SURFACE CHEMISTRY

1) Which of the following is true in respect of adsorption?
(a) $\triangle G<0, \triangle S>0, \triangle H<0$ **(b)** $\triangle G<0, \triangle S<0, \triangle H<0$ (c) $\triangle G>0, \triangle S>0, \triangle H<0$
(d) $\triangle G<0, \triangle S<0, \triangle H>0$

2) The most adsorbed gas on activated charcoal is
(a) N_2 (b) H_2 **(c)** **CO_2** (d) CH_4

3) Which of the following statements is uncorrect regarding physiosorption?
(a) It occurs because of van der Eaals 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 $(\triangle H_{adsorption})$ **is low and positive**

4) The chemical formula of Zeigler-Natta catalyst is
(a) $CuCl_2$ (b) $NiCl_2$ (c) $CrCl_3$ (d) $TiCl_4$

5) Colloidal solution is
(a) True solution (b) Suspension **(c) Heterogeneous solution**
(d) Homogeneous solution

6) Which one of the following forms an intrinsic colloid?
(a) Sulphur (b) As_2S_3 (c) $Fe(OH)_3$ **(d) Egg albumin**

7) Which one of the following is a lyophilic colloid?
(a) Milk **(b) Gum** (c) Fog (d) Blood

8) Positively charged colloidal solution is
(a) SnO_2 (b) As_2S_3 (c) gum (d) none of these

9) Which of the following is correct about lyophilic sols?
(a) They are irreversible (b) They are formed by inorhanic substances.
(c) They are readily coagulated by addition of electrolytes. **(d) They are self-stabilized.**

10) Purple of cassius is a cooloidal sol of
(a) silver (b) platinum **(c) gold** (d) iron

11) Which of the following electrolytes will be most effective in the coagulation of gold sol?
(a) $NaNO_3$ (b) $K_4[Fe(CN)_6]$ (c) Na_3PO_4 **(d)** **$MgCl_2$**

12) The function of gum arabic in the preparation of Indian ink is
(a) Coagulation (b) Peptization **(c) Protective action** (d) Adsorption.

13) Addition of ferric chloride solution to ferric hydroxide precipitate results in
(a) Peptization (b) Protection (c) Flocculation (d) Dialysis

14) The emulsifying agent present in milk that makes it stable is
(a) lactose (b) maltose **(c) casein** (d) lactic bacilli

15) Adsorption is accompanied by

(a) decrease in enthalpy and increase in entropy

(b) increase in enthalpy and increase in entropy

(c) decrease in enthalpy and decrease in entropy

(d) no change in enthalpy and entropy

16) The correct ascending order of adsorption of the following gases on the same mass of charcoal at the same mass of charcoal at the same temperature and pressure is

(a) $CH_4 < H_2 < SO_2$ **(b) $H_2 < CH_4 < SO_2$** (c) $SO_2 < CH_4 < H_2$ (d) $H_2 < SO_2 < CH_4$

(e) $CH_4 < SO_2 < H_2$

17) Which of the following are the characteristics of chemisorption ? 1. High heat of adsorption 2. Irreversibility 3. Low activation energy Select the correct answer using the code given below :

(a) 1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1,2 and 3

18) Although nitrogen does not adsorb on surface at room temperature, it adsorbs on the same surface at 83 K, Which one of the following statement is correct ?

(a) At 83 K, there is formation of monomolecular layer

(b) At 83 K, there is formation of multimolecular layer.

(c) At 83 K, nitrogen molecules are held by chemical bonds.

(d) At 83 K, nitrogen is adsorbed as atoms.

19) Which of the following relation is correct ? (i) x/m = constant at high pressure (ii) x/m = constant $xp^{1/n}$ (at intermediate pressure) (iii) x/m = constant xp^n (at lower pressure)

(a) all are correct (b) all are wrong **(c) (i) and (ii) are correct** (d) (iii) is correct

20) In Freundlich adsorption isotherm, the value of 1/n is

(a) between 0 and 1 in all cases (b) between 2 and 4 in all cases

(c) 1 in case of physical adsorption (d) 1 in case of chemisorption

21) According to Freundlich adsorption isotherm, which of the following is correct ?

