

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

**M.Sc. DEGREE EXAMINATION- PHYSICS**

THIRD SEMESTER – NOVEMBER 2007

**CH 3900 - INSTRUMENTAL ANALYSIS (FOR PHYSICS)**

AD 22

Date : 06/11/2007

Dept. No.

Max. : 100 Marks

Time : 9:00 - 12:00

**PART – A**

**Answer ALL the questions:**

**(10 × 2 = 20)**

1. A solution containing 5585 ppm of  $\text{Fe}^{+3}$  is how many molar  $\text{Fe}^{+3}$ ?
2. Determine the pH of 1% solution of NaOH.
3. How are the following separated?
  - i) A mixture of naphthalene and  $\text{NaCl}_{(s)}$ .
  - ii) A mixture of  $\text{C}_6\text{H}_6_{(l)}$  (b.p.  $80^\circ\text{C}$ ) and  $\text{C}_6\text{H}_5\text{OH}_{(e)}$  (b.p.  $130^\circ\text{C}$ ).
4. Mention the mobile phase and immobile phase in column chromatography.
5. Compare the solubility of  $\text{BaSO}_4_{(s)}$  in
  - i) pure  $\text{H}_2\text{O}$ ,
  - ii) 0.10 M  $\text{Na}_2\text{SO}_4$
  - iii) 0.10 M  $\text{KNO}_3$ .
6. Compare the  $\lambda_{\text{max}}$  for (i)  $\sigma \rightarrow \sigma^*$  and (ii)  $\pi \rightarrow \pi^*$  transition.
7. Compare the fundamental vibrational frequency of  $\text{>C-O}$  and  $\text{>C=O}$ .
8. Distinguish absorption spectroscopy and emission spectroscopy.
9. What are the factors which influence thermogram?
10. Mention the advantages of HPLC over GLC.

**PART – B**

**Answer any EIGHT questions:**

**(8 × 5 = 40)**

11. How is exactly 1.000 M  $\text{CH}_3\text{COOH}$  prepared?
12. How are naphthalene and benzoic acid separated from its mixture?
13. Determine the solubility of  $\text{AgCl}_{(s)}$  in mg/L.  $K_{\text{sp}}$  of  $\text{AgCl}$  is  $1 \times 10^{-10} \text{ mol}^2 \text{ dm}^{-6}$ . Mol mass of  $\text{AgCl} = 143.5 \text{ gmol}^{-1}$ .
14. Distinguish TGA and DTA.
15. Explain the principle of ion exchange chromatography.
16. pH of pure water at  $25^\circ\text{C}$  is 7, and at  $50^\circ\text{C}$  it is 6.5. Explain.
17. A  $10^{-3} \text{ M}$  solution has an absorbance 0.500, find out the concentration of the solution having an absorbance of 1.75.
18. Which of the following is having more acidic character?
  - i)  $10^{-2} \text{ M HCl}$
  - ii)  $10^{-2} \text{ M CH}_3\text{COOH}$ ;  $K_a = 10^{-5}$ .
19. Determine the pH of a buffer containing  $10^{-2} \text{ M CH}_3\text{COOH}$  and  $10^{-2} \text{ M CH}_3\text{COONa}$ .  $K_a$  of  $\text{CH}_3\text{COOH}$  is  $10^{-5}$ .
20. Explain chromophores and auxochromes.
21. Mention the advantages of DTA over TGA.
22. Distinguish AAS and FES.

## PART – C

Answer any FOUR questions:

(4 × 10 = 40)

23. Metro water needs to supply 4.2 million litres of water a day to Chennai residents. It makes an attempt to chlorinate water to kill germs, by treating with bleaching powder that contains 30% available chlorine. Bleaching powder costs Rs.20/- per kg. Determine expenditure in the process of chlorination per year. Metro water is advised to maintain 2 ppm of chlorine in water.
24. How is the solubility of a sparingly soluble substance determined using conductometer?
25. Draw the flow sheet Diagram of GLC, explain the principle and functions of the components.
26. Draw the thermogram of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}_{(s)}$  and explain.
27. Sketch I.R double beam spectrophotometer and explain its working.
28. Write notes on
  - i) Detector used in UV-visible spectroscopy.
  - ii) Soxhlet extraction.

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