

MAINS+ADVANCED

SOLUTIONS

TOPIC

SURFACE CHEMISTRY

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Exercise-I

1. (B)
A gas with high critical temperature has high vander waal force due to which they are more easily liquefiable & hence more easily adsorb as adsorption decreases their energy
2. (D)
Extent of adsorption increase with increase in critical temperature
3. (C)
Extent of adsorption & intermolecular force \propto vander waal const. (a) $\text{NH}_3 > \text{CO}_2 > \text{CH}_4$
4. (B)
Refer theory
5. (D)
Milk is emulsion
6. (A)
 $\text{H}_2\text{O} + \text{SiO}_2 \longrightarrow \text{SiO}_2 \cdot x\text{H}_2\text{O}$
Sillica gel
7. (B)
Emulsion :- ($\ell + \ell$) dispersed phase & dispersion medium both are liquid
8. (B)
Gelation, starch & gum are organic in nature & hence lyophilic in nature but S_8 is inorganic in nature & hence lyophobic in nature
9. (D)
Vander waal force is responsible for adsorption.
10. (B)
Tyndall effect is due to scattering of light
11. (C)
Chemical adsorption is irreversible.
12. (B)
Colloidal range of particle is 1nm-1000 nm
13. (B)
colloids are heterogeneous in nature & hence consist of two phase.
14. (D)
Refer theory
15. (A)
Milk is emulsion (butter fat dispersed in water).
16. (D)
17. (B)
Fog (liquid + gas) dispersed phase
Dispersion medium.
18. (C)
As per Hardy shulze rule coagulation power \propto +ve charge which is maximum in Al^{3+} .
19. (A)
Ultra-microscope is based on tyndall effect which is based on scattering of light.
20. (A)
Molecular size for colloidal range in 1nm-1000 nm.
21. (B)
Due to charge on colloidal particle they move under the influence of electric field.
22. (A)
Refer theory

23. (B)
Neutralization of charge on colloid as per hardy shulze rule.
24. (C)
Lyophilic colloids do not move in presence of electric field due to uncharged nature.
25. (B)
 As_2S_3 colloid can be represented as $\text{As}_2\text{S}_3 \text{ s}^{2-}$ so it is negatively charged.
26. (C)
Crystalloid & colloids differ in particle size & due to smaller size of crystalloid.
27. (C)
Micelle is an associated form of colloid
28. (C)
Alums due to the charged nature of colloidal particle & hence coagular impurities in muddy water as per shulze rule.
29. (D)
Ethanol is alcohol to the colloidal system is called alcosols.
30. (B)
Gum is organic in nature & hence it is lyophilic colloid.
31. (B)
Refer theory
32. (B)
For eg. Mn^{2+} auto catalyses
 $\text{H}_2\text{C}_2\text{O}_4 + \text{HMnO}_4 + \text{H}^+ \rightarrow \text{Cr} + \text{Mn}^{2+} + \text{CO}_2 + \text{H}_2\text{O}$
33. (D)
tyndall effect is the scattering of light in colloidal sol.
34. (A)
Physical adsorption is multi-layered.
35. (C)
It is the property of colloidal solution.

Exercise-II

1. (D)
Coagulation depends on charge.
2. (D)
 $\text{As}_2\text{S}_3/\text{S}^{2-}$ is negatively charged so cation is effective in coagulation
 $\therefore \text{Al}^{3+}$ is effective.
3. (B)
Physical adsorption is reversible in nature.
4. (B)
Soap + water forms micelle which is an associated colloid.
5. (B)
As in adsorption
 $\Delta S = -ve$
 $\Delta G = -ve$
 $\Delta H = -ve$
6. (A)
Emulsifier stabilises the emulsion.
7. (C)
Co can displace remaining gas as CO involve dipole-dipole interaction but O_2 , N_2 , H_2 involves london force which is weakest in nature & hence CO as more tendency as adsorption.
8. (B)
As per Le chatelier principle increase in temperature causes desorption.
9. (A)
Activated charcoal is more porous & hence adsorbs gases quantitatively.
10. (A)
AgI adsorbs Ag^+ ion from excess AgNO_3 & forms AgI/Ag^+ +ve charge colloidal particle.
11. (A)
Clouds are colloidal solution due to presence of liquid in gas.

