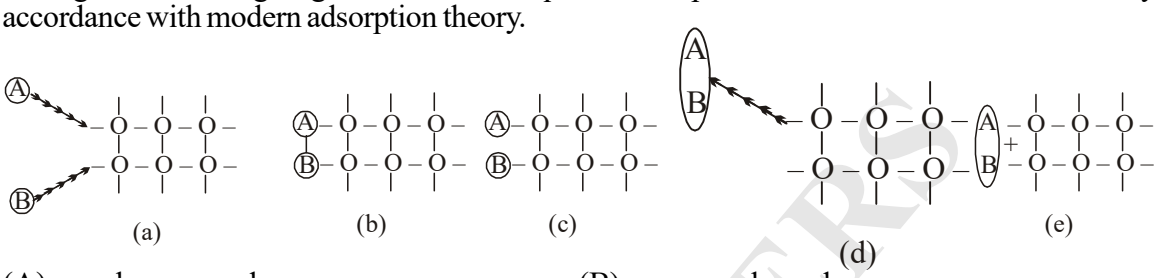
CLASS : CC -AD

Revision Work-sheet Surface Chemistry

Single correct :

Q.1 Arrange the following diagrams in correct sequence of steps involved in the mechanism of catalysis, in accordance with modern adsorption theory.



(A) $a \rightarrow b \rightarrow c \rightarrow d \rightarrow e$ (B) $a \rightarrow c \rightarrow b \rightarrow d \rightarrow e$
(C) $a \rightarrow c \rightarrow b \rightarrow e \rightarrow d$ (D) $a \rightarrow b \rightarrow c \rightarrow e \rightarrow d$

Q.2 The following informations are available for the reaction: $R \longrightarrow P$.

$R \longrightarrow P$; rate = r_1
$R \xrightarrow{A} P$; rate = r_2
$R \xrightarrow{B} P$; rate = r_3
$R \xrightarrow{C} P$; rate = r_4
$R \xrightarrow{D} P$; rate = r_5
$R \xrightarrow{A+C} P$; rate = r_6
$R \xrightarrow{A+D} P$; rate = r_7

If $r_3 < r_1 = r_4 = r_5 < r_7 < r_2 < r_6$, then the only incorrect statement is
(A) B is inhibitor. (B) C is catalytic promotor of catalyst A.
(C) D is catalytic poison of catalyst A. (D) A is catalytic promotor of catalyst C.

Q.3 At 70 K, the adsorption of N_2 gas at iron surface obeys Freundlich adsorption isotherm. The experimental data collected is

P(bar)	4	25	64
$\frac{x}{m}$	0.2	0.5	0.8

where $\frac{x}{m}$ is the mass **(in gm)** of N_2 gas adsorbed per gm of iron at P bar pressure. The moles of N_2 gas adsorbed per gm of iron at 36 bar and 70 K, is

(A) $\frac{3}{70}$ (B) $\frac{3}{140}$ (C) $\frac{3}{280}$ (D) 0.3

Q.4 Following data of osmotic pressure (π) is obtained when different moles of $C_{17}H_{35}COONa$ are mixed in 1L solution at 25°C :

Moles	**0**	**0.01**	**0.02**	**0.03**	**0.04**
$\frac{\pi}{RT}$ **(moles/litre)**	**0**	**0.02**	**0.04**	**0.058**	**0.076**

Select the **incorrect** nature of mixture at different concentration.
(A) Upto 0.02 M concentration, the mixture is true solution.
(B) At 0.03 M concentration, the mixture is a colloidal
(C) At 0.04M concentration, the mixture is homogeneous
(D) The critical micelle concentration (CMC) of $C_{17}H_{35}COONa$ may be 0.03 M or less.

Q.5 When $H_{2(gas)}$ gets adsorbed on transition metals hydride formation takes place. Which of the options will not be correct on the basis of above observation.
(A) Greater the surface area of transition metals greater will be the extent of adsorption.
(B) The enthalpy change involved will be in the range of 20 – 40 kJ/mole.
(C) The extent of adsorption will increase with increase in temperature.
(D) The adsorption will be irreversible in nature.

Q.6 Colloids can be purified by
(A) condensation (B) peptization (C) coagulation (D) dialysis

Q.7 Given below are a few electrolytes, indicate which one among them will bring about the coagulation of a gold sol. quickest and in the least of molar concentration?
(A) NaCl (B) $MgSO_4$ (C) $Al_2(SO_4)_3$ (D) $K_4[Fe(CN)_6]$

Q.8 When a lyophobic colloidal solution is observed , we can see
(A) light scattered by colloidal particle (B) size of the colloidal particle
(C) shape of the colloidal particle (D) relative size of the colloidal particle

Q.9 Smoke precipitator works on the principle of
(A) distribution law (B) neutralization of charge on colloids
(C) Le-Chaterlier's principle (D) addition of electrolytes

Q.10 The disperse phase in colloidal iron (III) hydroxide and colloidal gold is positively and negatively charged respectively. Which of the following is not correct ?
(A) Magnesium chloride solution coagulates the gold sol more readily than iron (III) hydroxide sol.
(B) Sodium sulphate solution cause coagulation in both sols.
(C) Mixing of the sols has no effect.
(D) Coagulation in both sols can be brought about by electrophoresis.

Q.11 Among the following, the surfactant that will from 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) $CH_3(CH_2)_{11}N^+(CH_3)_3Br^-$

Q.12 Alum helps in purfiying 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

Q.13 The volume of a colliodal particle, V_C as compared to the volume of a solute particle in a ture solution V_S, could be

(A) $\frac{V_C}{V_S} \approx 10^{23}$ (B) $\frac{V_C}{V_S} \approx 1$ (C) $\frac{V_C}{V_S} \approx 10^3$ (D) $\frac{V_C}{V_S} \approx 10^{-3}$

Q.14 In Langmuir's model of adsorption of a gas on a solid surface
(A) The adsorption at a single site on the surface may involve multiple molecules at the same time
(B) The mass of gas striking a given area of surface is proportional to the pressure of the gas
(C) The mass of gas striking a given area of surface is independent of the pressure of the gas
(D) The rate of dissociation of adsorbed molecules from the surface does not depend on the surface coverd

Q.15 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) A < C < B < D (B) B < C < A < D (C) D < A < C < B (D) C < B < D < A

Q.16 Which of the following statements is incorrect regarding physissorptions?
(A) Enthalpy of adsorption ($\Delta H_{adsorption}$) is low and positive.
(B) It occurs because of van der Waal's forces
(C) More easily liquefiable gases are adsorbed readily
(D) Under high pressure it results into multi molecular layer on adsorbent surface.

