Chapter - 5

SURFACE CHEMISTRY

VSA QUESTIONS (1 - MARK QUESTIONS)

1. Why does a gas mixed with another gas not form a colloidal system?
2. Why are adsorbate particles attracted and retained on the surface of adsorbent?
3. Explain the terms sorption and desorption.
4. "Chemisorption is highly specific." Illustrate with an example.
5. "Adsorbents in finely divided form are more effective." Why?
6. Name two compounds used as adsorbent for controlling humidity.
   [**Ans. :** Silica gel, Alumina gel]
7. Mention one shape selective catalyst used to convert alcohol directly into gasoline.
8. 'Generally high temperature is favourable for chemisorption.' Why?
9. Name the catalyst used in the following process :
   (a) Haber's process for the manufacture of NH_3 gas.
   (b) Ostwald process for the manufacture of nitric acid.
10. Explain the relationship given by Freundlich in adsorption isotherm.
11. Which group elements show maximum catalytic activity for hydrogenation reactions?
    [**Hint :** 7–9 group elements]
12. Why gas masks are used by miners in coal mines while working?
13. Write the chemical reaction involved in the preparation of sulphur sol.
14. Name the enzyme which converts milk into curd. [**Ans. :** lactobacilli]

15. What are the optimum temperature and pH at which enzymes are highly active. [**Ans. :** Temperature 298–310K and pH 5 to 7]

16. What are the physical states of dispersed phase and dispersion medium in foam rubber.

18. What is the composition of colloidion solution?

19. Why do colloidal particles show Brownian movement?

    [**Hint :** Due to unbalanced bombardment of the particles by the molecules of the dispersion medium]

21. State the sign of entropy change involved when the molecules of a substances get adsorbed on a solid surface. [**Ans. :** ΔS = –ve]

22. Why does sky appear blue to us?

23. What happens when hydrated ferric oxide and arsenious sulphide sols are mixed in almost equal proportions?

24. Gelatin is generally added to ice-cream. Why?

    [**Hint :** Ice-cream is water in oil type emulsion and gelatin acts as emulsifier].

25. How is lake test for aluminium ion based upon adsorption?

    [**Hint :** $Al_2O_3.xH_2O$ has the capacity to adsorb the colour of blue litmus from the solution]

26. What is saturation pressure in Freundlich's isotherm?

27. Mention the two conditions for the formation of micelles.

    [**Hint. :** CMC and T_k]

28. How is Brownian movement responsible for the stability of sols?

    [**Hint :** Stirring effect due to Brownian movement does not allow the particles to settle down.]

29. Which of the following is more effective in coagulating positively charged hydrated ferric oxide sol : (i) KCl (ii) $CaSO_4$ (iii) K_3 $[Fe(CN)_6]$.

30. State the purpose of impregnating the filter paper with colloidion solution.

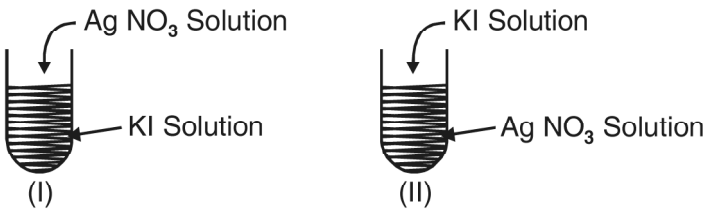
31. Mention one use of ZSM–5 catalyst.

SA (I) TYPE QUESTIONS (2 - MARK QUESTIONS)

35. Explain the effect of temperature on the extent of physical and chemical adsorption.

36. Define the term peptization and mention its cause.

37. What will be the charge on colloidal solutions in the following cases.



Give reasons for the origin of charge.

38. Write the factors upon which the catalytic reaction of shape-selective catalyst depends?

[**Hint :** (a) Pore structure of the catalyst; (b) Size and shape of the reactant and product molecules.]