(a) $\frac{x}{m} \alpha p^o$ (b) $\frac{x}{m} \alpha p^1$ (c) $\frac{x}{m} \alpha p^{1/n}$

(d) All the above are correct for different ranges of pressure

22) Langmuir adsorption isotherm is deduced using the assumption

(a) The adsorbed molecules interact with each other

(b) The adsorption takes place in multi layers

(c) The adsorption sites are equivalent in their ability to adsorb the particles

(d) The heat of adsorption varies with the coverage

23) Which among the following statements are correct with respect to adsorption of gases on a solid ? 1) The extent of adsorption is equal to k P^n according to Freundlich isotherm 2) The extent of adsorption is equal to k $P^{1/n}$ according to Freundlich isotherm. 3) The extent of adsorption is equal to (1+bP)/aP according to Langmuir isotherm. 4) The extent of adsorption is equal to aP/(1+bP) according to Langmuir isotherm. 5) Freundlich adsorption isotherm fails at low pressure.

(a) 1 and 3 (b) 1 and 4 (c) 2 and 3 (d) 2 and 4 (e) 2 and 5

24) If x is amount of adsorbate and m is amount of adsorbent, which of the following relations is not related to adsorption process ?

(a) $\frac{x}{m} = p \times T$ (b) $\frac{x}{m} = f(p) \quad at \quad constant \quad T$ (c) $\frac{x}{m} = f(T) \quad at \quad constant \quad p$

(d) $p = f(T) \quad at \quad costant \quad \left(\frac{x}{m}\right)$

25) What is the equation form of Langmuir isotherm under high pressure ?

(a) $\frac{x}{m} = \frac{a}{b}$ (b) $\frac{x}{m} = aP$ (c) $\frac{x}{m} = \frac{1}{a.p}$ (d) $\frac{x}{m} = \frac{b}{a}$

26) 3 g of activated charcoal was added to 50 mL of acetic acid solution (0.06 N) in a flask. After an hour it was filtered and the strength of the filtrate was found to be 0.042 N. The amount of acetic acid absorbed (per gram of charcoal) is

(a) 42 mg (b) 54 mg **(c) 18 mg** (d) 36 mg

27) Which of the following statements is correct for the spontaneous adsorption of a gas ?

(a) ΔS is negative and, therefore, ΔH should be highly positive

(b) ΔS is negative and, therefore, ΔH should be highly negative

(c) ΔS is positive and, therefore, ΔH should be negative.

(d) ΔS is positive and, therefore, ΔH should also be highly positive

28) $CO(g) + H_2(g) \xrightarrow{} CuX$ X.Y and Z respectively are

$CO(g) + H_2(g) \xrightarrow{} Cu/ZnO - Cr_2O_3Y$

$CO(g) + H_2(g) \xrightarrow{} NiZ$

(a) CH_3OH,HCHO,CH_4 **(b) HCHO,CH_3OH,CH_4** (c) CH_4,CH_3OH,HCHO

(d) HCHO,CH_4,CH_3OH

29) Decomposition of H_2O_2 can be prevent in presence of

(a) glycerol (b) acetanilide (c) phosphoric acid **(d) all of these**

30) An example of 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 $KMnO_4$

31) Hydrolysis of protein in the stomach and intestine takes place due to presence of the enzymes

(a) trypsin and pepsin respectively **(b) pepsin and trypsin respectively**

(c) trypsin in both cases (d) pepsin in both cases

32) Given below, catalyst and corresponding process/reaction are matched. The mismatch is

(a) $[RhCl(PPh_3)_2]$: hydrogenation **(b) $TiCl_4$+$Al(C_2H_5)_3$: polymerization**

(c) V_2O_5 : Haber - Bosch process (d) nickle : hydrogenation

33) 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) $\frac{V_c}{V_s} = 1$ (b) $\frac{V_c}{V_s} = 10^{23}$ (c) $\frac{V_c}{V_s} = 10^{-3}$ **(d)** $\frac{V_c}{V_s} = 10^{3}$

34) The dispersed phase and dispersion medium in soap lather are respectively

(a) gas and liquid (b) liquid and gas (c) solid and gas (d) solid and liquid

(e) gas and solid

35) The dispersed phase and dispersion medium of fog respectively are

(a) solid, liquid (b) liquid, liquid **(c) liquid, gas** (d) gas, liquid