be too slow
   c) No ammonia would be formed at all
   d) The percentage of ammonia in the equilibrium mixture would be too low
393. Solvent hating colloids are :
   a) Lyophobic b) Hydrophilic c) Lyophilic d) None of these
394. The gold numbers of some colloidal solutions are given below

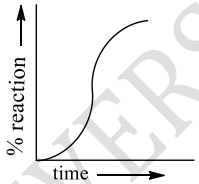
Colloidal solution	Gold number
A	0.01
B	2.5
C	20

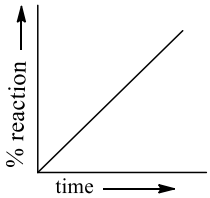
   The protective nature of these colloidal solutions follow the order
   a) $C > B > A$ b) $A > B > C$ c) $A = B = C$ d) $B > A > C$
395. A catalyst increases the rate of reaction because it :
   a) Increases the activation energy
   b) Decrease the energy barrier for reaction
   c) Decreases the collision diameter
   d) Increase the temperature coefficient
396. Pick out the wrong statement.
   a) Micelles are formed by surfactant molecules above the Critical Micelle Concentration (CMC)
   b) The conductivity of a solution having surfactant molecules decreases sharply at the (CMC)
   c) Lower is the CMC of detergent, more is its detergency
   d) Cleansing action is not related to micelles
397. Catalyst only
   a) Decreases activation energy b) Increases activation energy
   c) Bring about equilibrium d) None of the above
398. A precipitate is changed to colloidal solution by the following process
   a) Dialysis b) Ultrafiltration c) Peptization d) Electrophoresis
399. The Brownian movement is due to
   a) Enthalpy change during the formation of colloids
   b) Attractive forces between the colloidal particles and the molecules of dispersion medium
   c) The impact of molecules of the dispersion medium on the colloidal particles
   d) The movement of positively charged colloidal particle to negatively charged particle
400. Catalyst used in Haber's process is
   a) Nickel powder b) Iron and molybdenum powder
   c) Black lead d) Iodine
401. The capacity of an ion to coagulate a colloidal solution depends on :
   a) Its shape
   b) Amount of its charge
   c) The sign of charge
   d) Both amount and sign of the charge
402. The ion that is more effective for the coagulation of As_2S_3 sol is
   a) Ba^{2+} b) Na^{+} c) PO_4^{3-} d) Al^{3+}
403. The reaction rate at a given temperature is slower when :
   a) The energy of activation is higher
   b) The energy of activation is lower
   c) Entropy changes
   d) Initial concentration of the reactants remains constant

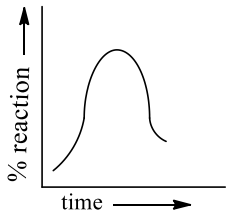
404. Hardy-Schulze law states that
    a) Higher the charge of the coagulating ions, greater its coagulating power, having opposite sign of solution
    b) Solution must have zero gold number
    c) Disperse phase and dispersion medium must be of the same sign
    d) Micelles coagulate in presence of surfactants
405. Choose the intrinsic colloids among the following
    a) Sulphur b) Arsenic sulphide c) Egg albumen d) Ferric hydroxide
406. Enzymes are :
    a) Substances made by chemists to activate washing powder
    b) Very active vegetable catalysts
    c) Catalysts found in organisms
    d) Synthetic catalysts
407. Whenever, gels are placed with their dispersed phase, they :
    a) Swells up
    b) Show intake of the dispersed phase
    c) Develops imbibition
    d) All of the above
408. Which forms multi molecular layers during adsorption?
    a) Physical adsorption
    b) van der Waals' adsorption
    c) Freundlich adsorption
    d) All of the above
409. Enzyme catalysts are :
    a) Highly specific in nature
    b) Non-specific
    c) Solids
    d) Always liquid
410. A catalyst :
    a) Increases the average kinetic energy of the reacting molecules
    b) Increases the activation energy
    c) Alters the reaction mechanism
    d) Increases the frequency of collisions of the reacting species
411. Micelle systems are used in
    a) Gums b) Magnetic separation process
    c) Petroleum recovery d) All of the above
412. Enzymes are known to increase the rate of reaction by :
    a) 10^2 times b) 10^{-2} times c) 10^5 times d) 10^{12} times
413. A catalyst promoter
    a) Increases the speed of the reaction b) Activates the action of a catalyst
    c) Starts a chemical reaction d) None of the above
414. Soaking of water by a sponze is an example of :
    a) Physical adsorption b) Chemical adsorption c) Absorption d) None of these
415. Indicate the correct statement
    a) In chemisorptions, there is no disruption of bonding in an adsorbed molecule
    b) The rate of decomposition of the substance adsorbed on a surface depends on the surface coverage
    c) In heterogeneous catalytic reaction no surface reaction occurs
    d) Increase in surface area of catalyst reduces the surface phase reactions
416. Cellulose dispersed in ethanol is called
    a) Emulsion b) Collodion c) Micelle d) Hydrophilic sol

417. A liquid aerosol is a colloidal system of :
   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
418. The disperse phase, dispersion medium and nature of colloidal solution (lyophilic or lyophobic) of 'gold sol' respectively are
   a) Solid, Solid, lyophobic
   b) Liquid, Liquid, Lyophobic
   c) Solid, Liquid, Lyophobic
   d) Solid, Liquid, Lyophilic
419. 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
420. Blue colour of water in sea is due to
   a) Refraction of blue light by impurities
   b) Refraction of blue sky by water
   c) Scattering of light by water
   d) None of the above
421. Which of the following is an example of biochemical catalyst?
   a) Platinium gauze
   b) Oxides of Nitrogen
   c) Zymase
   d) V_2O_5
422. Which one of the following statements is incorrect?
   a) Adsorption always leads to a decrease in enthalpy and entropy of the system
   b) Adsorption arises due to unsaturation of valence forces of atoms or molecules on the surface
   c) Adsorption increases with rise in the temperature
   d) Adsorption decreases the surface energy
423. In emulsion the dispersed phase and dispersion medium are :
   a) Both solids
   b) Both liquids
   c) A solid and liquid
   d) A liquid and solid
424. Which graph represents auto catalysis?

a) 

b) 

c) 

d) 

425. The Rubin number which was proposed by Ostwald as an alternative to the Gold number in order to measure the protective efficiency of a lyophilic colloid may be defined as the
   a) Mass in milligrams of a colloid per 100 cc of solution which just prevents the colour change of standard sol of dye Congo-Rubin from red to violet when 0.16 g eq. KCl is added to it
   b) Mass in grams of a colloid per 100 cc of solution which just prevents the colour change of standard sol of dye Congo-Rubin from red to violet when 0.1 M KCl is added to it
   c) Mass in grams of a colloid per 100 cc of solution which just prevents the colour change of standard sol of dye Congo-Rubin from red to violet when 0.2 M KCl is added to it
   d) Mass in grams of a colloid per 100 cc of solution which just prevents the colour change of standard sol of dye Congo-Rubin from red to violet when 1 M KCl is added to it
426. Which of the following is applicable to chemisorption?
   a) It occurs at high temperature
   b) There is formation monomolecular layer
   c) It involves the formation of chemical bonds between adsorbent and adsorbate
   d) All of the above
427. Which of the following is used to provide smoke screens :
   a) Calcium phosphide
   b) Zinc sulphate
   c) Sodium carbonate
   d) Zinc phosphide
428. The process of froth floatation and chromatography are based on :
   a) Emulsification
   b) Adsorption
   c) Absorption
   d) Either of them

429. The efficiency of enzyme catalysis is due to its capacity to
a) From a strong enzyme-substrate complex
b) Change the shape of the substrate
c) Lower the activation energy of the reaction
d) Form a colloidal solution in water

430. Which acts as a promoter for nickel in the hydrogenation of oils?
a) Cu b) Mo c) Fe d) Pt

431. In Langmuir's model of adsorption of a gas on a solid surface
a) The rate of dissociation of adsorbed molecules from the surface does not depend on the surface covered
b) The adsorption at a single site on the surface may involve multiple molecules at the same time
c) The mass of gas striking a given area of surface is proportional to the pressure of the gas
d) The mass of gas striking a given area of surface is independent of the pressure of the gas

432. Cloud bursts due to :
a) Attraction towards the electrical charges on the earth
b) Large amount of water present in the cloud
c) Dense clouds are present in the upper atmosphere
d) Mutual discharge of oppositely charged clouds resulting in the coagulation

433. Bleeding due to a cut can be stopped by applying ferric chloride solution in the laboratory. This is due to
a) Coagulation of negatively charged blood particles by Fe^{3+} ions.
b) Coagulation of positively charged blood particles by Cl^{-}ions.
c) Reaction taking place between ferric ions and the haemoglobin forming a complex
d) Common element, iron, in both $FeCl_3$ amd haemoglobin

434. 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

435. Which is used in the Haber's process for the manufacture of NH_3?
a) Al_2O_3 b) Fe + Mo c) CuO d) Pt

436. Tails of comets are visible due to :
a) Tyndall effect b) Reflection c) Brownian motion d) None of these

437. The minimum flocculation power of KCl, $MgCl_2$, $CrCl_3$ and $SnCl_4$ for a positively charged sol are in the order of
a) $KCl < MgCl_2 < CrCl_3 < SnCl_4$
b) $KCl = MgCl_2 = CrCl_3 = SnCl_4$
c) $MgCl_2 < KCl < CrCl_3 < SnCl_4$
d) $SnCl_4 < CrCl_3 < MgCl_2 < KCl$

438. Smoke (a negatively charged colloid) is an example of :
a) Gas dispersed in liquid
b) Gas dispersed in solid
c) Solid dispersed in gas
d) Solid dispersed in solid

439. Which one of the following is an example for homogeneous catalysis?
a) Manufacture of sulphuric acid by Contact process
b) Manufacture of ammonia by Haber's process
c) Hydrolysis of sucrose in presence of dilute hydrochloric acid
d) Hydrogenation of oil

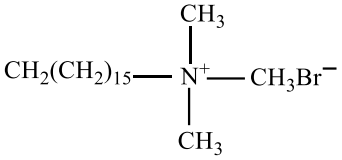
440. Which is not true in case of catalyst?
a) The catalyst is unchanged chemically at the end of a reaction
b) The catalyst accelerates the reaction
c) In a reversible reaction, the catalyst alters the equilibrium position
d) A small amount of catalyst is often sufficient to bring about a large change in reaction

441. Which of the following is not the property of hydrophilic sol.?
a) Coagulation is reversible
b) Viscosity and surface tension are equal to that of water

c) Charge on the particle depends upon pH of the medium. It may be positive, negative or zero
d) Dispersed phase acquires higher concentration easily

442. Point out the false statement
a) The size range of colloidal particles is $10 - 2000Å$
b) Colloidal solutions are homogeneous systems
c) Colloids carry charge
d) Colloids show Tyndall effect

443. Soaps are generally prepared from :
a) Linseed oil b) Coconut oil c) Groundnut oil d) Mustard oil

444. Which of the following is not a surfactant :
a) 
b) $CH_3(CH_2)_{14}CH_2NH_2$
c) $CH_3(CH_2)_{16}CH_2OSO_2^-Na^+$
d) Decyl pyridinium chloride