12. (B)
Electrical chimneys are based on the principle of charged nature of smoke.
13. (D)
 ΔS for micelles formations positive in nature as hydration energy released in hydration is more than the energy required for micelles formation.
14. (C)
 $\text{RCOO}^- \text{Na}^+$ soap.
15. (A)
Organic part i.e., RCOO^- dissolves grease.
16. (B)
Refer theory
17. (A)
grease (Like dissolves).
18. (D)
Gold no. = $0.025 \times 10^3 = 25$
It is the weight of starch in Mg required for protection.
19. (B,D)
Gold no. \propto protective power
20. (A)
Gold no. measures protective power of colloids.
21. (B)
22. (C)
 AgI/I^- colloidal particles are formed.
23. (C)
 $\Delta S = 0$
24. (C)
Extent at adsorption \propto critical temperature
 \propto case of liquification
25. (D)
Refer theory
26. (B)
27. (C)
Refer theory
28. (A,B,D)
When liquid is dispersed in liquid it is called emulsion.
29. (A,B,D)
Physical adsorption is due to vander waal force net by free valency.
30. (A,B)
Refer properties of lyophilic sols.
31. (A,B)
Gold number is the index of protective power of lyophilic colloidal for standard gold sol.
32. (A,B,D)
33. (A,B,C)
34. (A,B)
 $\text{As}_2\text{S}_3/\text{S}^{2-} + \text{Fe}(\text{OH})_3/\text{H}^+$
causes mutual coagulation due to opposite charged nature of colloidal particle.
35. (B,C,D)
Organic sol. are lyophilic.
36. (A,B)
Since gold is metal so it is prepared by bredig's arc method
 $\text{AuCl}_3 + \text{SnCl}_2 \rightarrow \text{Au} + \text{SnCl}_4$
37. (A,B,C,D)
38. (A,C,D)
Sulphur being inorganic in nature so, it is lyophobic & rest are organic in nature.
39. (A,B,D)
40. (A,B,C)
Except paramagnetism all are properties of sol.

41. (A,D)

$\text{AgI} + \text{AgNO}_3 \rightarrow \text{AgI}/\text{Ag}^+ + \text{ve charge colloidal particle}$

& hence -ve charge is effective in coagulation.

42. A-P; B-Q,R,S; C-P,S; D-P,Q

Exercise-III

LEVEL-I

1. (A)

2. (D)

Adsorption increases with increase in temperature

3. (C)

4. (D)

Colloidal iron is coagulated by Mg^{+2} and colloidal gold is coagulated by Cl^-

5. (B)

the mass of gas striking a given area of surface is independent of the pressure of the gas

6. (B)

Higher the gold number lesser will be the protective power of colloid.

$A < C < B < D$

7. (C)

Enthalpy of adsorption ($\Delta H_{\text{adsorption}}$) is not +ve and it is negative.

8. (D)

As_2S_3 is an anionic solution (-ve sol.) hence coagulation will depend upon coagulating power of cation. Which will directly proportional to the valency of cation.

Exercise-III

LEVEL-II

1. $5 \times 10^{-19} \text{ m}^2$

No. of CH_3COOH molecule absorbed = $(0.5$

$$- 0.49) \times \frac{100}{1000} \times 6.023 \times 10^{23}$$

= 6.023×10^{20} CH_3COOH absorbed molecule.

\therefore Surface area absorbed

$$= \frac{3.01 \times 10^2}{6.023 \times 10^{20}} = 4.997 \times 10^{-19}$$

= $5 \times 10^{-19} \text{ m}^2$ per CH_3COOH molecule.

2. 0002

No. of molecules of N_2 gas = $N_A \times \frac{PV}{RT}$

$$= \frac{0.001 \times 2.46}{0.0821 \times 1000 \times 298} \times 6.023 \times 10^{23}$$

$$= 6.02 \times 10^{16}$$

Total surface sites. = $6.023 \times 10^{14} \times 1000$
= 6.023×10^{17}

Surface sites occupied by

$$= 20\% 6.023 \times 10^{17}$$

$$= \frac{20}{100} \times 6.023 \times 10^{17} = 1.2046 \times 10^{17}$$

\therefore Number of sites occupied by N_2

$$= \frac{1.2046 \times 10^{17}}{6.02 \times 10^{16}} = 2$$

3. (B)

4. (A)

$$\text{CMC} \propto \frac{1}{\text{Mol. wt. of soap}}$$

5. (C)

$\text{Sb}_2\text{S}_3/\text{S}^{2-}$ is -ve charge sol so cation is effective in coagulation.

6. (0007)

7. (ABD)

8. (AC)

9. (AD)