Q.17 According to Freundlich adsorption isotherm, which fo the following is correct ?

(A) $\frac{x}{m} \propto p^{1/n}$ (B) $\frac{x}{m} \propto p^{0}$

(C) $\frac{x}{m} \propto p^{1}$ (D) All the above the correct for different ranges of pressure.

Q.18 Physical adsorption of a gaseous species may change to chemical adsorption with _____.
(A) decrease in temperature (B) increase in temperature
(C) increase in surface area of adsorbent (D) decrease in surface area of adsorbent

Q.19 Which of the following is an example of absorption?
(A) Water on silica gel (B) Water on calcium chloride
(C) Hydrogen on finely divided nickel (D) Oxygen on metal surface

Q.20 On the basis of data given below predict which of the following gases shows least adsorption on a definite amount of charcoal?

Gas	**CO_2**	**SO_2**	**CH_4**	**H_2**
Critical temp./K	**304**	**630**	**190**	**33**

(A) CO_2 (B) SO_2 (C) CH_4 (D) H_2

Q.21 At high concentration of soap in water, soap behaves as _____.
(A) molecular colloid (B) associated colloid
(C) macromolecular colloid (D) lyophilic colloid

Q.22 Which of the following will show Tyndall effect?
(A) Aqueous solution of soap below critical micelle concentration.
(B) Aqueous solution of soap above critical micelle concentration.
(C) Aqueous solution of sodium chloride.
(D) Aqueous solution of sugar.

Q.23 Method by which lyophobic sol can be protected.
(A) By addition of oppositely charged sol. (B) By addition of an electrolyte.
(C) By addition of lyophilic sol. (D) By boiling

Q.24 Freshly prepared precipitate sometimes gets converted to colloidal solution by_____.
(A) coagulation (B) electrolysis (C) diffusion (D) peptisation

Q.25 The values of colligative properties of colloidal solution are of small order in comparison to those shown by true solutions of same concentration because of colloidal particles _____.
(A) exhibit enormous surface area. (B) remain suspended in the dispersion medium.
(C) form lyophilic colloids. (D) are comparatively less in number.

Q.26 Which of the following process is not responsible for the presence of electric charge on the sol particles?
(A) Electron capture by sol particles.
(B) Adsorption of ionic species from solution.
(C) Formation of Helmholtz electrical double layer.
(D) Absorption of ionic species from solution.

Q.27 Which gas will be adsorbed on a solid to greater extent.
(A) A gas having non polar molecule (B) A gas having highest critical temperature (T_c)
(C) A gas having lowest critical temperature (D) A gas having highest critical pressure

Q.28 The heat of physisorption lie in the range of
(A) 1 – 10 kJ mol^{-1} (B) 20 to 40 kJ mol^{-1} (C) 40 to 200 kJ mol^{-1} (D) 200 to 400 kJ mol^{-1}

Q.29 Which of the following is a lyophobic colloid?
(A) Gelatin (B) Sulphur (C) Starch (D) Gum

Q.30 The Tyndall effect associated with colloidal particles is due to
(A) presence of electrical charges (B) scattering of light
(C) absorption of light (D) reflection of light

Assertion Reason

Q.31 **Assertion :** Fe^{3+} can be used for coagulation of As_2S_3 sol.
Reason : Fe^{3+} reacts with As_2S_3 to give Fe_2S_3.
(A) If assertion is true but the reason is false.
(B) If assertion is false but the reason is true.
(C) If both assertion and reason are true and the reason is a correct explanation of assertion.
(D) If both assertion and reason are true but reason is not a correct explanation of assertion.

Q.32 **Assertion :** Isoelectric point is pH at which colloidal can move towards either of electrode
Reason : At isoelectric point, colloidal particles become electrically neutral.
(A) If assertion is true but the reason is false.
(B) If assertion is false but the reason is true.
(C) If both assertion and reason are true and the reason is a correct explanation of assertion.
(D) If both assertion and reason are true but reason is not a correct explanation of assertion.

Q.33 **Assertion :** When $AgNO_3$ is treated with excess of potassium iodide, colloidal particles gets attracted towards anode.
Reason : Precipitate adsorb common ions (excess) and thus become charged.
(A) If assertion is true but the reason is false.
(B) If assertion is false but the reason is true.
(C) If both assertion and reason are true and the reason is a correct explanation of assertion.
(D) If both assertion and reason are true but reason is not a correct explanation of assertion.

Comprehension

Paragraph for question nos. 34 to 36

The protective power of the lyophilic colloids is expressed in terms of gold number a term introduced by Zsigmondy. Gold number is the number of milligram of the protective colloid which prevent the coagulation of 10 ml of red gold sol. when 1 ml of a 10 percent solution of sodium chloride is added to it. Thus, smaller the gold number of lyophilic colloid, the greater is the protective power.

Q.34 On addition of one mL of solution of 10% NaCl to 10 mL of red gold sol in presence of 0.025 g of starch, the coagulation is just prevented. The gold number of starch is
(A) 0.025 (B) 0.25 (C) 2.5 (D) 25

Q.35 Which of the following statement(s) is/are correct
(A) Higher the gold number, more protective power of colloid
(B) Lower the gold number, more the protective power
(C) Higher the coagulation value, more the coagulation power
(D) Lower the coagulation value, higher the coagulation power

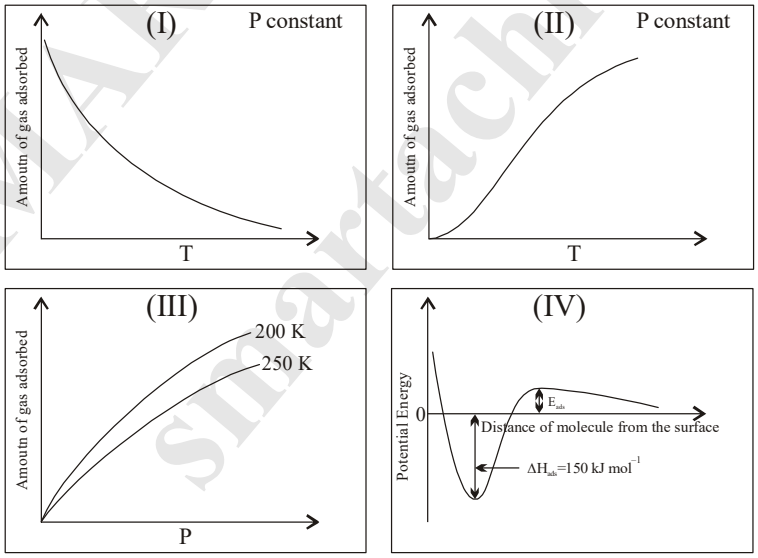
Q.36 Gold number gives an indication of
(A) protective nature of colloids (B) purity of gold in suspension
(C) the charge on a colloidal solution of gold (D) g-mole of gold per litre

More than one may be correct

Q.37 Which of the option(s) regarding **true/false** nature of the statements is/are **correct**?
S-1 : Out of all colligative properties, osmotic pressure is easiest to determine experimentally.
S-2 : Chemisorption is a multilayer process.
S-3 : Solubility of gases in water increases with increase in temperature.
S-4 : Addition of NaCl can cause coagulation in both +vely charged and –vely charged sols.
S-5 : Enzyme catalysed reactions are elementary reactions.
S-6 : NaCl crystal shows Frenkel defects.
(A) There are more false statements than true statements
(B) S-3 and S-5 are false statements
(C) S-1 and S-4 are the only true statements
(D) Only S-1 is a true statement.