445. A catalyst for a reversible reaction is a substance that :
a) Supplies energy to the reaction
b) Decreases the time to reach equilibrium
c) Increases the equilibrium concentration of the products
d) Change the equilibrium constant of the reaction

446. In a reversible reaction, a catalyst
a) Increases the rate of forward reaction only
b) Increases the rate of forward reaction and decreases that of backward reaction
c) Increases the rate of forward and backward reaction equally
d) Increases the rate of forward reaction to great extent than that of backward reaction

447. The concentration of electrolyte required to coagulate a given amount of As_2S_3 sol is minimum in the case of
a) Magnesium nitrate b) Potassium nitrate c) Potassium sulphate d) Aluminium nitrate

448. 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 the above

449. Which of the following is not an emulsion?
a) Butter b) Ice cream c) Milk d) Clouds

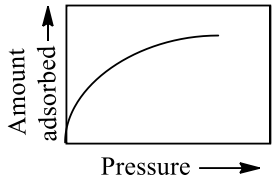
450. Emulsifying agents generally used are :
a) Ions with negative charge
b) Surface active agents
c) Ions with a positive charge
d) Lyophobic substances

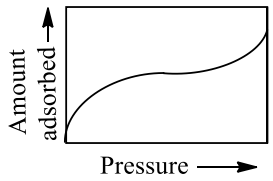
451. The catalyst used in lead chamber process of H_2SO_4 manufacture is
a) Platinum
b) Oxides of nitrogen
c) Nickel
d) Vanadium compounds

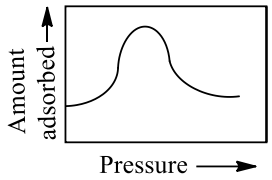
452. Hydrolysis of sucrose ($C_{12}H_{22}O_{11}$) by invertase gives :
a) Glucose b) Fructose c) Both(a) and (b) d) None of these

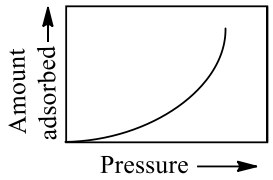
453. Which one of the following characteristics is not correct for physical adsorption?
a) Adsorption on solids is reversible
b) Adsorption increases with increase in temperature
c) Adsorption is spontaneous
d) Both enthalpy and entropy of adsorption are negative

454. Which of the following curves do not correspond to adsorption isotherms?

a) 

b) 

c) 

d) 

455. In a reversible reaction, the catalyst
   a) Increases the activation energy of the backward reaction
   b) Increases the activation energy of the forward reaction
   c) Decreases the activation energy of both forward and backward reaction
   d) Decreases the activation energy of forward reaction

456. Which acts as poison to platinum (a catalyst) in the manufacture of H_2SO_4 by contact process?
   a) Arsenious oxide b) CO_2 c) CO d) Sodium sulphide

457. Which among the following statements are correct with respect to adsorption of gases on a solid?
   (i)The extent of adsorption is equal to Kp^n according to Freundlich isotherm.
   (ii)The extent of adsorption is equal to $Kp^{1/n}$ according to Freundlich isotherm.
   (iii)The extent of adsorption is equal to $(1 + bp)/ap$ according to Langmuir isotherm.
   (iv) The extent of adsorption is equal to $ap/(1 + bp)$according to Langmuir isotherm.
   (v)Freundlich adsorption isotherm fails at low pressure, where k, a and b are constant and p is pressure
   a) (i) and (iii) b) (i) and (iv) c) (ii) and (iii) d) (ii) and (iv)

458. Which of the following is adsorbed greatly by activated charcoal?
   a) SO_2 b) CO_2 c) NO_2 d) Water vapours

459. Choose macromolecular colloids among the following
   a) Soap b) Detergent
   c) Starch and cellulose d) All of these

460. In aerosol, the dispersion medium is
   a) Solid b) Liquid c) Gas d) Any of these

461. Which acts as poison for Pd-charcoal in Lindlar's catalyst?
   a) $BaSO_4$ b) Quinoline c) Both (a) and (b) d) None of these

462. Which acts as negative catalyst?
   a) Lead tetraethyl as antiknock compound
   b) Glycerol in decomposition of H_2O_2
   c) Ethanol in oxidation of chloroform
   d) All of the above

463. From the following which is not a surface phenomenon?
   a) Corrosion b) Crystallisation
   c) Heterogenous catalysis d) None of the above

464. Hydrolysis of protein in stomach and in intestine takes place due to action of enzyme :
   a) Pepsin in stomach, trypsin in intestine
   b) Trypsin in stomach, pepsin in intestine
   c) Both (a) and (b)
   d) None of the above

465. Which of the following is less than zero during adsorption?
   a) ΔG b) ΔS c) ΔH d) All of these

466. Which one of the following methods, does not give the sol?

a) Electrophoresis b) Peptization c) Electrodispersion d) Solvent exchange

SURFACE CHEMISTRY

CHEMISTRY

: ANSWER KEY :

1)	d	2)	b	3)	b	4)	b	169)	c	170)	a	171)	c	172)	a
5)	c	6)	a	7)	a	8)	b	173)	d	174)	b	175)	a	176)	a
9)	b	10)	c	11)	d	12)	d	177)	a	178)	a	179)	c	180)	c
13)	c	14)	a	15)	d	16)	b	181)	a	182)	d	183)	d	184)	a
17)	d	18)	a	19)	a	20)	c	185)	c	186)	b	187)	a	188)	a
21)	b	22)	b	23)	d	24)	a	189)	d	190)	b	191)	c	192)	b
25)	b	26)	d	27)	b	28)	a	193)	d	194)	d	195)	c	196)	c
29)	b	30)	d	31)	a	32)	c	197)	a	198)	b	199)	c	200)	a
33)	d	34)	d	35)	a	36)	b	201)	d	202)	d	203)	c	204)	b
37)	d	38)	c	39)	c	40)	b	205)	c	206)	c	207)	a	208)	b
41)	b	42)	c	43)	b	44)	b	209)	c	210)	a	211)	b	212)	a
45)	c	46)	b	47)	b	48)	b	213)	a	214)	a	215)	b	216)	c
49)	c	50)	b	51)	b	52)	c	217)	a	218)	d	219)	b	220)	b
53)	d	54)	c	55)	c	56)	d	221)	c	222)	d	223)	c	224)	c
57)	c	58)	b	59)	a	60)	c	225)	c	226)	a	227)	c	228)	c
61)	b	62)	c	63)	b	64)	c	229)	b	230)	a	231)	a	232)	b
65)	a	66)	d	67)	d	68)	a	233)	d	234)	a	235)	a	236)	a
69)	c	70)	c	71)	c	72)	a	237)	d	238)	a	239)	c	240)	c
73)	a	74)	c	75)	b	76)	a	241)	b	242)	b	243)	c	244)	a
77)	b	78)	c	79)	d	80)	c	245)	b	246)	b	247)	d	248)	d
81)	c	82)	a	83)	b	84)	d	249)	b	250)	c	251)	d	252)	a
85)	c	86)	d	87)	a	88)	d	253)	a	254)	b	255)	d	256)	b
89)	c	90)	b	91)	d	92)	d	257)	a	258)	c	259)	a	260)	d
93)	a	94)	d	95)	b	96)	b	261)	d	262)	d	263)	b	264)	d
97)	c	98)	a	99)	d	100)	b	265)	d	266)	c	267)	d	268)	d
101)	c	102)	c	103)	a	104)	d	269)	a	270)	b	271)	c	272)	c
105)	a	106)	b	107)	d	108)	b	273)	c	274)	d	275)	a	276)	d
109)	b	110)	d	111)	d	112)	a	277)	c	278)	a	279)	d	280)	c
113)	b	114)	a	115)	a	116)	b	281)	a	282)	a	283)	b	284)	c
117)	d	118)	b	119)	c	120)	b	285)	b	286)	c	287)	b	288)	d
121)	c	122)	a	123)	c	124)	c	289)	b	290)	c	291)	c	292)	d
125)	a	126)	a	127)	d	128)	d	293)	a	294)	b	295)	b	296)	c
129)	d	130)	b	131)	a	132)	b	297)	a	298)	a	299)	c	300)	b
133)	a	134)	b	135)	c	136)	d	301)	d	302)	c	303)	b	304)	c
137)	a	138)	d	139)	d	140)	d	305)	d	306)	c	307)	b	308)	a
141)	b	142)	b	143)	b	144)	b	309)	a	310)	b	311)	c	312)	d
145)	a	146)	b	147)	b	148)	c	313)	d	314)	d	315)	d	316)	b
149)	c	150)	d	151)	b	152)	d	317)	c	318)	d	319)	d	320)	d
153)	b	154)	a	155)	b	156)	d	321)	a	322)	a	323)	a	324)	a
157)	c	158)	d	159)	d	160)	c	325)	c	326)	b	327)	b	328)	c
161)	b	162)	a	163)	d	164)	b	329)	a	330)	b	331)	a	332)	c
165)	d	166)	d	167)	a	168)	c	333)	d	334)	d	335)	b	336)	d

337)	d	338)	c	339)	a	340)	c	405)	c	406)	c	407)	d	408)	d
341)	b	342)	b	343)	c	344)	b	409)	a	410)	c	411)	c	412)	d
345)	a	346)	c	347)	c	348)	a	413)	b	414)	c	415)	b	416)	b
349)	d	350)	b	351)	d	352)	d	417)	b	418)	c	419)	b	420)	c
353)	a	354)	d	355)	d	356)	c	421)	c	422)	c	423)	b	424)	b
357)	c	358)	c	359)	a	360)	c	425)	a	426)	d	427)	a	428)	d
361)	a	362)	b	363)	c	364)	c	429)	c	430)	a	431)	c	432)	d
365)	c	366)	b	367)	c	368)	c	433)	a	434)	a	435)	b	436)	a
369)	c	370)	c	371)	d	372)	d	437)	b	438)	c	439)	c	440)	c
373)	b	374)	c	375)	a	376)	a	441)	b	442)	b	443)	a	444)	b
377)	a	378)	c	379)	d	380)	a	445)	b	446)	c	447)	d	448)	a
381)	d	382)	b	383)	d	384)	c	449)	d	450)	b	451)	b	452)	c
385)	b	386)	c	387)	b	388)	a	453)	b	454)	c	455)	c	456)	a
389)	b	390)	a	391)	a	392)	b	457)	d	458)	d	459)	c	460)	c
393)	a	394)	b	395)	b	396)	d	461)	c	462)	d	463)	d	464)	a
397)	a	398)	c	399)	c	400)	b	465)	d	466)	a				
401)	d	402)	d	403)	a	404)	a								

SURFACE CHEMISTRY

CHEMISTRY

: HINTS AND SOLUTIONS :

1 **(d)**

$\log\frac{x}{m} = \log K + \frac{1}{n}\log P$; this is freundlich isotherm.

Thus, slope $= 1/n$.

2 **(b)**

Catalyst does not make the reaction more exothermic or endothermic.

3 **(b)**

The no. of particles in sol form is less than true solution.

4 **(b)**

Inorganic sols are usually hydrophobic in nature.

