LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - CHEMISTRY

SECOND SEMESTER – NOVEMBER 2013

CH 2901 - INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Date : 06/11/2013   Dept. No.   Max. : 100 Marks
Time : 1:00 - 4:00

Part-A

Answer all questions. Each question carries two marks.

1. How will you prepare 500 mL of 0.1 M sodium hydroxide (Molecular weight=40) solution?
2. State the principle of turbidimetric analysis.
3. Define: Molar absorption coefficient.
4. Calculate the hydrogen ion concentration of a solution that has a pH of 5.16.
5. What are basic buffer solutions? Give an example.
6. Give the characteristic absorption bands in IR spectroscopy for ethanol and acetone.
7. Define chemical shift.
8. State Bragg's law.
9. What is molecular ion peak in mass spectrometry? Cite an example.
10. What is meant by hyperfine splitting?

Part-B

Answer eight questions. Each question carries five marks.

11. a) A 250.0 mL of aqueous solution contains 45.1 µg of a pesticide. Express the pesticides concentration in ppm and ppb.   (3 + 2)
    b) How will you prepare 0.10 M of 100 mL barium chloride solution from a stock solution of 5 M?
12. What are primary and secondary standard solutions? Mention the prerequisites of primary standard substances.
13. Sketch the block diagram of double beam spectrophotometer and explain.
14. Calculate pH of a buffer that is 0.020 M in NH_3 and 0.03 M in NH_4Cl. (Dissociation constant of NH_4OH is 1.81×10^{-5})
15. Explain how the concentration of fluoride ion is determined using ion-selective electrode?
16. Discuss the application of circular dichroism studies.
17. Describe the components of spectrofluorimeter.
18. What are the factors affecting the chemical shift?
19. Explain any one detector used in gas chromatographic technique.
20. Describe the basic principle of mass spectrometry with an example.
21. Write a note on isotopic dilution analysis.
22. Explain the modes of molecular vibrations.

Part-C

Answer four questions. Each question carries ten marks.

23. State Beer-Lambert's law. Explain the deviations from the law.
24. Explain the quantitative determination of lead and magnesium by AAS.
25. a) How will you determine pH using glass electrode?
    b) Sketch and explain the potentiometric curves obtained for acid-base titrations. (5+5)
26. a) Compare the principles of HPLC and GC.
    b) Explain how powder diffraction method is used for the determination of internal structure of crystals. (5+5)
27. Explain the applications of neutron and electron diffraction techniques.
28. a) Explain the principle of ESR spectroscopy.
    b) Sketch the ESR spectrum expected for methyl radical and explain the same. (5+5)

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