Q.38 From the following options select the options which are correct with respect the adsorption.
(A) The "y-intercept" of log x/m vs log P as per Freundlich theory is greater for O_2 as compared to H_2 at same temperature.
(B) Adsorption of gas on a solid is an enthalpy driven process.
(C) Decrease in pressure cause desorption in case of chemisorptions.
(D) Adsorption isobars keeps on decreasing with increase in temperature if there is only Vander Waal interactions between adsorbent and adsorbate.

Q.39 The given graphs / data I, II, III and IV represents general trends observed for different physisorption and chemisorption processes under mild conditions of temperature and pressure. Which of the following choice(s) about I, II, III and IV is (are) **correct**?



(A) I is physisorption and II is chemisorption (B) I is physisorption and III is chemisorption
(C) IV is chemisorption and II is chemisorption (D) IV is chemisorption and III is chemisorption

Q.40 In a reaction, catalyst changes _____.
(A) physically (B) qualitatively (C) chemically (D) quantitatively

Q.41 Which of the following phenomenon occurs when a chalk stick is dipped in ink?
(A) adsorption of coloured substance (B) adsorption of solvent
(C) absorption and adsorption both of solvent (D) absoprtion of solvent

Q.42 Colloidal Gold can be prepared by
(A) Bredig's are method (B) Reduction of $AuCl_3$ (C) Hydrolysis (D) Peptization

Q.43 The **correct** statement(s) pertaining to the adsorption of a gas on a solid surface is (are)
(A) Adsorption is always exothermic
(B) Physisorption may transform into chemisorption at high temperature
(C) Physisorption increases with increasing temperature but chemisorption decreases with increasing temperature
(D) Chemisorption is more exothermic than physisorption, however it is very slow due to higher energy of activation

Q.44 Choose the correct reason(s) for the stability of the lyophobic colloidal particles.
(A) Preferential adsorption of ions on their surface from the solution
(B) Preferential adsorption of solvent on their surface from the solution
(C) Attraction between different particles having opposite charges on their surface
(D) Potential difference between the fixed layer and the diffused layer of opposite charges around the colloidal particles.

Q.45 Which of the following options are correct?
(A) Micelle formation by soap in aqueous solution is possible at all temperatures.
(B) Micelle formation by soap in aqueous solution occurs above a particular concentration.
(C) On dilution of soap solution micelles may revert to individual ions.
(D) Soap solution behaves as a normal strong electrolyte at all concentrations.

Q.46 H_2 gas is adsorbed on activated charcoal to a very little extent in comparison to easily liquefiable gases due to _____.
(A) very strong van der Waal's interaction. (B) very weak van der Waals forces.
(C) very low critical temperature. (D) very high critical temperature.

Q.47 Which of the following statements are correct?
(A) Mixing two oppositely charged sols neutralises their charges and stabilises the colloid.
(B) Presence of equal and similar charges on colloidal particles provides stability to the colloids.
(C) Any amount of dispersed liquid can be added to emulsion without destabilising it.
(D) Brownian movement stabilises sols.

Q.48 What happens when a lyophilic sol is added to a lyophobic sol?
(A) Lyophobic sol is protected.
(B) Lyophilic sol is protected.
(C) Film of lyophilic sol is formed over lyophobic sol.
(D) Film of lyophobic sol is formed over lyophilic sol.

Q.49 Which phenomenon occurs when an electric field is applied to a colloidal solution and electrophoresis is prevented?
(A) Reverse osmosis takes place. (B) Electroosmosis takes place.
(C) Dispersion medium begins to move. (D) Dispersion medium becomes stationary.

Match the Column

Q.50 Match the items given in Column I and Column II.

	Column I		Column II
(i)	Protective colloid	(a)	$FeCl_3$ + NaOH
(ii)	Liquid - liquid colloid	(b)	Lyophilic colloids
(iii)	Positively charged colloid	(c)	Emulsion
(iv)	Negatively charged colloid	(d)	$FeCl_3$ + hot water

Q.51 Match the items of Column I and Column II.

	Column I		Column II
(i)	Butter	(a)	dispersion of liquid in liquid
(ii)	Pumice stone	(b)	dispersion of solid in liquid
(iii)	Milk	(c)	dispersion of gas in solid
(iv)	Paints	(d)	dispersion of liquid in solid

Q.52 Method of formation of solution is given in Column I. Match it with the type of solution given in Column II.

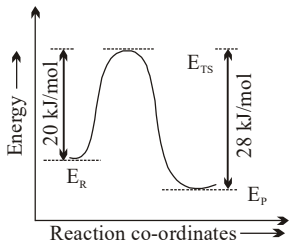
	Column I		Column II
(i)	Sulphur vapours passed through cold water	(a)	Normal electrolyte solution
(ii)	Soap mixed with water above critical micelle concentration	(b)	Molecular colloids
(iii)	White of egg whipped with water	(c)	Associated colloid
(iv)	Soap mixed with water below critical micelle concentration	(d)	Macro molecular colloids

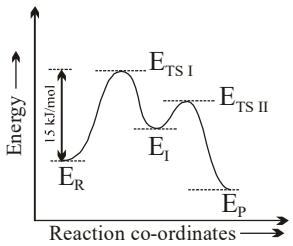
Q.53 Match the statement given in Column I with the phenomenon given in Column II.