5 **(c)**

$$2SO_2(g) + O_2 \underset{\text{solid}}{\overset{V_2O_5}{\rightleftharpoons}} 2SO_3\ (g)$$

In this reaction reactants as well as the catalyst are present in more than one phase hence it is an example of heterogeneous catalysis.

6 **(a)**

$NH_2CONH_2 \xrightarrow{\text{Urease}} NH_3 + CO_2$

7 **(a)**

Adsorption is an exothermic process. Thus according to Le-chatelier principle the amount of substance adsorbed should increase with decrease in temperature

8 **(b)**

Freundlich adsorption isotherm reaction is

$\frac{x}{m} = kp^n$

9 **(b)**

In lead nitrate, lead is present as Pb^{2+} ion. While there is only on negative ion per mole of colloid. Hence, one mole Pb^{2+} can coagulate two moles of $[AgI]I^-$.

11 **(d)**

CMC occurs only above Kraft's temperature.

13 **(c)**

Washing soaps are obtained by ground nut oils.

14 **(a)**

$4NH_3 + 5\ O_2 \xrightarrow{Pt} 4NO + 6H_2O$

15 **(d)**

Colloidal systems are heterogeneous, $i.e., P \geq 2, i.e.$, dispersion of one phase in other.

16 **(b)**

Formalin acts as preservative for milk.

17 **(d)**

$Fe_4[Fe(CN)_6]_3$ is Prussian blue sol of +ve charge.

18 **(a)**

Because of larger surface area in colloidal state, adsorption is more, also it acts as germ killer.

19 **(a)**

The substance which gets adsorbed on the surface of solid is called adsorbate and the solid on which adsorption occurs is called adsorbent

20 **(c)**

Physical adsorption decreases with increase in temperature, whereas chemisorptions first increase and then decreases with increase in temperature.

21 **(b)**

When temperature increases, the adsorbed molecules get energy and desorption starts increasing, therefore adsorption decreases with increase in temperature

22 **(b)**

For chemisorption, high temperature is favourable. It increases with rise in temperature. On the other hand low temperature is favourable for physisorption so it decreases with rise in temperature

23 **(d)**

Ferric hydroxide sol is positively charged sol. It is coagulated by negative ions. Larger the charge on anion, larger is its coagulating power or smaller is its flocculation value. In $K_4[Fe(CN)_6]$, the anion $[Fe(CN)_6]^{4-}$ has highest charge, therefore $K_4[Fe(CN)_6]$ is most effective in coagulating $Fe(OH)_3$ sol.

24 **(a)**

CMC is the lowest concentration at which micelle formation appears

25 **(b)**

Litmus is adsorbed by charcoal.

26 **(d)**

$CO(g) + 2H_2(g) \xrightarrow{Cu,ZnO-Cr_2O_3(s)} CH_3OH(l)$

In this reaction, reactants and catalyst are in different physical states, hence it is an example of heterogeneous catalysis.

27 **(b)**

Adsorption is an exothermic process and hence, ΔH is negative for adsorption. On the other hand the molecules of the adsorbate are held on the surface of the adsorbent and hence, they have lesser tendency to move about freely. In other words entropy decreases *i.e.*,$\Delta S$is negative. According to Gibbs-Helmholtz equation, $\Delta G = \Delta H - T.\Delta S$

Thus, for the process of adsorption to occur ΔG must be negative. Hence, for adsorption $\Delta G < 0; \Delta S < 0; \Delta H < 0$

28 **(a)**

A homogeneous solution has number of phase $=$ 1.

29 **(b)**

Among Na^+, K^+, Mg^{2+}, ions, Mg^{2+} ion has maximum valency, thus it will be the most effective in the coagulation of gold sol

30 **(d)**

Activated charcoal is used for decolourizing and deodorizing sugar solution during the process of manufacture of sugar due to its adsorbing property.

31 **(a)**

The phenomenon of the precipitation of a colloidal solution by the addition of the excess of an electrolyte is called coagulation. When oppositely charged sols are mixed in almost equal proportions, their charges are neutralised. So, statement (a) is wrong.

32 **(c)**

The size of colloidal particles is in the range of 100 nm to 1nm or 10^{-5} cm to 10^{-7} cm.

33 **(d)**

Note that pollen grains also move irregularly in water, $i.e.$, lighter and smaller suspended particles. In true solution of sugar, the sugar particles are also in motion in solution.

34 **(d)**

It involves sorption. Both process of adsorption and absorption taking place simultaneously are called sorption.

35 **(a)**

Physical adsorption occurs at low temperature while chemisorption occurs at higher temperature

37 **(d)**

The negatively charged carbon particles in air (smoke) are moved towards anode due to cataphoresis, where they are neutralized to left free air. The process is used to control air pollution.

40 **(b)**

Enzymes decrease the activation energy to greater extent.

41 **(b)**

At critical micelle concentration, the surfactant molecules associate to form micelles

42 **(c)**

In case of chemisorption, adsorption only monolayered. All other option are correct about chemisorption.

43 **(b)**

Lyophobic sols are irreversible. Rest all points signify for lyophilic sols.

44 **(b)**

The size of the particles order in three states is : True solution $<$ colloidal solution $<$ suspension

45 **(c)**

Emulsions can be broken to get the constituent liquids by heating, freezing, centrifuging or by addition of appreciable amount of electrolytes. They are also broken by destroying the emulsifying agent

46 **(b)**

Physical adsorption is non-directional, reversible, multilayers exothermic process where adsorbent molecules are held on surface of adsorbent by physical forces such as van der Waals' forces.

47 **(b)**

Gelatin is protective colloid.

48 **(b)**

Blood is negatively charged emulsion.

49 **(c)**

The plot of temperature *versus* pressure for a given amount of adsorption is called adsorption isostere

50 **(b)**

Scattering of blue light is maximum because scattering $\propto \frac{1}{\lambda^4}$.

51 **(b)**

An application in paints industry.

52 **(c)**
The dispersal of a precipitated material into colloidal solution by the action of an electrolyte in solution is called peptisation and the electrolyte is called a peptising agent.

53 **(d)**
Colloidal state possesses lower surface tension or increase in surface area. This provides sol to acquire peculiar properties, *e*. g., more adsorption power.

54 **(c)**
Al^{3+} is very good coagulating agent for –ve sol (muddy water).

55 **(c)**
Liquid in solid are known as gels.

56 **(d)**
In physical adsorption, gas molecules over the surface of adsorbent are held by weak van der Waals' forces

57 **(c)**
Gold no. is to be reported in mg.

58 **(b)**
It is the definition of rule.

59 **(a)**
Catalyst forms an intermediate with reactant and thus, rate of reaction for intermediate formation depends upon concentration of catalyst.

60 **(c)**
When a catalyst is present in finely divided state greater adsorption takes place hence its efficiency increases

62 **(c)**
Catalysis is a process where the rate of a chemical reaction alters due to mere presence of foreign substance. In thermite process, no other substance present except the reacting substances

63 **(b)**
Whipped cream is gas in liquid system.

64 **(c)**
Alloy is a mixture of two or more elements which has metallic properties. Brass is an alloy of Cu and Zn. Alloy is an example of solid sol. Some kinds of steel are alloys of Fe and C and can be considered as solid solutions in which carbon atoms are located in some of the space between iron atoms.

65 **(a)**
Langmuir's adsorption is monomolecular, *ie*, the gas adsorbed forms unimolecular layer

66 **(d)**
These are the characteristics of zeolites.

68 **(a)**
It is definition of adsorption.

69 **(c)**
A colloidal solution cannot form when dispersion medium as well as dispersion medium both are gas

70 **(c)**
The adsorption of a gas is directly proportional to the pressure of the gas.

71 **(c)**
When one of the products of a reaction acts as a catalyst for the reaction, the phenomenon is known as auto catalysis. When $KMnO_4$solution is added to oxalic acid, the disappearance of pink colour is slow at start but as soon as some Mn^{2+}ion are formed the disappearance of colour becomes fast.

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \longrightarrow 2Mn^{2+}10CO_2 + 8H_2O$$
(catalyst)

or $2KMnO_4 + 5H_2C_2O_4 + 3H_2SO_4 \longrightarrow 2MnSO_4 + K_2SO_4 + 8H_2O + 10CO_2$
(catalyst)

Mn^{2+}ion (or$MnSO_4$)acts as catalyst in this reaction.

72 **(a)**
Lesser valence of Br^- is responsible for least effective nature.

73 **(a)**
A colloidal system in which gas bubbles are dispersed in a liquid is known as foam.

74 **(c)**
Hydroph ilic sols have higher viscosity than medium.

75 **(b)**
Catalyst never changes the equilibrium constant.

76 **(a)**
The simplest way to check whether a system is colloid or not is Tyndall effect because it requires to keep colloid in path of light. Rest of the methods are complicated than this method.

77 **(b)**
Micelles show lower colligative properties as that of common colloidal solution

78 **(c)**
Equation,

$CH_3COOH(l) +$

$C_2H_5OH(l) \xrightarrow[H_2SO_4(l)]{H^+} CH_3COOC_2H_5(l) + H_2O(l)$
represents the homogeneous catalysis as all reactants and catalyst are in liquid state

79 **(d)**
The micelles formed by detergents in water solubilize the oily stain forming emulsion with it.

80 **(c)**
Zsigmondy designed ultramicroscope based on scattering of light by sol particles.

81 **(c)**
Follow the concept of promoters.

82 **(a)**
The substance which is added to stabilize the emulsion is known as emulsifier or emulsifying agent.
Emulsions are two types –
(i)Water in oil (ii)Oil in water

83 **(b)**
$C_{15}H_{31}COO^-Na^+$ is an anionic surfactants

84 **(d)**
According to Freundlich adsorption isotherm,
$\log\frac{x}{m} = \log k + \frac{1}{n}\log p$
It is clear from above equation that slope is equal to $\frac{1}{n}$

85 **(c)**
It is the definition of promoter or in other words lowers the energy of activation.

86 **(d)**
Since for spontaneous and exothermic process $\Delta G = -$ve, $\Delta H = -$ve at all temperatures, therefore from $\Delta G = \Delta H - T\Delta S, \Delta S$ should be $-$ve.

87 **(a)**
Freundlich adsorption isotherm is
$x/m = kp^{1/n}$
Here, p, k and n are constant.
Note Freundlich isotherm is not applicable at high pressure.

88 **(d)**
$R(NH_3)_3\,Br \rightarrow R(NH_3)_3^+ + Br^-$
Alkyl trimethyl ammonium ions aggregates to form cationic micelles

89 **(c)**
A catalyst increases the rate of the reaction by decreasing its activation energy.

90 **(b)**
Sol particles, $i.e.$, particles of dispersed phase lie in the range 10Å to 2000 Å.

91 **(d)**
If x/m is the mass of adsorbate per unit mass of adsorbent, p is the pressure of adsorbate gas and a and b are constants, then Langmuir adsorption isotherm is given as
$\frac{x}{m} = \frac{ap}{1+bp}$
or $\frac{1}{x/m} = \frac{1+bp}{ap}$
$\frac{1}{x/m} = \frac{1}{ap} + \frac{b}{a}$

92 **(d)**
It is definition of tanning of leather.

93 **(a)**
In a chemical reaction the catalyst decreases the activation energy of reaction and hence, increases the rate of reaction.