39. Mention two examples of emulsifying agents for o/w emulsions and w/o emulsions.

40. Suggest a mechanism of enzyme catalysed reaction.

41. A small amount of silica gel and a small amount of anhydrous calcium chloride are placed separately in two beakers containing water vapour. Name of phenomenon that takes place in both the beakers.

[**Hint :** Silica gel – Adsorption, Anhydrous $CaCl_2$–Absorption, as it forms $CaCl_2.\ 2H_2O$)

42. Write the differences between adsorption and absorption?

43. How can physisorption be distinguished from chemisorption?

44. Classify the following reactions as homogeneous and heterogeneous catalysis :

(a) Vegetable oil (l) + H_2 (g) $\xrightarrow{Ni(s)}$ Vegetable ghee (s)

(b) $C_{12}H_{22}O_{11}$ (aq) + H_2O (l) $\xrightarrow{H_2SO_4\ (aq)}$ $C_6H_{12}O_6$ (aq) + $C_6H_{12}O_6$ (aq)

45. In what way these are different : (a) a sol and a gel (b) a gel and an emulsion.

46. State “Hardy Schulze Rule” with one example.

47. What is an emulsifying agent? What role does it play in forming an emulsion?

48. Define the terms :

    (a) Helmholtz electrical double layer.

    (b) Zeta potential.

49. A graph between $\frac{x}{m}$ and log p is a straight line at an angle of 45° with intercept on the y-axis i.e. (log k) equal to 0.3010. Calculate the amount of the gas absorbed per gram of the adsorbent under a pressure of 0.5 atmosphere.

    [**Hint :** Refer to NCERT Text Book page 125, Fig. 5.2

    $\frac{1}{n} = \tan 45° = 1,\ \log k = 0.3010,\ k = 2,\ p = 0.5$ atm.

    $\frac{x}{m} = kp^{\frac{1}{n}} = 2 \times (0.5)^1 = 1.0$]

50. Mention the two necessary conditions for the observation of Tyndall Effect.

51. Account for the following :

    (a) Artificial rain can be caused by spraying electrified sand on the clouds.

    (b) Electrical precipitation of smoke.

52. Write chemical equations for the preparation of sols :

    (a) Gold sol by reduction.

    (b) hydrated ferric oxide sol by hydrolysis.

53. How can the two emulsions can be distinguished :

    (a) oil in water type (O/W) and

    (b) water in oil type (W/O)

SA (II) TYPE QUESTIONS (3 - MARK QUESTIONS)

54. Write the difference between

    (a) catalysts and enzymes

    (b) promoters and poisons

55. Write the steps of 'Modern Adsorption Theory of Heterogenous Catalysis.'

56. Mention the two important features of solid catalysts and explain with the help of suitable examples.

57. How are the following colloids different from each other in respect of dispersion medium and dispersed phase? Give one example of each type.

    (a) An aerosol (b) A hydrosol (c) An emulsion.

58. What happens :

    (a) by persistent dialysis of a sol.

    (b) when river water meets the sea water.

    (c) when alum is applied on cuts during bleeding.

59. Distinguish between multimolecular, macromolecular and associated colloids with the help of one example of each.

60. (a) Which property of colloids is responsible for the sun to look red at the time of setting?

    (b) C_2H_2 on addition with H_2 forms ethane in presence of palladium catalyst but if reaction is carried in the presence of barium sulphate and quinoline, the product is ethene and not ethane. Why?

[**Ans.** (a) Sun is at horizon and blue part of the light is scattered away by the dust particles as light has to travel a long distance through the atmosphere.

(b) $CH = CH + H_2 \xrightarrow{Pd} CH_2 = CH_2 \xrightarrow[Pd]{H_2} CH_3 - CH_3$

$CH \equiv CH + H_2 \xrightarrow[BaSO_4, \text{ quinoline}]{Pd} (CH_2 = CH_2)$

($BaSO_4$ in presence of quinoline act as poison. The catalyst in this case is not effective in further reduction].