	Column I		Column II
(i)	Dispersion medium moves in an electric field	(a)	Osmosis
(ii)	Solvent molecules pass through semi permeable membrane towards solvent side	(b)	Electrophoresis
(iii)	Movement of charged colloidal particles under the influence of applied electric potential towards oppositely charged electrodes	(c)	Electroosmosis
(iv)	Solvent molecules pass through semi permeable membranes towards solution side	(d)	Reverse osmosis

Subjective

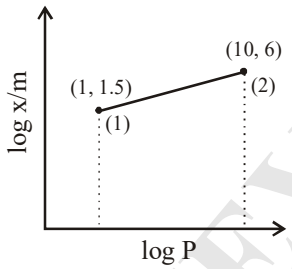
Q.54 The energy profile of an uncatalysed and a catalysed reaction are





If $E_{TS\ I} - E_{TS\ II}$ is 6 kJ /mol, then what is the value of $E_{TS\ II} - E_P$ (in kJ / mol)

Q.55 For adsorption of a gas on solid surface, following isotherm was obtained.



where P is pressure of gas in atm, x represents amount of gas adsorbed and m represents mass of adsorbent, calculate the value of $\frac{x}{m}$ of the gas at same temperature and at a pressure of 81 atm.

Q.56 What is collodion?

Q.57 Why does leather get hardened after tanning?

Q.58 What is isoelectric point pH.

Q.59 For the coagulation of 100 mL of arsenious sulphide solution, 5 mL of 1 M NaCl was used. What is the flocculation value of NaCl?

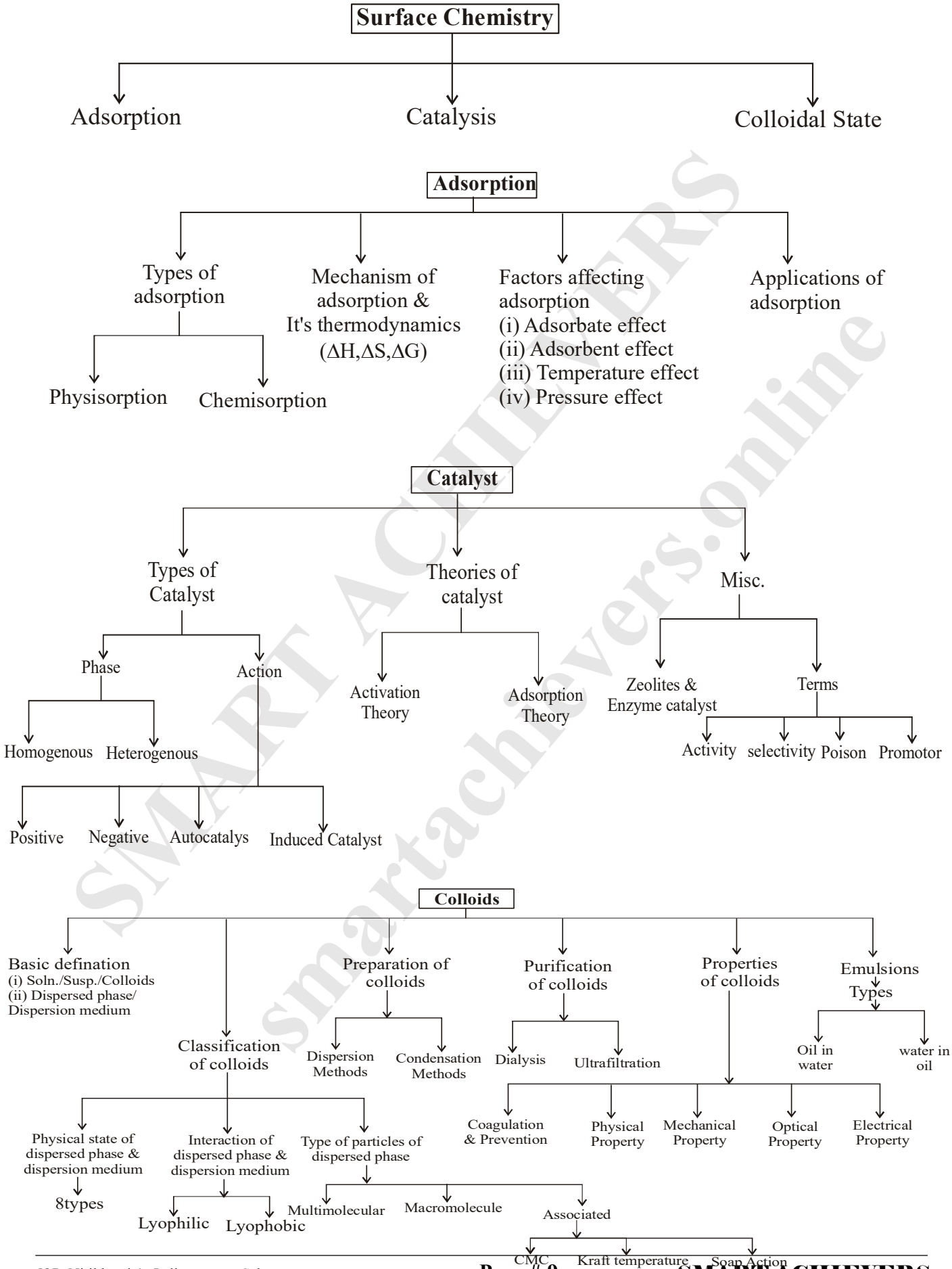
Q.60 The coagulation of 100 mL of a colloidal solution of gold is completely prevented by the addition of 0.25 g of starch to it before adding 1 mL of 10% NaCl solution. Find the gold number of starch.

Q.61 Consider the Freundlich isotherm as $x = kC^n$, where x is the mass of solute adsorbed per gram of solid adsorbent. k = 0.160 and n = 0.431. What will be the amount of acetic acid that 1.0 Kg of charcoal would adsorb from 0.837 M acetic acid?

Q.62 A plot of log (x/m) and log 'p' is a straight line at an angle of 45° and the intercept on the y-axis is equal to 0.3010. Calculate the amount of gas adsorbed in gram per gram of adsorbent when pressure is 0.2 atm.

Q.63 Out of lyophilic and lyophobic colloids, which colloid shows the highest value for following properties?
(a) Viscosity (b) Surface tension (c) Tyndall effect (d) stability

REVISION FLOW CHART



LAST MOMENT REVIEW

SURFACE CHEMISTRY

Theory : .....

.....

.....

.....

Exercise - 1 : Question .....

Exercise - 2 : Question .....

Exercise - 3 : Question .....

Exercise - 4 : Question .....

DPPs : ....

....

....

....

Other Sources : .....