94 **(d)**
Addition of electrolyte brings in coagulation of sol.

95 **(b)**
Strong intermolecular van der Waals' forces operates among molecules.

96 **(b)**
When one of the products acts as a catalyst, it is known as autocatalysis

97 **(c)**
Larger is surface area, more are active centres.

98 **(a)**
The definition of Zeta potential.

99 **(d)**
Gold number is a scale to express protecting power of lyophilic colloidal sol.

100 **(b)**
Physical adsorption decrease with increasing temperature or rate of physical adsorption increase with decreasing temperature.

101 **(c)**
The size of colloidal particle is 0.1μ-1mμ or 100 nm – 1 nm.

102 **(c)**
It involves motion of dispersed phase.

103 **(a)**
The phenomenon of the scattering of light by the particles is called Tyndall effect

104 **(d)**
Each one possesses two liquid phases, one dispersed in other; however they have low m.p.

105 **(a)**

The colour of $KMnO_4$ disappears slowly in the beginning and then readily during its reaction with oxalic acid, due to formation of Mn^{2+} ions which acts as auto catalyst.

$$2KMnO_4 + 5H_2C_2O_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 10CO_2 + 2MnSO_4 + 8H_2O$$

106 **(b)**

Lyophilic sols are more stable than lyophobic sols due to the fact that lyophilic colloids are extensively solvated.

107 **(d)**

These are characteristics of hydrophilic sols.

108 **(b)**

Soap in water is called sol (solid in water).

109 **(b)**

Gold number is associated with protective colloids.

110 **(d)**

According to Hardy-Schulze rule, coagulating power of ions is directly proportional to charge on ion

$\because Fe(OH)_3$is positively charged colloid.

$\therefore$ It will be coagulated by anion.

(a)$KCN - K^+$ and CN^-

(b)$BaCl_2 - Ba^{2+}$and Cl^-

(c)$NaCl - Na^+$ and Cl^-

(d)$Mg_3(PO_4)_2 - Mg^{2+}$and PO_4^{3-}

$\because PO_4^{3-}$has highest charge among the given ions anions.

$\therefore Mg_3(PO_4)_2$ is the most effective in coagulation of $Fe(OH)_3$sol.

112 **(a)**

Due to maximum surface area in colloidal state.

114 **(a)**

The colloidion solution is used to prepare ultrafilters. It is a solution of 5% cellulose nitrate in alcohol-ether.

115 **(a)**

Follow theories of catalysis.

116 **(b)**

Solvent loving sols are lyophilic or in other words dispersed phase has more affinity for solvent.

117 **(d)**

Adsorption and occlusion have same meaning.

118 **(b)**

When the particles of the adsorbate are held to the surface of the adsorbent by the physical forces, the adsorption is called physical adsorption or physisorption. It is a reversible process and usually occurs at low temperature. The value of adsorption enthalpy is low in this process. It forms multimolecular layers. No activation energy is required in this process.

119 **(c)**

Follow mechanism of negative catalysis.

120 **(b)**

Sols or colloidal solutions scatter light and are passed through ordinary filter paper.

121 **(c)**

Reactant + Catalyst $\longrightarrow$ Adsorbed activated complex $\longrightarrow$ Product + Catalyst

The intermediate is formed as a result of physical or chemical adsorption.

122 **(a)**

Transitional metals, showing variable valency in finely divided state mostly acts as catalyst

123 **(c)**

Due to similar structure, the adsorption becomes more effective and the neutralization of charge coagulates clouds to bring in rain.

126 **(a)**

Colloidal state has large surface area and provides more effective adsorption of medicine to bring in better results.

127 **(d)**

Anhydrous $AlCl_3$ is used as a catalyst in Friedel-Craft's reaction

128 **(d)**

Casein is the important protein of milk.

129 **(d)**

Chemisorption is stronger than physical adsorption and give rise to evolution of more heat.

130 **(b)**

Easily liquifiable gases (like SO_2, NH_3, CO_2 etc.) are adsorbed up to greater extent than the gases like O_2, H_2, N_2, He etc which liquify with great difficulty.

131 **(a)**

As_2S_3solution is negatively charged colloidal solution. A positive ion will coagulate it. As coagulating power $\propto$ effective charge on ion. Hence,Al^{3+} ion will have highest coagulating power.

132 **(b)**

It is the definition of dialysis.

133 **(a)**

Dust storm is solid dispersed in gas, a class (solid aerosol) of colloidal system.

134 **(b)**

$4NH_3 + 5O_2 \xrightarrow{Pt} 4NO + 6H_2O$; Pt is catalyst.

135 **(c)**

Tyndall effect would be observed in colloidal solution.

136 **(d)**

Freundlich adsorption isotherm equation is

$\frac{x}{m} = kp^{1/n}$

On taking log both sides

$\log\frac{x}{m} = \log k + \frac{1}{n}\log p$

$\log\frac{x}{m} = \log 10 + \frac{1}{n}\log 0.5$

$(\because \text{Slope} = \frac{1}{n} = \tan\theta = \tan 45° = 1)$

$\log\frac{x}{m} = 1 + \frac{1}{1}\log(5 \times 10^{-1})$

$\log\frac{x}{m} = 1 + 0.6990 - 1$

$=0.6990$

$\frac{x}{m} = 5.00$

$=5$ g

137 **(a)**

When a coagulated substance (*ie*, colloidal solution) is treated with a suitable electrolyte, it again changes to a colloidal solution, this is known as peptization

138 **(d)**

All are same processes.

139 **(d)**

Enzymes are biological catalyst

140 **(d)**

Colloid	Dispersed phase	Dispersion medium
Milk	Liquid	Liquid
Foam	Gas	Liquid
Mist	Liquid	Gas
Vegetable oil	Liquid	Liquid

∴ Foam is colloid which has liquid dispersed in gas.

141 **(b)**

Gold is a lyophobic sol.

142 **(b)**

The reaction in contact process is

$2SO_2 + O_2 \xrightarrow{V_2O_5} 2SO_3$

143 **(b)**

$2SO_2 + O_2 \xrightarrow{NO} 2SO_3$; NO is catalyst.

144 **(b)**

The sol particles at isoelectric point do not show electrophoresis.

145 **(a)**

Langmuir adsorption isotherm is valid for monolayer (chemical adsorption). Having adsorption sites at active centres, $i.e.$,free valencies which have equivalent ability to adsorb the particles.

147 **(b)**

Adsorption is an exothermic process, thusΔH is negative (i.e., $\Delta H<0$). Moreover, adsorption results in more ordered arrangement of molecules, thus entropy decreases ($i.e.,\Delta S < 0$).

$\Delta G = \Delta H - T\Delta S$

Hence, low temperature favours the reaction.

149 **(c)**

Cow milk is stabilized by casein.

150 **(d)**

Normal optimum temperature of enzymes is between 25°C to 40°C hence (a) is false. Similarly, (b) and (c) are also false. Enzymes have well defined active sites and their actions are specific in nature.

151 **(b)**

If $BaSO_4$is not used, the reaction will give alcohol. $BaSO_4$ retards the activity of Pd.

$$R\text{COCl} \xrightarrow[Pd/BaSO_4]{H_2} R\text{CHO}$$

$$R\text{COCl} \xrightarrow[Pd]{H_2} R\text{CHO} \longrightarrow R\text{CH}_2\text{OH}$$

152 **(d)**

Rest all are characteristics of sol.

153 **(b)**

Bredig arc method is used to prepare the metal sols which do not react with water even at high temperature.

154 **(a)**

$$\begin{array}{l} CH_2OOCR \\ | \\ CHOOCR + 3\ NaOH \\ | \\ CH_2OOCR \\ (Fat) \end{array} \xrightarrow[(Alkali)]{} \begin{array}{l} CH_2OH \\ | \\ CHOH + 3\ RCOONA \\ | \\ CH_2OH \\ (Glycerol) \end{array} \quad (Soap)$$

is saponification.

155 **(b)**

Colloidal state involves dispersion state, an intermediate state in between true solution and suspension state.

156 **(d)**

$\text{Milk} \xrightarrow{\text{Lactic bacilli}} \text{Curd}$

157 **(c)**
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

158 **(d)**
Follow theories of catalysis –The modern theory.

159 **(d)**
On passing a beam of light through a colloidal solution, the colloidal particles adsorb light energy and then emit it in all the possible directions. This phenomenon is called scattering of light or Tyndall effect.
Note: Tyndall effect is not observed in true solutions.

160 **(c)**
The pH at which the colloidal particles are neither positive nor negative is known as isoelectric point of the colloid

161 **(b)**
Homogenous catalysis Whenthe reactants and catalyst are in the same phase, the catalysis is known as homogeneous catalysis.
Example $2KClO_3(s) \xrightarrow{MnO_2(s)} 2KCl(s) + 3O_2(g)$

162 **(a)**
$(C_6H_{12}O_6) \xrightarrow{\text{Touching}} C_2H_5OH$

163 **(d)**
The solid in liquid system sets on meaning for the formation of liquid in solid system, *i.e.*, gel formation.

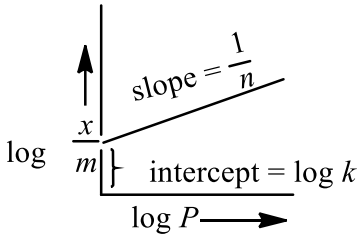
164 **(b)**
Because of larger surface area in colloidal state, adsorption is more, also it acts as germ killer.

165 **(d)**
Zeigler-Natta catalyst is formed by the action of $(C_2H_5)_3Al$ and $TiCl_4$. The active species is Ti^{III} as $(C_2H_5)_3Al$ can reduce $TiCl_4$ to $TiCl_3$. Ti^{III} has one active site vacant and thus accommodates one alkyl group.

166 **(d)**
When a liquid (dispersed phase) is dispersed in solid (dispersion medium), the colloidal solution is termed as gel.

167 **(a)**
During the manufacturing of HNO_3 from ammonia, platinum is used as a catalyst for the oxidation of ammonia to nitric oxide

169 **(c)**
When we plot a graph between log (x/m) and log p, a straight line with positive slope will be obtained. This graph represents the Freundlich adsorption isotherm.



170 **(a)**
ZSM–5 acts as an effective catalyst to convert alcohol to alkanes (petrol).

171 **(c)**
Both are antiknock compounds.

172 **(a)**
$Fe(OH)_3$is a positively charged sol, thus coagulated by negative ion (anion). Smaller the charge on anion, smaller is its coagulating power or higher is its flocculation value.
(a)$KBr \rightarrow K^+ + Br^-$
(b)$K_2SO_4 \rightarrow 2K^+ + SO_4^{2-}$
(c)$K_2CrO_4 \rightarrow 2K^+ + CrO_4^{2-}$
(d)$K_4[Fe(CN)_6] \rightarrow 4K^+ + [Fe(CN)_6]^{4-}$
$\because Br^-$has smaller charge.
$\therefore$ KBr is least effective in coagulating $Fe(OH)_3$ sol.

173 **(d)**
All these are standard facts for given graph.

174 **(b)**
The substances that stabilise emulsions are called emulsifiers. Agar, gum and soap all were emulsifier while milk is an emulsion, not an emulsifier.

