PREVIOUS YEARS QUESTION SERIES (SURFACE CHEMISTRY) PART-I

1. Explain what are "surfactants" and "micelles".
2. Describe 'Langmuir adsorption isotherm'. Explain under what condition 'Langmuir adsorption isotherm' resembles 'Freundlich adsorption isotherm'.
3. Discuss the principle of the method by which surface area of finely divided solids can be measured from the adsorption isotherm of gases.
4. Explain why i. $Al_2(SO_4)_3$ is more active than Na_2SO_4 in coagulating a sol. Ii Lyophilic colloids are more stable than lyophobic colloids.
5. Write short note on 'Electrokinetic phenomena'.
6. Define surface excess. Derive how surface excess is related to the surface tension of a solution. How does surface tension of aqueous solutions of the following substances vary with concentration i. NaCl ii. CH_3COOH iii. Sodium dodecyl sulphate
7. 'Adsorption is an exothermic process'- justify or criticize.
8. Distinguish between 'chemisorption' and 'physical adsorption' in the case of adsorption of gases on solid surface.
9. Explain the stability of colloid in the context of Zeta potential.
10. Explain the phenomenon of electro-osmosis.
11. What is Schulze-Hardy rule?
12. Explain the term "coagulation of a colloid". State and explain the Schulze-Hardy rule.
13. Explain the term "coagulation of a colloid". State and explain Schulze-Hardy rule.
14. 'Colloidal solutions are thermodynamically unstable.'- Comment.
15. What is "Zeta potential"?
16. Write the Debye-equation denoting the variation of total polarization with temperature for a molar molecule. Calculate the dimension of (μ^2 / kT), the terms have their usual meanings.
17. Explain the origin of electrical charge on nanoparticles in a sol. Give an experimental evidence for the same.
18. Draw diagram showing the variation of surface tension of aqueous solution of the following substances with concentration: i. NaCl ii Sodium dodecyl sulphate. Explain using Gibbs adsorption Isotherm.
19. The dielectric constant of a liquid compound of molecular weight 84.16 is 2.033; its refractive index(D-line) is 1,427 and its density is 0.7784 gcm^{-3} at 20°C. Determine its molar and electron polarizations. Comment on the polarity of the molecule from these results.
20. "Adsorption of a gas on a solid is an exothermic." Justify or criticize.
21. Explain, with reasons, why para-dichloro benzene is non polar but para-dihydroxybenzene is polar.
22. Distinguish between physical adsorption and chemisorption. Derive Langmuir adsorption isotherm. State clearly the assumptions involved.

23. Stearic acid, $C_{17}H_{35}COOH$, (density=0.85 gm/cm^3) molecules occupies an area of 0.205 nm^2 in a close packed surface film. Calculate the length of the molecule.
24. How does 'molar polarization' vary with temperature? Explain using proper equation. How would you determine the dipole moment of a molecule using the variation of molar polarization with temperature? Find CGS unit of (μ^2 / kT).
25. Explain the stability of lyophobic colloids in the context of zeta potential.
26. What do you understand by micelle and critical micelle concentration((CMC)?
27. Write down the Gibbs adsorption equation with interpretation. Give the significance of the term 'surface excess'.
28. What do you understand by dielectric constant of a medium?
29. 'Debye equation for the dipole moment should be applicable to gases and vapours only'- Comment on the statement.
30. Explain what do you mean by orientation of a molecule. Why does molar polarization of a polar molecule decrease at high frequencies?