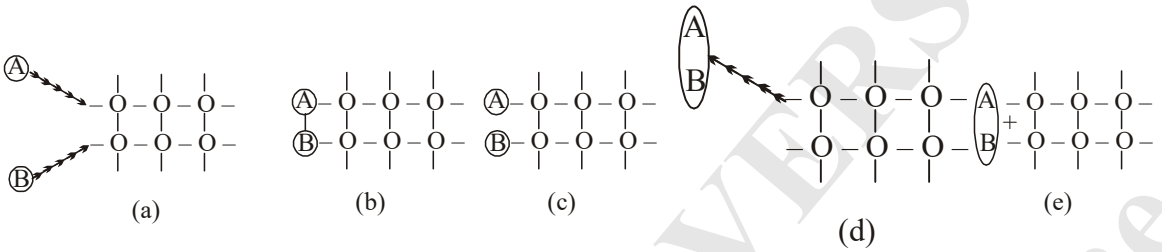
.....

.....

Revision Work-sheet Surface Chemistry

Single correct :

Q.1 Arrange the following diagrams in correct sequence of steps involved in the mechanism of catalysis, in accordance with modern adsorption theory.



(A) $a \rightarrow b \rightarrow c \rightarrow d \rightarrow e$ (B) $a \rightarrow c \rightarrow b \rightarrow d \rightarrow e$

(C*) $a \rightarrow c \rightarrow b \rightarrow e \rightarrow d$ (D) $a \rightarrow b \rightarrow c \rightarrow e \rightarrow d$

Q.2 The following informations are available for the reaction: $R \longrightarrow P$.

$R \longrightarrow P$; rate = r_1

$R \xrightarrow{A} P$; rate = r_2

$R \xrightarrow{B} P$; rate = r_3

$R \xrightarrow{C} P$; rate = r_4

$R \xrightarrow{D} P$; rate = r_5

$R \xrightarrow{A+C} P$; rate = r_6

$R \xrightarrow{A+D} P$; rate = r_7

If $r_3 < r_1 = r_4 = r_5 < r_7 < r_2 < r_6$, then the only incorrect statement is

(A) B is inhibitor.

(B) C is catalytic promotor of catalyst A.

(C) D is catalytic poison of catalyst A.

(D*) A is catalytic promotor of catalyst C.

Q.3 At 70 K, the adsorption of N_2 gas at iron surface obeys Freundlich adsorption isotherm. The experimental data collected is

P(bar)	4	25	64
$\frac{x}{m}$	0.2	0.5	0.8

where $\frac{x}{m}$ is the mass **(in gm)** of N_2 gas adsorbed per gm of iron at P bar pressure. The moles of N_2 gas adsorbed per gm of iron at 36 bar and 70 K, is

(A) $\frac{3}{70}$ (B*) $\frac{3}{140}$ (C) $\frac{3}{280}$ (D) 0.3

Q.4 Following data of osmotic pressure (π) is obtained when different moles of $C_{17}H_{35}COONa$ are mixed in 1L solution at 25°C :

Moles	**0**	**0.01**	**0.02**	**0.03**	**0.04**
$\frac{\pi}{RT}$ **(moles/litre)**	**0**	**0.02**	**0.04**	**0.058**	**0.076**

Select the **incorrect** nature of mixture at different concentration.
(A) Upto 0.02 M concentration, the mixture is true solution.
(B) At 0.03 M concentration, the mixture is a colloidal
(C*) At 0.04M concentration, the mixture is homogeneous
(D) The critical micelle concentration (CMC) of $C_{17}H_{35}COONa$ may be 0.03 M or less.

Q.5 When $H_{2(gas)}$ gets adsorbed on transition metals hydride formation takes place. Which of the options will not be correct on the basis of above observation.
(A) Greater the surface area of transition metals greater will be the extent of adsorption.
(B*) The enthalpy change involved will be in the range of 20 – 40 kJ/mole.
(C) The extent of adsorption will increase with increase in temperature.
(D) The adsorption will be irreversible in nature.

Q.6 Colloids can be purified by
(A) condensation (B) peptization (C) coagulation (D*) dialysis

Q.7 Given below are a few electrolytes, indicate which one among them will bring about the coagulation of a gold sol. quickest and in the least of molar concentration?
(A) NaCl (B) $MgSO_4$ (C*) $Al_2(SO_4)_3$ (D) $K_4[Fe(CN)_6]$

Q.8 When a lyophobic colloidal solution is observed , we can see
(A*) light scattered by colloidal particle (B) size of the colloidal particle
(C) shape of the colloidal particle (D) relative size of the colloidal particle

Q.9 Smoke precipitator works on the principle of
(A) distribution law (B*) neutralization of charge on colloids
(C) Le-Chaterlier's principle (D) addition of electrolytes

Q.10 The disperse phase in colloidal iron (III) hydroxide and colloidal gold is positively and negatively charged respectively. Which of the following is not correct ?
(A) Magnesium chloride solution coagulates the gold sol more readily than iron (III) hydroxide sol.
(B) Sodium sulphate solution cause coagulation in both sols.
(C*) Mixing of the sols has no effect.
(D) Coagulation in both sols can be brought about by electrophoresis.

Q.11 Among the following, the surfactant that will from 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) $CH_3(CH_2)_{11}N^+(CH_3)_3Br^-$

Q.12 Alum helps in purfiying 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

Q.13 The volume of a colliodal particle, V_C as compared to the volume of a solute particle in a ture solution V_S, could be

(A) $\frac{V_C}{V_S} \approx 10^{23}$ (B) $\frac{V_C}{V_S} \approx 1$ (C*) $\frac{V_C}{V_S} \approx 10^{3}$ (D) $\frac{V_C}{V_S} \approx 10^{-3}$

Q.14 In Langmuir's model of adsorption of a gas on a solid surface
(A) The adsorption at a single site on the surface may involve multiple molecules at the same time
(B*) The mass of gas striking a given area of surface is proportional to the pressure of the gas
(C) The mass of gas striking a given area of surface is independent of the pressure of the gas
(D) The rate of dissociation of adsorbed molecules from the surface does not depend on the surface coverd

Q.15 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*) A < C < B < D (B) B < C < A < D (C) D < A < C < B (D) C < B < D < A

Q.16 Which of the following statements is incorrect regarding physissorptions?
(A*) Enthalpy of adsorption ($\Delta H_{adsorption}$) is low and positive.
(B) It occurs because of van der Waal's forces
(C) More easily liquefiable gases are adsorbed readily
(D) Under high pressure it results into multi molecular layer on adsorbent surface.

Q.17 According to Freundlich adsorption isotherm, which fo the following is correct ?

(A*) $\frac{x}{m} \propto p^{1/n}$ (B) $\frac{x}{m} \propto p^{0}$

(C) $\frac{x}{m} \propto p^{1}$ (D) All the above the correct for different ranges of pressure.

Q.18 Physical adsorption of a gaseous species may change to chemical adsorption with _____.
(A) decrease in temperature (B*) increase in temperature
(C) increase in surface area of adsorbent (D) decrease in surface area of adsorbent

Q.19 Which of the following is an example of absorption?
(A) Water on silica gel (B*) Water on calcium chloride
(C) Hydrogen on finely divided nickel (D) Oxygen on metal surface

Q.20 On the basis of data given below predict which of the following gases shows least adsorption on a definite amount of charcoal?