175 **(a)**
Langmuir's adsorption isotherm deals in terms of chemical adsorption which fails at high pressure because, the mass adsorbed reaches a constant value when the adsorbed surface is completely covered by a unimolecular layer of gases.

176 **(a)**
To catalyse the digestion process.

177 **(a)**
Flocculation value or coagulation value is the amount of electrolyte in millimole to coagulate one lire of a colloidal solution.

178 **(a)**
In heterogeneous catalysis the reactants and the catalyst are in different phases.
$N_2(g) + 3H_2(g) \xrightleftharpoons{Fe\ (S),\ Mo} 2NH_3(g)$
In the Haber's process the reactants are in gaseous phase while catalyst (Fe) in solid phase.

Hence, it is an example of heterogeneous catalysis.

179 **(c)**
Gases which have high critical temperature, have strong van der Waals' forces of attraction and hence, are adsorbed to a greater extent.

180 **(c)**
Enzyme catalysed reactions are highly specific, $i.e$, one enzyme catalyses one reaction.

181 **(a)**
It is an scale to represent protective power of lyophilic sols.

184 **(a)**
Water molecules are held up in solid cement particles to give gel formation.

185 **(c)**
Tyndall effect is not observed in sugar solution because it is a true homogeneous solution.

186 **(b)**
Enzymes are high molecular weight protein with specific action

187 **(a)**
Multilayer adsorption occurs in physical adsorption due to weak van der Waals' forces

189 **(d)**
Catalyst never starts a chemical reaction, it only alter the rate of reaction

190 **(b)**
Contact process of H_2SO_4 requires Pt asbestos or V_2O_5 as catalyst for combination of SO_2 and O_2.

191 **(c)**
Electrolysis is the technique by which electrolytic impurities can be removed. Hence, urea, being non-electrolyte cannot be removed by this nethod.

192 **(b)**
The minimum energy barrier required to be crossed to bring in a chemical change is called threshold energy level.

193 **(d)**
Sol particles carry charge and thus, move towards opposite electrodes under the influence of electric field and the phenomenon is known as cataphoresis or electrophoresis.

194 **(d)**
More is the valence of effective ion, greater is its coagulating power. The Hardy-Schulze rule.

195 **(c)**
$Sb_2S_3$is an anionic sol, therefore cation of highest valency (Al^{3+}in the present case) would be most effective coagulating agent.

196 **(c)**
Precious stones are solid in solid sol.

197 **(a)**
Size of colloidal particles =1 to 100 nm (say 10 nm).

$V_C = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(10)^3$

Size of true solution particles ≈1 nm

$V_S = \frac{4}{3}\pi(1)^3$

Thus, $\frac{V_C}{V_S} = 10^3$

198 **(b)**

$\frac{V_c}{V_s} = \frac{4/3\pi r_c^3}{4/3\pi r_s^3} = \frac{r_c^3}{r_s^3} = \left(\frac{10}{1}\right)^3 = 10^3$

199 **(c)**
The gold sol is obtained by the reduction of $AuCl_3$.

$2AuCl_3 + 3HCHO + 3H_2O \rightarrow 2Au + 3HCOOH + 6HCL$

Gold sol

200 **(a)**
Gold number of protective colloid is
"Colloid in milligrams which when added to 10 mL of gold solution just prevents its coagulation by 1mL of 10% NaCl solution."

$$\text{Protective power} \propto \frac{1}{\text{gold number}}$$

The gold number of starch is 25, because it has very low protective power.

201 **(d)**
Electrophoresis is movement of colloidal particles under the influence of electric field.

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

203 **(c)**
All these are liquid aerosol systems, $i.e.$, liquid dispersed in gas.

204 **(b)**
Hydrolysis of ester catalysed by a proton is acid-base catalysis.

205 **(c)**
An example of autocatalysis.

206 **(c)**
Freundlisch adsorption isotherm is :

$$\frac{X}{m} = KP^{1/n}$$

If $P \rightarrow 0$; $n = 1$ $\frac{X}{m} = KP$

If P is high; $n = 0$ $\frac{X}{m} = KP^0$

207 **(a)**
Colloidal solution of gold is called purple of cassius

208 **(b)**
According to Freundlich equation,
$\frac{X}{m} \propto p^{1/n}$ or $\frac{X}{m} = kp^{1/n}$
or $\log\frac{X}{m} = \log kp^{1/n}$
or $\log\frac{X}{m} = \log k + \frac{1}{n}\log p$

209 **(c)**
CO gets adsorbed on active centres of Fe.

210 **(a)**
The conversion of freshly prepared suspension into colloid is known as peptisation and those substances which help for such a conversion are known as peptising agent.

211 **(b)**
The graph plotted between amount of substance adsorbed and on the given pressure at constant temperature is known as adsorption isotherm

212 **(a)**
Tyndall effect is shown by colloidal solution due to scattering of light by their particles.

213 **(a)**
The definition of negative catalyst.

214 **(a)**
Chlorophyll is a compound.

215 **(b)**
Dodecyl trimethyl ammonium chloride $C_{12}H_{25}(CH_3)_3NCl$ on dissolution forms $C_{12}H_{25}(CH_3)_3N^+$ and Cl^- ions. The former possesses hydrophilic $(-N^+)$ and hydrophobic $[C_{12}H_{25}(CH_3)_3^-]$ parts.

216 **(c)**
It is w/o type emulsion.

217 **(a)**
Colour of colloidal solution depends upon particle size. As the particles size increases, the colour of gold sol changes from red to blue and finally to golden.

218 **(d)**
In medical field, colloidal gold is used as tonic to raise vitality of human systems

219 **(b)**
It is the definition of thixotropy, a property of gel.

220 **(b)**
Catalyst in finely powdered state possesses larger surface area and more active centres and thus, becomes more effective.

221 **(c)**
Higher the gold number, lesser will be the protective power of colloid.

222 **(d)**
Gold number is the amount of substance in milligram that is required to prevent coagulation of $10\ cm^3$ of gold sol by addition of 1 mL of 10% NaCl solution.

Convert 0.025 g into milligram $= 25$

0.025 g starch $= 0.025 \times 1000 = 25$ mg

Thus, the gold number of starch $= 25$

223 **(c)**
50 mL of 1 M oxalic acid $[(COOH)_2 .2H_2O]$
$= 50$ millimol

$= 0.050$ mol

$= 0.050 \times 126$ g

$= 6.3$ g

50 mL of 0.5 M oxalic acid $= 3.15$ g
$\therefore$ Oxalic acid asorbed on 0.5 g charcoal
$= 6.3 - 3.15$

$= 3.15$ g

$\therefore$ Amount of oxalic acid adsorbed per gram of charcoal $= \frac{3.19}{0.5} = 6.3$

224 **(c)**
Colloidal solutions are heterogeneous in nature.

225 **(c)**
The scattering $\propto \frac{1}{\lambda^4}$. Thus, scattering of blue light (shorter wavelength) is more.

226 **(a)**
It is the definition of synerisis, a property of gel.

227 **(c)**
Solid aerosol involves solid dispersed in gas, *e*. g., smoke, storm, etc.

228 **(c)**
Negative colloid is coagulated by positive ion or *vice-versa*. Greater the valency of coagulating ion, greater will be coagulating ion, greater will be coagulating power.
(a)$ZnSO_4 \rightarrow Zn^{2+} + SO_4^{2-}$
(b)$Na_3PO_4 \rightarrow 3Na^+ + PO_4^{3-}$
(c)$AlCl_3 \rightarrow Al^{3+} + 3Cl^-$
(d)$K_4[Fe(CN)_6] \rightarrow 4K^+ + [Fe(CN)_6]^{4-}$
Since, in $AlCl_3$, the valency of positive ion (coagulation ion) is highest, it is the most

powerful coagulating agent among the given to coagulate the negative colloid.

229 **(b)**

C_2H_5OH acts as negative catalyst for oxidation of $CHCl_3$.

231 **(a)**

Catalyst affects only activation energy. It brings down activation energy of reaction. Catalyst does not affect equilibrium constant, reaction entropy and reaction enthalpy.

232 **(b)**

The blue colour of sky is due to Tyndall effect *i.e.*, the colloidal particles adsorb light, become self luminous and then scatter light of different wavelengths in all possible directions.

233 **(d)**

Egg albumin is organic sols and organic sols are usually lyophilic.

234 **(a)**

In chemical adsorption, unimolecular layer is formed over the surface of adsorbent

235 **(a)**

Blood is purified by dialysis method

236 **(a)**

Berzelius used the term for the first time.

237 **(d)**

The sky looks blue due to scattering of light.

238 **(a)**

Fermentation of starch is enzyme catalysed reaction,

$$(C_6H_{10}O_5)_n \xrightarrow{\text{Diastase}} C_{12}H_{22}O_{11}$$

239 **(c)**

The efficiency of a catalyst depends upon the size of particles

240 **(c)**

Adsorption of gases increases with pressure, decreases with temperature.

241 **(b)**

$k = Ae^{-E_a/RT}$; higher is E_a, lesser is k.

242 **(b)**

$$\underset{\text{(Unsaturated)}}{\text{Oils} + H_2} \xrightarrow{\text{Ni}} \underset{\text{(Saturated)}}{\text{Ghee}}$$

243 **(c)**

$$2H_2O_2(l) \xrightarrow{\text{Pt}\,(s)} 2H_2O(l) + O_2(g)$$

In this reaction, reactants and catalyst are in different phase, hence it is an example of heterogeneous catalysis.

244 **(a)**

Palmitate is an anion and not a macromolecule.

246 **(b)**

Soap solutions act as emulsifier to remove grease *via* emulsification of grease in water.

247 **(d)**

All the option are correct for Freundlich adsorption isotherm at different pressures.

$\frac{x}{m} = kp^1$ (at low pressure)

$\frac{x}{m} = kp^0$ (at high pressure)

$\frac{x}{m} = kp^{1/n}$ (at intermediate pressure)

248 **(d)**

Adsorption is an exothermic process *i.e.*, energy is released against van der Waals' force of attraction (physisorptions).

Hence, ΔH is always negative.

249 **(b)**

The catalysts used are $CuCl_2$ in Deacon's process, NO in chamber process and Fe in Haber's process.

250 **(c)**

Enzymes are biological catalysts produced by living cells which catalyze the biochemical reactions in living organisms. Hydrolysis of urea by urease (enzyme) is an example of biochemical catalysis.

$$\underset{\text{urea}}{H_2N-\overset{\overset{O}{\|}}{C}-NH_2} + H_2O \xrightarrow{\text{Urease}} 2NH_3 + CO_2$$

251 **(d)**

Equation, $SO_2(g) + \frac{1}{2}O_2(g) \xrightarrow{V_2O_5(l)} SO_3(g)$ is only example of heterogeneous catalysis

252 **(a)**

Milk is an emulsion in which the particles (or globules) of liquid fats are dispersed in water.

253 **(a)**

Protective power of colloid

$$\propto \frac{1}{\text{gold number}}$$

∴ Gelatin has lowest gold number among given choices.

∴ Gelatin is best protective colloid.

254 **(b)**

$$2HNO_3 + 3H_2S \rightarrow 3S + H_2O + 2NO$$

This equation is used for the preparation of sulphur sol

255 **(d)**

Each one brings in neutralization of charges on sol particles.

