



MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :.....

Name :.....

Third Semester B.Sc. Degree Examination, November 2016

First Degree Programme under CBCSS

Complementary Course: Chemistry – III (for Botany)

AUCH331.2a: Physical & Inorganic Chemistry

Time: 3 Hours

Max. Marks: 80

SECTION – A

Answer ALL questions in one word to maximum of two sentences.

1. 75% of a reaction of a first order reaction is completed in 32 minutes. Its half – life is _____.
2. What are the units of k for the rate law: Rate = k[A][B]², when the concentration unit is mol/L ?
3. What do you mean by pseudo first order reaction ?
4. What is the difference between heterogeneous and homogeneous catalysis ?
5. What is the Arrhenius concept of acids and bases ?
6. What is the pH of 0.1 M HCl ? Assume complete dissociation.
7. What is meant by a chromophore ?
8. What is the range of UV – visible radiation ?
9. Write down possible values ‘m’ can have for a nucleus with I = 1.
10. How many ¹H–NMR peaks will be shown by the compound ethane ?

(10 × 1 = 10 Marks)

SECTION – B

Answer any EIGHT questions, each in a short paragraph not exceeding 50 words.

11. What factors influence the absorbance of a sample ? Is each factor directly or inversely proportional to the absorbance ?

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12. What is meant by chemical equivalence of a set of nuclei ? How many NMR signals would a set of three chemically equivalent nuclei yield ?
13. What is meant by chemical shift ? What is δ -scale ?
14. A 6.95 gram sample of radioactive nobelium – 259 has a half – life of 58 min. How much is left after 2 hours and 54 minutes ?
15. Discuss two biological effects of radiation exposure ?
16. What information you get from the Retardation factor value R_f ?
17. Explain critical solution temperature.
18. Briefly explain the principle of steam distillation.
19. Explain the mechanism of an acidic buffer.
20. Calculate the pH of ammonium hydroxide – ammonium chloride buffer solution that is 0.1 M in ammonium hydroxide and 0.01 M in ammonium chloride. (pK_b of $NH_4 OH = 9.25$)
21. Write the integrated rate expression for the second order reaction $2A \rightarrow P$.
22. Discuss the adsorption theory of catalysis.

(8 × 2 = 16 Marks)

SECTION – C

Answer any SIX questions, each in a paragraph not exceeding 120 words.

23. a) Write Arrhenius equation and explain the terms. **1 Mark**
b) Consider the reaction: $2B \rightarrow C + 3D$. In one experiment it was found that at 300 K the rate constant is 0.134 L/(mol.s). A second experiment showed that at 450 K, the rate constant was 0.569 L/(mol.s). Determine the activation energy for the reaction. **3 Marks**
24. Explain how 1H -NMR can be used to distinguish between 1-propanol and 2-propanol.
25. Explain the significance of distribution law in the process of solvent extraction.
26. Describe in detail one suitable chromatographic method used for separation of amino acids.
27. Write a note on the applications of radioactivity in agriculture and medicine.
28. Discuss the fractional distillation of a binary liquid mixture forming a minimum boiling azeotrope.

29. Discuss the colorimetric method for estimation of glucose.
30. Explain why aqueous Na_2CO_3 is basic and aqueous FeCl_3 is acidic ?
31. Discuss collision theory of reaction rates.

(6 × 4 = 24 Marks)

SECTION – D

Answer any TWO questions, not exceeding four pages.

32. What are buffer solutions ? Derive an expression for pH of a basic buffer.
33. Write an essay on the applications of UV–Visible spectroscopy.
34. Derive the integrated rate expression for a first order reaction and show the time required to complete a definite fraction of the reaction does not depend on concentration of reactant.
35. Write an essay on HPLC technique.

(2 × 15 = 30 Marks)

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