Gas	**CO_2**	**SO_2**	**CH_4**	**H_2**
Critical temp./K	**304**	**630**	**190**	**33**

(A) CO_2 (B) SO_2 (C) CH_4 (D*) H_2

Q.21 At high concentration of soap in water, soap behaves as _____.

(A) molecular colloid (B*) associated colloid
(C) macromolecular colloid (D) lyophilic colloid

Q.22 Which of the following will show Tyndall effect?
(A) Aqueous solution of soap below critical micelle concentration.
(B*) Aqueous solution of soap above critical micelle concentration.
(C) Aqueous solution of sodium chloride.
(D) Aqueous solution of sugar.

Q.23 Method by which lyophobic sol can be protected.
(A) By addition of oppositely charged sol. (B) By addition of an electrolyte.
(C*) By addition of lyophilic sol. (D) By boiling

Q.24 Freshly prepared precipitate sometimes gets converted to colloidal solution by_____.
(A) coagulation (B) electrolysis (C) diffusion (D*) peptisation

Q.25 The values of colligative properties of colloidal solution are of small order in comparison to those shown by true solutions of same concentration because of colloidal particles _____.
(A) exhibit enormous surface area. (B) remain suspended in the dispersion medium.
(C) form lyophilic colloids. (D*) are comparatively less in number.

Q.26 Which of the following process is not responsible for the presence of electric charge on the sol particles?
(A) Electron capture by sol particles.
(B) Adsorption of ionic species from solution.
(C) Formation of Helmholtz electrical double layer.
(D*) Absorption of ionic species from solution.

Q.27 Which gas will be adsorbed on a solid to greater extent.
(A) A gas having non polar molecule (B*) A gas having highest critical temperature (T_c)
(C) A gas having lowest critical temperature (D) A gas having highest critical pressure

Q.28 The heat of physisorption lie in the range of
(A) 1 – 10 kJ mol^{-1} (B*) 20 to 40 kJ mol^{-1} (C) 40 to 200 kJ mol^{-1} (D) 200 to 400 kJ mol^{-1}

Q.29 Which of the following is a lyophobic colloid?
(A) Gelatin (B*) Sulphur (C) Starch (D) Gum

Q.30 The Tyndall effect associated with colloidal particles is due to
(A) presence of electrical charges (B*) scattering of light
(C) absorption of light (D) reflection of light

Assertion Reason

Q.31 **Assertion :** Fe^{3+} can be used for coagulation of As_2S_3 sol.
Reason : Fe^{3+} reacts with As_2S_3 to give Fe_2S_3.
(A*) If assertion is true but the reason is false.
(B) If assertion is false but the reason is true.

(C) If both assertion and reason are true and the reason is a correct explanation of assertion.
(D) If both assertion and reason are true but reason is not a correct explanation of assertion.

Q.32 **Assertion :** Isoelectric point is pH at which colloidal can move towards either of electrode
Reason : At isoelectric point, colloidal particles become electrically neutral.
(A) If assertion is true but the reason is false.
(B*) If assertion is false but the reason is true.
(C) If both assertion and reason are true and the reason is a correct explanation of assertion.
(D) If both assertion and reason are true but reason is not a correct explanation of assertion.

Q.33 **Assertion :** When $AgNO_3$ is treated with excess of potassium iodide, colloidal particles gets attracted towards anode.
Reason : Precipitate adsorb common ions (excess) and thus become charged.
(A) If assertion is true but the reason is false.
(B) If assertion is false but the reason is true.
(C*) If both assertion and reason are true and the reason is a correct explanation of assertion.
(D) If both assertion and reason are true but reason is not a correct explanation of assertion.

Comprehension

Paragraph for question nos. 34 to 36

The protective power of the lyophilic colloids is expressed in terms of gold number a term introduced by Zsigmondy. Gold number is the number of milligram of the protective colloid which prevent the coagulation of 10 ml of red gold sol. when 1 ml of a 10 percent solution of sodium chloride is added to it. Thus, smaller the gold number of lyophilic colloid, the greater is the protective power.

Q.34 On addition of one mL of solution of 10% NaCl to 10 mL of red gold sol in presence of 0.025 g of starch, the coagulation is just prevented. The gold number of starch is
(A) 0.025 (B) 0.25 (C) 2.5 (D*) 25

Q.35 Which of the following statement(s) is/are correct
(A) Higher the gold number, more protective power of colloid
(B*) Lower the gold number, more the protective power
(C) Higher the coagulation value, more the coagulation power
(D*) Lower the coagulation value, higher the coagulation power

Q.36 Gold number gives an indication of
(A*) protective nature of colloids (B) purity of gold in suspension
(C) the charge on a colloidal solution of gold (D) g-mole of gold per litre

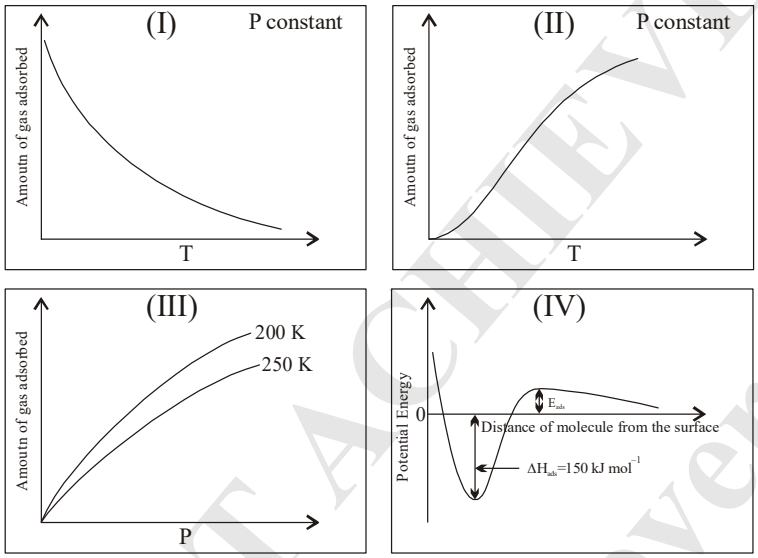
More than one may be correct

Q.37 Which of the option(s) regarding **true/false** nature of the statements is/are **correct**?
S-1 : Out of all colligative properties, osmotic pressure is easiest to determine experimentally.
S-2 : Chemisorption is a multilayer process.
S-3 : Solubility of gases in water increases with increase in temperature.
S-4 : Addition of NaCl can cause coagulation in both +vely charged and –vely charged sols.
S-5 : Enzyme catalysed reactions are elementary reactions.
S-6 : NaCl crystal shows Frenkel defects.
(A*) There are more false statements than true statements
(B*) S-3 and S-5 are false statements

(C*) S-1 and S-4 are the only true statements
(D) Only S-1 is a true statement.