256 **(b)**

$2SO_2(g) + O_2(g) \xrightarrow{Pt(s)} 2SO_3$; Phase for reactant + catalyst = 2;

Thus, heterogeneous.

257 **(a)**

Negatively charged sols require minimum amount of electrolyte having higher valence of cation.

258 **(c)**

The dispersed phase particles bear continuous collisions with dispersion medium to show irregular motion in sol state.

259 **(a)**

Freundlich adsorption isotherm is given as

$\frac{x}{m} = kp^{1/n}$(at a particular pressure)

When $x = 1, \frac{x}{m} = kp$ (at low pressure)

When $n > 1, \frac{x}{m} = k$(at high pressure)

260 **(d)**

Autocatalysis is a process in which one of the product behaves as a catalyst.

$e.g.,2KMnO_4 + 5H_2C_2O_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 10CO_2$

(acts as catalyst)

The pink colour of $KMnO_4$dissappears slowly on reaction with oxalic acid, but the rate of disappearance of colour fastens after sometime due to the formation of $MnSO_4$ which acts as autocatalyst for the reaction.

261 **(d)**

The action of enzyme in living system is to enhance the rate of biochemical reactions.

263 **(b)**

Catalyst shows exothermic adsorption of reactant molecules and thus, energy of activation is lowered.

265 **(d)**

In a, b, c anionic micelle is formed.

266 **(c)**

Colloidal solution is prepared by electrical dispersion, peptization and mechanical dispersion. It is not prepared by coagulation because coagulation is the phenomenon of the precipitation of colloidal solution by the addition of the electrolyte.

267 **(d)**

Volume of the gold dispersed in one litre water

$$= \frac{\text{mass}}{\text{density}} = \frac{1.9 \times 10^{-4}\text{g}}{19\text{g cm}^{-3}}$$

$$= 1 \times 10^{-5}\text{cm}^{-3}$$

Radius of gold sol particle =10 nm

$$= 10 \times 10^{-9}\text{m} = 10 \times 10^{-7}\text{cm}$$

Volume of the gold sol particle

$$= \frac{4}{3}\pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times (10^{-6})^3$$

$$= 4.19 \times 10^{-18}\text{cm}^3$$

Number of gold sol particle in $1 \times 10^{-5}\text{cm}^3$

$$= \frac{1 \times 10^{-5}}{4.19 \times 10^{-18}}$$

$$= 2.38 \times 10^{12}$$

Number of gold sol particle in one mm^3

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

$$= 2.38 \times 10^6$$

269 **(a)**

Usually poisons for human body are poison for catalysts.

270 **(b)**

If reactant + catalyst have $P = 1$ then homogeneous catalysis.

271 **(c)**

The reaction in solution phase ($P = 1$) is catalysed by H^+.

272 **(c)**

Such a process involving oxidation of one substance in presence of other which would otherwise not been possible is called induced catalysis or better to say induced oxidation.

273 **(c)**

Detergents possess surface activity like surfactants as well as cleaning action.

274 **(d)**

When dispersed phase is gas and dispersion medium is solid the colloidal sol obtained is termed as solid foam

275 **(a)**

Lower is the value of gold number, more is its protecting power.

276 **(d)**

Due to dipole and van der Waals' forces of attraction.

277 **(c)**

Polyoxyethylene glycols and their derivatives are

non-ionic detergents.

278 **(a)**
Graph (a) represent correctly the action of catalysis

279 **(d)**
Colloidal solution of $CuCl_2$ is not prepared by double decomposition method

280 **(c)**
Hydrogenation of oils requires Ni as catalyst.

282 **(a)**
Soaps, surfactants, polymers and finely divided metal oxides and hydroxides are emulsifiers.

283 **(b)**
The phenomenon of change of colloidal state to suspension state is called flocculation of colloidal solution.
According to Hardy-Schulze rule, the flocculating power of electrolyte increases with valency of ion of electrolyte.

284 **(c)**
Organic sols are usually lyophilic.

285 **(b)**
A solid may be lyophilic or lyophobic.

286 **(c)**
Adsorption theory involves adsorption of gas on solids.

287 **(b)**
Transition metals are more effective catalyst on account of their larger surface area and half filled nature of penultimate *d*–subshells.

288 **(d)**
Emulsion are the colloidal solutions in which both the dispersed phase and the dispersion medium are liquids. A good example of an emulsion is milk in which fat globules are dispersed in water.

289 **(b)**
H_3PO_4, acetamide acts as negative catalyst for decomposition of H_2O_2.

290 **(c)**
Zeolites are used to make soft water from hard water as well as catalyst in petrochemical industry due to their shape selective nature or activity because of different pore sizes and cavity sizes on their surface.

291 **(c)**
Starch is an example of lyophilic (water loving) colloidal solution. Lyophilic colloids are those colloids which form colloidal solution in contact with water.

292 **(d)**
Poisoners are adsorbed on active centres either physically (temporary poisoning) or chemically (permanent poisoning).

293 **(a)**
$\frac{x}{m} = P$(at constant T) and $\frac{x}{m}$ decrease with T at constant P.

294 **(b)**
Heterogeneous gases are adsorbed to greater extent

295 **(b)**
Fog is an example of aerosols *i.e.*, it is a colloidal solution of liquid in gas, where liquid is dispersed phase and gas is dispersion medium.

296 **(c)**
A catalyst increases the rate of forward and rate of backward reaction to attain equilibrium earlier.

297 **(a)**
Since ferric ions can coagulate negatively charged blood solution, therefore ferric chloride may be applied to stop bleeding

298 **(a)**
The formation of colloid from suspension is called peptisation.
The process of converting a precipitate (suspension) into colloidal particles by adding suitable electrolyte is known as **peptisation**.

299 **(c)**
Mist is liquid dispersed in gas.

300 **(b)**
A catalyst alter the nature of chemical reaction by lowering the activation energy of the reactants and products

301 **(d)**
These are different forms of Freundlich equation.

302 **(c)**
Initially Pt asbestos was used. Now-a-days a relatively cheaper catalyst V_2O_5 is used. Also it is not poisoned by CO and As_2O_3.

303 **(b)**
Adsorbent is the surface on which adsorption occurs

304 **(c)**
In Cottrell's precipitator, the charged particles are attracted towards the walls of precipitator, here they lose their charge and coagulate. Hence, the basic principle of Cottrell's precipitator is the neutralisation of charge on colloidal particles.

305 **(d)**
Freundlich adsorption isotherm gives relationship between pressure and amount of substrate

adsorbed.

$x/m = kp^{\frac{1}{n}}$ (where, $x/m =$ amount adsorbed , $p =$ pressure)

or $x = m.kp^{\frac{1}{n}}$

or $x/m = kp^{-n}$

∴ All equations represent Freundlich adsorption isotherm.

306 **(c)**

Butter is an w/o emulsion having fat dispersed in water.

307 **(b)**

Peptisation is a process in which freshly prepared precipitate disintegrates into colloidal solution

308 **(a)**

A negative catalyst is one which lowers the rate of chemical reaction. *eg*, Addition of chloroform to H_2O_2 prevents the decomposition of $CHCl_3$ to a great extent

309 **(a)**

Gold no.is the amount of lyophilic in mg which just protect 10 mL gold sol against coagulation by 1 mL of 10% NaCl solution. It is a measure of protective power of lyophilic colloids.

310 **(b)**

Suspension	Colloidal solution	True solution
Particle size		
>100 nm	1nm-100nm	< 1 nm

Colloidal solution is a heterogeneous solution which contains particles of intermediate size. The particles of a colloidal solution have diameters between 1 to 100 nm. Colloidal solution shows the optical property (*i.e.*,Tyndall effect and Brownian movement).

311 **(c)**

Lyophilic possesses solvent loving nature and thus, a thin layer of dispersed phase is formed around sol particles.

312 **(d)**

Gold number is the number of milligrams of a hydrophilic colloid that will just prevent the coagulation of 10 mL of a gold sol on addition of 1 mL of 10% NaCl solution.

∴ Gold number $=0.25\times1000=250$

313 **(d)**

Sodium stearate is an example of associated colloids. Colloidal solution of enzymes, proteins, cellulose and starch are the examples of macromolecular colloids.

314 **(d)**

MnO_2speeds up the reaction.

316 **(b)**

Blue colour of the sky and red colour of the red sun sets are due to scattering of light from particles of dust in the atmosphere

317 **(c)**

$AlCl_3$ in Friedel-Crafts reaction acts as Lewis acid to produce electrophile.

318 **(d)**

Potassium stearate is an example of associated colloid or micelle.

319 **(d)**

Coagulating power of an electrolyte for arsenioussulphide decreases as $Al^{3+} > Ba^{2+} > Na^{+}$.

320 **(d)**

A biological catalyst is an enzyme.

321 **(a)**

$R-COONa$ has hydrophilic ($-COO^{-}$) and hydrophobic moities and thus, dispersion of C_6H_6 and water is possible.

322 **(a)**

In colloid particles, the range of diameters *i.e.*,particle size is of the order of 1 to 100 nm.

324 **(a)**

Sodium dodecyl sulphate (SDS)

CMC (mm)>-10

Hexadecyl trimethyl ammonium bromide (CTAB)

Note At a certain concentration surfactant molecules start to aggregate and form micelle, the concentration is called critical micellisationconcentration(CMC).

325 **(c)**

Hydrophobic sol are irreversible in nature. They have no affinity between the dispersed phase and the dispersion medium (H_2O). Further once precipitated, they do not form the colloidal sol by simple addition of water.

327 **(b)**

Sulphur sol is prepared by the oxidation of H_2S by bromine.

$Br_2 + H_2S \rightarrow 2HBr + S$

sol

328 **(c)**

When some $FeCl_3$ is added to the $Fe(OH)_3$ solution, Fe^{3+} ions are preferentially adsorbed on $Fe(OH)_3$ particle. Thus, it turns into positive ferric hydroxide sol$[Fe(OH)_3]Fe^{3+}$. This process is

called peptisation.

329 **(a)**
Emulsion is solution of liquid in liquid.
Cod liver oil is emulsion.

330 **(b)**
Adsorbent adsorbs impurities from surface of substance. Animal charcoal is good adsorbent. The impurities adsorb on its surface and thus it decolourises colour of liquids.

331 **(a)**
Flocculation value$\propto \frac{1}{\text{Coagulating power}}$
$Fe(OH)_3$is a positively charged sol.
To coagulate$Fe(OH)_3$, negative charge electrolyte is used and greater the value of negative charge, coagulating power will be strong. Among the given electrolytes, NaCl has lowest coagulating power. So, its flocculation value will be maximum.

332 **(c)**
Gold sol is a lyophobic sol. Gold particles have very less affinity towards dispersion medium, hence its sol can be easily coagulated.

333 **(d)**
H^+ for (a) ; mixture of gases for (b) and Mn^{2+} for (c) formed during reaction acts as catalyst.

334 **(d)**
Palladium being a transition element, adsorbs the hydrogen gas to a greater extent and the molecules of H_2 are held to the surface of the metal by chemical forces

335 **(b)**
$\because$ Protective power $\propto \frac{1}{\text{gold number}}$
$\therefore$ Order of protective power will be
Gelatin $>$ Haemoglobin $>$ *Sodium acetate*
(0.005) (0.05) (0.7)

336 **(d)**
A catalyst change the activation energy of the reaction. As a result, the reaction follows an alternate path and the rate of reaction will change.

337 **(d)**
Adsorption of a gas on a solid depends on
(a)nature of the gas and solid
(b)temperature (decreases with increase in temperature)
(c)pressure

339 **(a)**
Fog is a colloidal solution in which water (liquid, dispersed phase) is dispersed in air (gas, dispersion medium)

340 **(c)**
Larger is surface area, more is efficiency of catalyst. The surface area becomes more in finely powdered state, colloidal state or if surface is rough.

341 **(b)**
Gold number is defined as "the minimum amount of protective colloid in milligrams required to just prevent the coagulation of a 10 mL of a given gold sol, when 1 mL of a 10% solution of sodium chloride is added to it.

343 **(c)**
Separation of the dispersed phase from the gel is known as syneresis

344 **(b)**
Silica gel is a powerful adsorbent for moisture.

345 **(a)**
The gold number of the given compounds is
Gelatin - 0.005 to 0.1
Starch - 15 to 25
Albumin - 0.1 to 0.2
Blood or haemoglobin – 0.03 to 0.07
So, gelatin has the least gold number.

346 **(c)**
Mixing the soles together can cause coagulation since the charges are neutralised.

348 **(a)**
Larger is surface area, more is efficiency of catalyst. The surface area becomes more in finely powdered state, colloidal state or if surface is rough.

349 **(d)**
Ionic surfactant molecules are preferentially adsorbed at the interfaces

351 **(d)**
An emulsion is a dispersion of finely divided droplets in another liquid. Thus, it is a liquid, liquid colloidal system

352 **(d)**
H^+ from weak acids or strong acids or enzyme's invertase catalyse the hydrolysis of sugar.

353 **(a)**
Rate $= k$ [Reactant] or $k = Ae^{-E_a/RT}$

354 **(d)**
—do—

355 **(d)**
Fe is used in Haber's process.

357 **(c)**

A trade name for graphite-water sol.

358 **(c)**

Active charcoal has greater surface area.

∴it has more adsorption power.

359 **(a)**

An aerosol is dispersion of solid or liquid in a gas. Smoke and dust are examples of aerosol. Aerosol is a type of colloidal system.

360 **(c)**

When the reactants and catalyst are in the same phase, the catalysis is known as homogeneous.

$2CO(g) + O_2(g) \xrightarrow{NO(g)} 2CO_2(g)$

In this reaction both reactant and catalyst are in the gaseous phase.

361 **(a)**

Milk is an emulsion of fat in water or o/w type.

362 **(b)**

Lyophilic colloids are protective colloids because they prevent the precipitation of lyophobic colloids.

Gelatin is a protective colloid. Its gold number is 0.005-0.001.

363 **(c)**

When aqueous solution of $AgNO_3$ is added to KI solution, positively charged sol of AgI is obtained due to the adsorption of Ag^+ ions on AgI molecules.

$$\underset{\text{excess}}{AgNO_3} + KI \longrightarrow AgI + KNO_3$$

$$\downarrow Ag^+$$

$$[AgI]\,Ag^+$$

positively charged sol

364 **(c)**

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

365 **(c)**

Chemisorption is directional, irreversible and unimolecular exothermic process where adsorbate molecules are adsorbed on active centres of adsorbent by chemical forces.

366 **(b)**

Enzymes are most reactive at optimum temperature (app. $25 - 35^{\circ}$).

367 **(c)**

Alum purify muddy water y coagulation.

368 **(c)**

The continuous phase contain the dispersed phase throughout.

Example is water droplet in mist.

370 **(c)**

NO reacts with O_2 to give intermediate, NO_2 (brown vapours).

371 **(d)**

A catalytic poison inhibits a chemical reaction

372 **(d)**

Rest all are colloidal solutions.

373 **(b)**

Follow poisoning of catalyst.

374 **(c)**

The phenomenon of converting freshly precipitated mass into colloidal state by the action of solute or solvent is called peptization.

375 **(a)**

The application of adsorption.

376 **(a)**

The action of sodium aluminium silicate(zeolite) on hard water is not an example of colloidal action. It is actually the simple chemical substitution of calcium salts with zeolite so that calcium zeolite precipitates out, and hardness of water removes.

377 **(a)**

This is called synerisis or weeping of gels.

379 **(d)**

The decomposition of H_2O_2 can be slowed by the addition of acetamide. Acetamide act as an inhibitor.

Catalytic poisons or **inhibitor**are those substances which decrease or inhibit the activity of catalyst.

380 **(a)**

Catalyst always lowers energy of activation. The working of negative catalyst is not based on energy of activation concept.

381 **(d)**

Sols having water as dispersion medium (D.M.) are called aquasol. If benzene is D.M., it is benzosol. If alcohol is D.M., it is alcosol.

382 **(b)**

Both process of adsorption and absorption taking place simultaneously are referred as **Sorption.**

383 **(d)**

In adsorption, due to forces of attraction, ΔH is negative and as the particles came closer entropy of the system decrease, ie, ΔS is negative, hence $T\Delta S$ is also negative

384 **(c)**

Viscosity of hydrophilic is much higher than dispersion medium. Surface tension being much lesser than dispersion medium (water). This is due to higher concentration of dispersed phase in water due to water loving nature.

385 **(b)**
Coagulation is the phenomenon of conversion of colloidal sol into precipitate while in peptization, a fresh precipitate is converted into sol by adding electrolyte. Hence, it is clear that peptization does not involve coagulation.

386 **(c)**
$BaSO_4$is insoluble in water and thus, it does not from true solution with water.

387 **(b)**
On passing H_2S through a cold solution of an oxidant, colloidal sulphur is formed.

388 **(a)**
The physical state changes but chemically it remains same.

389 **(b)**
A catalyst lowers the activation energy and increases the rate of reaction. It is not consumed during reaction.

390 **(a)**
$$\underset{\text{Maltase}}{C_{12}H_{22}O_{11}} \xrightarrow{\text{Maltase}} \underset{\text{Glucose}}{2C_6H_{12}O_6}$$

391 **(a)**
$$SO_2(g) + (1/2)\, O_2(g) \xrightarrow{Pt(s)} SO_3\ (g)$$

392 **(b)**
The optimum temperature for production of ammonia by Haber's process is 500°C. If the temperature is lowered down then production of ammonia becomes slow down

393 **(a)**
Solvent hating sols are lyophobic or in other words dispersed phase has less affinity for solvent.

394 **(b)**
Smaller the value of gold number, greater will be the protecting power of the protective colloid.
Hence, protective nature of A, B and C is as
Colloidal solution : $A > B > C$
Gold number : 0.01 2.5 20

395 **(b)**
Catalyst lowers the activation energy or brings down the threshold energy barrier.

396 **(d)**
Oil and grease are adsorbed into the hydrophobic centre of detergent micelle and washed away.

397 **(a)**
Catalyst decreases the activation energy and thus, chemical process undergoes through a new path of lower energy

398 **(c)**
(i)Dialysis is the method of separating particles of colloids from those of crystalloids by diffusion of mixture through perchament membrane.
(ii)Ultrafiltration is the method of separating particles of electrolyte from colloidal particle by filtering through ultrafilter paper.
(iii)Electrophoresis is the movement of colloidal particles under influence of electric field.
(iv) Peptization is a process of passing of precipitate into colloidal particle on addition of suitable electrolyte.
∴ Peptization is correct answer.

399 **(c)**
The continuous rapid zig-zag motion by a colloidal particle in the dispersion medium is called Brownian movement

400 **(b)**
In Haber's process, a mixture of iron powder and molybdenum powder is used as catalyst

$$N_2 + 3H_2 \underset{Mo}{\overset{Fe}{\rightleftharpoons}} 2NH_3$$

401 **(d)**
Follow Hardy-Schulze rule.

402 **(d)**
Since, As_2S_3 is a negatively charged sol, the ion bearing the highest positive charge, is more effective for its coagulation, Al^{3+}has highest positive charge,*i.e.*,+3, so it is more effective for the coagulation of As_2S_3 sol.

403 **(a)**
$k = Ae^{Ea/RT}$

407 **(d)**
This is the phenomenon of gel, called as imbibition or swelling up of gels.

408 **(d)**
All are same terms since Freundlich isotherm is based on physical adsorption.

409 **(a)**
One enzyme catalyses only one reaction. This is highly specific action of enzyme. Sucrose ($C_{12}H_{22}O_{11}$) is hydrolysed by invertase whereas, another sugar maltose ($C_{12}H_{22}O_{11}$) is hydrolysed by maltase.

410 **(c)**
A catalyst alter the path of reaction mechanism by adsorbing reactant on its surface.

412 **(d)**
The activity of enzymes is much faster than

ordinary catalysts.

413 **(b)**
A promoter is not a catalyst but it activates the action of a catalyst

414 **(c)**
It is simply absorption.

416 **(b)**
Cellulose dispersed in ethanol is called collodion.

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

418 **(c)**
Colloidal solution of gold is obtained when dispersed phase is solid and dispersion medium is liquid.
Substances like metals cannot be brought into the colloidal state simply by bringing them in contact with water and therefore, special methods are devised for the purpose. Hence, they are known as hydrophobic or lyophobic colloids.

419 **(b)**
Emulsions are colloidal system in which dispersion medium and dispersed phase both are liquids. So, emulsion is dispersion of liquid in liquid.

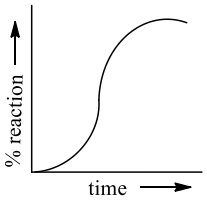
420 **(c)**
The colour of a colloidal solution depends on the wavelength of the light scattered by the dispersed particles, which in turn depends on the size and the nature of particle.
The colour of water in sea is blue due to the scattering of light by water.

421 **(c)**
Zymase is protein which is a biochemical catalyst

422 **(c)**
When temperature increases, the adsorbed molecules get energy and desorption starts increasing, therefore adsorption decreases with increase in temperature

423 **(b)**
Emulsion are the class of colloids having liquid dispersed in liquid.

424 **(b)**



This graph represents autocatalysis

425 **(a)**
A new definition for protective power of a lyophobic sol as given by Ostwald and known as Rubin number

427 **(a)**
Calcium phosphide reacts with moisture to give $PH_3 \cdot PH_3$ reacts with O_2 to give white dense for of P_2O_5.

428 **(d)**
These are applications of adsorption, absorption and emulsification.

429 **(c)**
The efficiency of enzyme catalysis is due to its capacity to lower the activation energy of the reaction. Enzymes are biocatalysts which increases the rate of reaction without being consumed in the reaction. In case of equilibrium reactions, catalyst help in attaining the equilibrium quickly without disturbing the equilibrium.

431 **(c)**
In Langmuir's adsorption isotherm, the mass of gas striking a given area of surface is proportional to the pressure of the gas as

$$\frac{x}{m} = \frac{k'p}{1 + kp}$$

432 **(d)**
Clouds are water-dispersed in air sol carrying + ve and – ve charge on water molecules.