Q.38 From the following options select the options which are correct with respect the adsorption.
(A*) The "y-intercept" of log x/m vs log P as per Freundlich theory is greater for O_2 as compared to H_2 at same temperature.
(B*) Adsorption of gas on a solid is an enthalpy driven process.
(C) Decrease in pressure cause desorption in case of chemisorptions.
(D*) Adsorption isobars keeps on decreasing with increase in temperature if there is only Vander Waal interactions between adsorbent and adsorbate.

Q.39 The given graphs / data I, II, III and IV represents general trends observed for different physisorption and chemisorption processes under mild conditions of temperature and pressure. Which of the following choice(s) about I, II, III and IV is (are) **correct**?



(A*) I is physisorption and II is chemisorption
(B) I is physisorption and III is chemisorption
(C*) IV is chemisorption and II is chemisorption
(D) IV is chemisorption and III is chemisorption

Q.40 In a reaction, catalyst changes _____.
(A*) physically (B*) qualitatively (C) chemically (D) quantitatively

Q.41 Which of the following phenomenon occurs when a chalk stick is dipped in ink?
(A*) adsorption of coloured substance (B) adsorption of solvent
(C) absorption and adsorption both of solvent (D*) absoprtion of solvent

Q.42 Colloidal Gold can be prepared by
(A*) Bredig's are method (B*) Reduction of $AuCl_3$
(C) Hydrolysis (D) Peptization

Q.43 The **correct** statement(s) pertaining to the adsorption of a gas on a solid surface is (are)
(A*) Adsorption is always exothermic
(B*) Physisorption may transform into chemisorption at high temperature
(C) Physisorption increases with increasing temperature but chemisorption decreases with increasing temperature

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

Q.44 Choose the correct reason(s) for the stability of the lyophobic colloidal particles.
(A*) Preferential adsorption of ions on their surface from the solution
(B) Preferential adsorption of solvent on their surface from the solution
(C) Attraction between different particles having opposite charges on their surface
(D*) Potential difference between the fixed layer and the diffused layer of opposite charges around the colloidal particles.

Q.45 Which of the following options are correct?
(A) Micelle formation by soap in aqueous solution is possible at all temperatures.
(B*) Micelle formation by soap in aqueous solution occurs above a particular concentration.
(C*) On dilution of soap solution micelles may revert to individual ions.
(D) Soap solution behaves as a normal strong electrolyte at all concentrations.

Q.46 H_2 gas is adsorbed on activated charcoal to a very little extent in comparison to easily liquefiable gases due to _____.
(A) very strong van der Waal's interaction. (B*) very weak van der Waals forces.
(C*) very low critical temperature. (D) very high critical temperature.

Q.47 Which of the following statements are correct?
(A) Mixing two oppositely charged sols neutralises their charges and stabilises the colloid.
(B*) Presence of equal and similar charges on colloidal particles provides stability to the colloids.
(C) Any amount of dispersed liquid can be added to emulsion without destabilising it.
(D*) Brownian movement stabilises sols.

Q.48 What happens when a lyophilic sol is added to a lyophobic sol?
(A*) Lyophobic sol is protected.
(B) Lyophilic sol is protected.
(C*) Film of lyophilic sol is formed over lyophobic sol.
(D) Film of lyophobic sol is formed over lyophilic sol.

Q.49 Which phenomenon occurs when an electric field is applied to a colloidal solution and electrophoresis is prevented?
(A) Reverse osmosis takes place. (B*) Electroosmosis takes place.
(C*) Dispersion medium begins to move. (D) Dispersion medium becomes stationary.

Match the Column

Q.50 Match the items given in Column I and Column II.

	Column I		**Column II**
(i)	Protective colloid	(a)	$FeCl_3$ + NaOH
(ii)	Liquid - liquid colloid	(b)	Lyophilic colloids
(iii)	Positively charged colloid	(c)	Emulsion
(iv)	Negatively charged colloid	(d)	$FeCl_3$ + hot water

[Ans.(i) – (b) (ii) – (c) (iii) – (d) (iv) – (a)]

Q.51 Match the items of Column I and Column II.

	Column I		**Column II**
(i)	Butter	(a)	dispersion of liquid in liquid

(ii)	Pumice stone	(b)	dispersion of solid in liquid
(iii)	Milk	(c)	dispersion of gas in solid
(iv)	Paints	(d)	dispersion of liquid in solid

[Ans. (i) – (d) (ii) – (c) (iii) – (a) (iv) – (b)]

Q.52 Method of formation of solution is given in Column I. Match it with the type of solution given in Column II.

	Column I		**Column II**
(i)	Sulphur vapours passed through cold water	(a)	Normal electrolyte solution
(ii)	Soap mixed with water above critical micelle concentration	(b)	Molecular colloids
(iii)	White of egg whipped with water	(c)	Associated colloid
(iv)	Soap mixed with water below critical micelle concentration	(d)	Macro molecular colloids

[Ans. (i) – (b) (ii) – (c) (iii) – (d) (iv) – (a)]

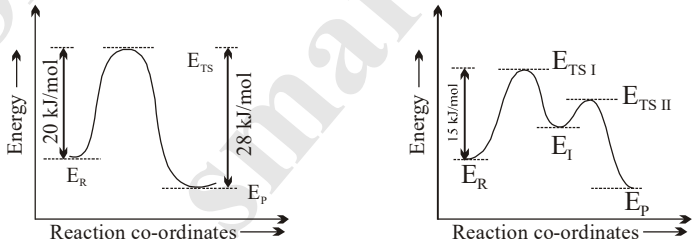
Q.53 Match the statement given in Column I with the phenomenon given in Column II.

	Column I	**Column II**
(i)	Dispersion medium moves in an electric field	(a) Osmosis
(ii)	Solvent molecules pass through semi permeable membrane towards solvent side	(b) Electrophoresis
(iii)	Movement of charged colloidal particles under the influence of applied electric potential towards oppositely charged electrodes	(c) Electroosmosis
(iv)	Solvent molecules pass through semi permeable membranes towards solution side	(d) Reverse osmosis

[Ans. (i) – (c) (ii) – (d) (iii) – (b) (iv) – (a)]

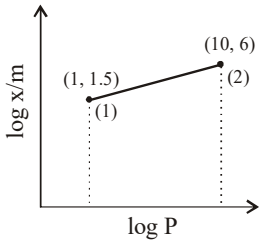
Subjective

Q.54 The energy profile of an uncatalysed and a catalysed reaction are



If $E_{TS\ I} - E_{TS\ II}$ is 6 kJ /mol, then what is the value of $E_{TS\ II} - E_P$ (in kJ / mol) [Ans.0017]

Q.55 For adsorption of a gas on solid surface, following isotherm was obtained.



where P is pressure of gas in atm, x represents amount of gas adsorbed and m represents mass of adsorbent, calculate the value of $\frac{x}{m}$ of the gas at same temperature and at a pressure of 81 atm.

[Ans. 0090]

Q.56 What is collodion?

Ans. It is a 4% solution of nitrocellulose in a mixture of alcohol and ether.

Q.57 Why does leather get hardened after tanning?

Ans. Animal hide is colloidal in nature and has positively charged particles. When it is soaked in tanin which has negatively charged colloidal particles, it results in mutual coagulation taking place.

Q.58 What is isoelectric point pH.

Ans. The hydrogen ion concentration at which the colloidal particles are neither positively charged nor negatively charged (i.e. uncharged) is known as isoelectric point of the colloid.

Q.59 For the coagulation of 100 mL of arsenious sulphide solution, 5 mL of 1 M NaCl was used. What is the flocculation value of NaCl?

Ans. 50.0

Q.60 The coagulation of 100 mL of a colloidal solution of gold is completely prevented by the addition of 0.25 g of starch to it before adding 1 mL of 10% NaCl solution. Find the gold number of starch.

Ans. 25.0

Q.61 Consider the Freundlich isotherm as $x = kC^n$, where x is the mass of solute adsorbed per gram of solid adsorbent. k = 0.160 and n = 0.431. What will be the amount of acetic acid that 1.0 Kg of charcoal would adsorb from 0.837 M acetic acid?

Ans. 2.47 moles

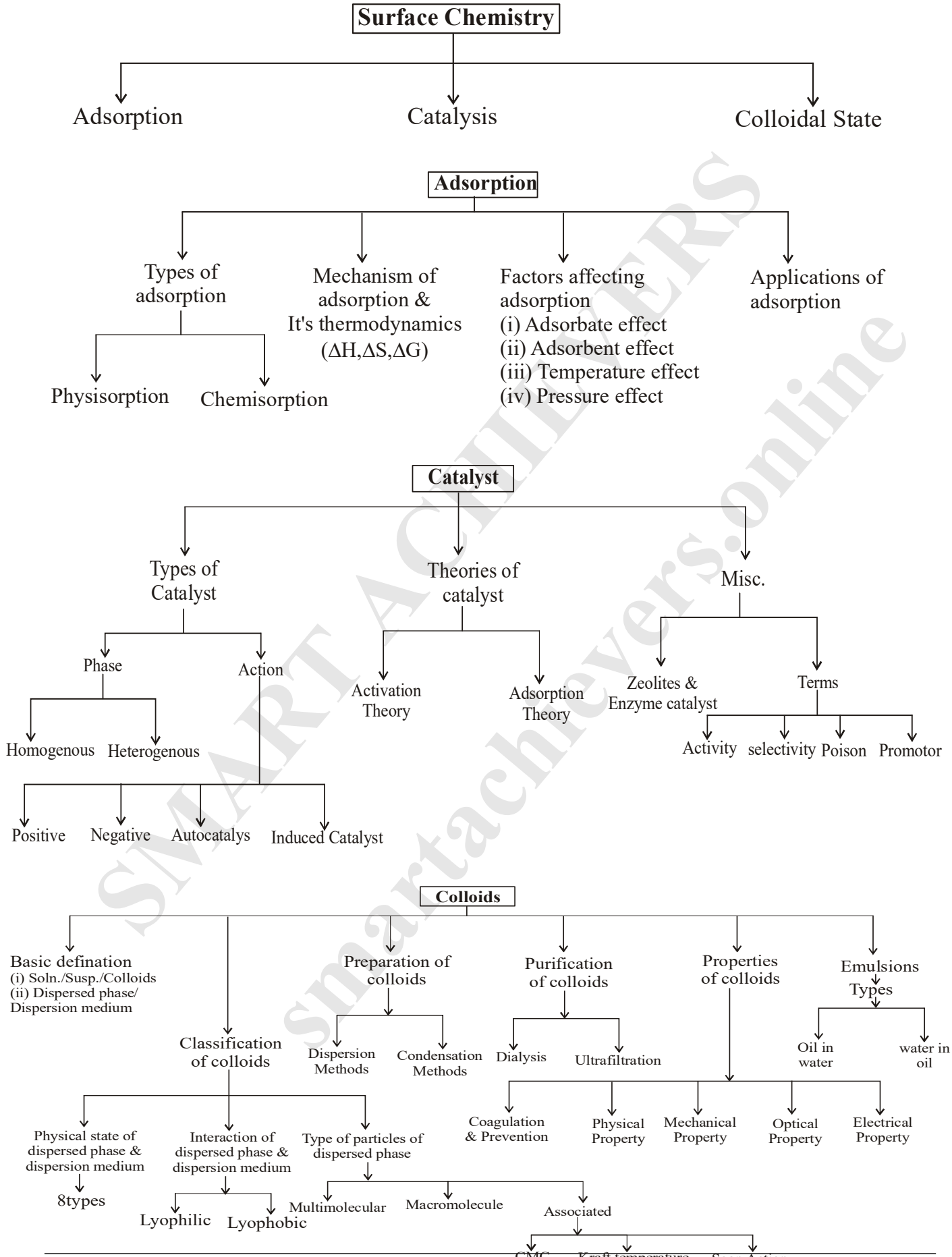
Q.62 A plot of log (x/m) and log 'p' is a straight line at an angle of 45° and the intercept on the y-axis is equal to 0.3010. Calculate the amount of gas adsorbed in gram per gram of adsorbent when pressure is 0.2 atm.

Ans. 0.4 g

Q.63 Out of lyophilic and lyophobic colloids, which colloid shows the highest value for following properties?
(a) Viscosity (b) Surface tension (c) Tyndall effect (d) stability

Ans. (a) Lyophilic (b) Lyophobic (c) Lyophobic (d) Lyophilic

REVISION FLOW CHART



LAST MOMENT REVIEW

SURFACE CHEMISTRY

Theory : .....

.....

.....

.....

Exercise - 1 : Question .....

Exercise - 2 : Question .....

Exercise - 3 : Question .....

Exercise - 4 : Question .....

DPPs : ....

....

....

....

Other Sources : .....

.....

.....