433 **(a)**
Bleeding due to cut can be stopped by applying $FeCl_3$or alum solution. This is due to coagulation of negatively charged colloidal blood particles (albuminoid substance) by positively charged Fe^{3+} ions. These substances are used as styptic (which check the flow of blood).

434 **(a)**
Lyophilic sols have lower surface tension than H_2O due to loving nature towards H_2O.

435 **(b)**
Fe is catalyst, Mo is promoter.

436 **(a)**
Tyndall effect or scattering of light by smoke.

438 **(c)**
Smoke is carbon in air, negative aerosol.

439 **(c)**
In homogeneous catalysis, reactants and catalyst are in the same phase.

$$(a)SO_2(g) + O_2(g) \overset{Pt\,(s)}{\rightleftharpoons} SO_3(g)$$

(contact process)

It is an example of heterogeneous catalysis.

(b) $N_2(g) + H_2(g) \xrightleftharpoons{Fe\ (S)} 2NH_3(g)$

(Haber's process)

It is an example of heterogeneous catalysis.

(c) $C_{12}H_{22}O_{11}(aq) + H_2O(aq) \xrightleftharpoons{HCl\ (aq)} C_6H_{12}O_6 + C_6H_{12}O_6$

It is an example of homogeneous catalysis.

(d) $\text{oil}(l) + H_2(g) \xrightarrow[pt(s)]{\text{(Hardening)}} \text{fat}$

Thus, it is also an example of heterogeneous catalysis.

440 **(c)**

Catalyst does not alter the equilibrium constant.

441 **(b)**

For hydrophilic sol, viscosity is higher than water whereas surface tension is low

442 **(b)**

Colloidal solutions are heterogenous in nature

443 **(a)**

Linseed oil is commonly used to prepare soap because of low cost.

444 **(b)**

Rest all have moities with polar and non-polar part.

445 **(b)**

Catalyst simply helps in attaining the equilibrium earlier.

446 **(c)**

In a reversible reaction, catalyst only alters the rate of reaction

447 **(d)**

As_2S_3sol is a negative sol due to preferential adsorption of S^{2-}ions $[As_2S_3]S^{2-}$. Hence, a cation is needed to coagulate it. Accodig to Hardy-Schulze rule, aluminium nitrate will be the most efficient to coagulate it, as it gives the most valent aluminium ion (Al^{3+}), hence it is required in minimum amount. (*i.e.*,coagulation value is least for $Al(NO_3)_3$.

448 **(a)**

Paste is suspension of solid in liquid.

449 **(d)**

Cloud is not an emulsion. Since, its dispersed phase is liquid and dispersion medium is gas.

While emulsion is such type of a colloidal solution which has both the dispersed phase and medium in liquid state.

450 **(b)**

Emulsifying agents are usually of three types, macromolecules such as polymers, surface active agents and metal oxides in finely divided state.

451 **(b)**

In lead chamber process of H_2SO_4, oxide of nitrogen is used as catalyst

452 **(c)**

$$\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} \xrightarrow{\text{Invertase}} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

453 **(b)**

As temperature increases desorption increases.

Adsorbent +adsorbate ⇌ Adsorbed state+ΔE

Adsorption is exothermic process (forward direction),

Desorption is endothermic process (backward direction).

According to Le-Chatelier's principle increase in temperature favours endothermic process.

455 **(c)**

A catalyst increases the rate of reaction by decreasing its activation energy. In a reversible reaction, catalyst decreases activation energies of both, forward and backward reactions, equally, thereby increasing rate of both reactions equally. Thus, equilibrium is approached quickly.

456 **(a)**

As_2O_3 gets adsorbed on active centres of Pt.

457 **(d)**

Extent of adsorption $= kp^{1/n}$

(Freundlich adsorption isotherm)

The amount of gas adsorbed does not increase as rapidly as the pressure.

The extent of adsorption$=\frac{ap}{(1+bp)}$

(Langmuir adsorption isotherm)

Where, k, a, b are constants and p is pressure.

458 **(d)**

Activated charcoal has great affinity for water vapour as they easily form hydrogen bond among themselves

459 **(c)**

Starch and cellulose are macromolecular particles

460 **(c)**

Aerosol is colloidal system of solid in gas.

e.g., smoke. So, dispersion medium in aerosol is gas.

461 **(c)**

Either $BaSO_4$ or Quinoline are used to reduce the activity of Pd-charcoal. The catalyst Pd-

charcoal/$BaSO_4$ or Quinoline is used to hydrogenate alkyne to alkene only

$CH \equiv CH + H_2 \xrightarrow{\text{Lindlar's catalyst}} CH_2 = CH_2$

462 **(d)**

All are examples of negative catalysts.

463 **(d)**

The phenomenon that takes place at the surface, are termed as surface phenomenon. Among the given processes, all processes take place at the surface, so option (e) is correct.

464 **(a)**

This is a fact.

465 **(d)**

Adsorption is process where randomness decreases and energy is released hence ΔS, ΔH and ΔG, all have negative values

SURFACE CHEMISTRY

CHEMISTRY

Assertion - Reasoning Type

This section contain(s) 0 questions numbered 1 to 0. Each question contains STATEMENT 1(Assertion) and STATEMENT 2(Reason). Each question has the 4 choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

a) Statement 1 is True, Statement 2 is True; Statement 2 **is** correct explanation for Statement 1

b) Statement 1 is True, Statement 2 is True; Statement 2 **is not** correct explanation for Statement 1

c) Statement 1 is True, Statement 2 is False

d) Statement 1 is False, Statement 2 is True

1

Statement 1: A reaction cannot become fast by itself unless a catalyst is added

Statement 2: A catalyst always increases the speed of a reaction

2

Statement 1: For the coagulation of sols carrying positive charge, PO_4^{3-} ions are more efficient than SO_4^{2-} or Cl^- ions

Statement 2: This follows Hardy-Schulze rule

3

Statement 1: Colloidal solutions are stable but colloidal particles do not settle down.

Statement 2: Brownian movement counters the force of gravity actively on colloidal particles.

4

Statement 1: A catalyst increases the rate of a reaction.

Statement 2: In presence of a catalyst, the activation energy of the reaction increases.

5

Statement 1: Lyophilic colloids are called reversible sols

Statement 2: Lyophilic sols are liquid loving

6

Statement 1: ZSM – 5 is used as a catalyst in petrochemical industries

Statement 2: Zeolites are three dimensional network silicates in which some silicon atoms are replaced by aluminium atoms

7

Statement 1: An emulsion becomes stable if soap is added to it.

Statement 2: Soap contains hydrophilic hydrophobic parts.

8

Statement 1: Aqueous gold colloidal solution is red in colour.

Statement 2: The colour arises due to scattering of light by colloidal gold particles.

9

Statement 1: According to Freundlich, $\frac{x}{m} = k \, . \, p^{1/n}$

Statement 2: The isotherm shows variation of the amount of gas adsorbed by the adsorbent with temperature

10

Statement 1: The activity of a catalyst depends upon the strength of physisorption .

Statement 2: The reactant must adsorb very strongly for the catalyst to be active.

11

Statement 1: A colloidal solution of $Fe(OH)_3$ formed by peptization carries positive charge.

Statement 2: During formation of $Fe(OH)_3$ solution, electrons are lost by the particles.

12

Statement 1: The molecules on the surface have lesser energy.

Statement 2: During adsorption the surface of solid is in a state of relaxation.

13

Statement 1: According to Freundlich$\frac{x}{m}$=K.P $^{1/n}$.

Statement 2: The isotherm shows variation of the amount of gas adsorbed by the adsorbent with temperature.

SURFACE CHEMISTRY

CHEMISTRY

: ANSWER KEY :

1)	**d**	**2)**	**a**	**3)**	**a**	**4)**	**c**
5)	**b**	**6)**	**b**	**7)**	**a**	**8)**	**a**
9)	**c**	**10)**	**d**	**11)**	**c**	**12)**	**d**
13)	**c**						

SURFACE CHEMISTRY

CHEMISTRY

: HINTS AND SOLUTIONS :

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

2 **(a)**
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

4 **(c)**
A catalyst increases the rate of reaction because in the presence of catalyst the activation energy of the reaction and decreases.

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

6 **(b)**
ZSM-5 converts alcohols directly into gasoline (petrol) by dehydrating them so that a mixture of hydrocarbons is formed

7 **(a)**
Soap coats the drops of an emulsion and check them from coming together and emulsion stabilized.

8 **(a)**
The colour of colloidal solution depends upon the wavelength of light scattered by the dispersed particles which in turn depends upon size and nature of particles. Finest gold colloidal solution is red, as the size increase it become purple, blue and finally yellow.

9 **(c)**
Freundlich adsorption isotherm gives an empirical relationship between the quantity of gas adsorbed by unit mass of solid adsorbent and pressure at a particular temperature

10 **(d)**
The activity of a catalyst depends upon the strength of chemisorption to a large extent.

The reactant must absorb reasonably strongly for the catalyst to be active but must not adsorb so strongly that they are immobilized and other reactants are left with no space on catalyst surface for adsorption.

11 **(c)**
During formation of $Fe(OH)_3$sol, Fe^{3+} ions are adsorbed on the particles.

12 **(d)**
The molecules on the surface, have higher energy than those inside.

The surface of a solid or liquid is in state or strain or tension on account of the unbalanced or residual forces.

13 **(c)**
Freundilch adsorption isotherm gives an empirical relationship between the quality of gas adsorbed by unit mass of solid adsorbed and pressure at a particular temperature.

SURFACE CHEMISTRY

CHEMISTRY

Matrix-Match Type

This section contain(s) 0 question(s). Each question contains Statements given in 2 columns which have to be matched. Statements (A, B, C, D) in **columns I** have to be matched with Statements (p, q, r, s) in **columns II**.

1. Match the following :

Column-I	**Column- II**
(A) Dialysis	(p) Precipitate converts to colloidal solution
(B) Peptization	(q) Precipitation of colloidal solution
(C) Flocculation	(r) Protective power
(D) Gold number	(s) Purification of colloidal solution

CODES :

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

2. Match list-I with list-II and select the correct match.

Column-I	**Column- II**
(A) Rain cloud	(p) Sol
(B) Milk of magnesia	(q) Foam
(C) Whipped cream	(r) Micelles
(D) Soap in water	(s) Aerosol

CODES :

	A	**B**	**C**	**D**
a)	i	ii	iii	iv
b)	iv	i	ii	iii

c) iv ii iii i

d) iii i ii iv

3. Match the following

	Column-I		Column- II
(A)	Smoke	(p)	Aerosol of liquid
(B)	Milk	(q)	Aerosol of solid
(C)	Butter	(r)	Emulsion
(D)	Fog	(s)	Gel

CODES :

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

SURFACE CHEMISTRY

CHEMISTRY

: ANSWER KEY :

1) b 2) b 3) d

SURFACE CHEMISTRY

CHEMISTRY

: HINTS AND SOLUTIONS :

1 **(b)**

Dialysis is used to purification of colloidal solution In peptization, freshly prepared precipitates converted in to colloidal solution.
Flocculation is precipitation of colloidal solution.
Gold number is a scale of protective power

2 **(b)**

Rain cloud is an example of aerosol. Milk of magnesia is a sol. Whipped cream is foam. Or soap in water is a form of associated colloids, *ie*, micelles