

Register No.: Name:



**SAINTGITS COLLEGE OF ENGINEERING
KOTTAYAM, KERALA**

(AN AUTONOMOUS COLLEGE AFFILIATED TO
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2022

Course Code: 20CYT100

Course Name: ENGINEERING CHEMISTRY

Max. Marks: 100

Duration: 3 Hours

PART A

(Answer all questions. Each question carries 3 marks)

- Compare electrochemical series and galvanic series.
- Write the electrode reaction and calculate the single electrode potential of Zn electrode dipped in 0.02 M ZnSO₄ solution of at 25°C (Given $E_{Zn^{2+}/Zn}^0 = -0.76V$).
- Compare the molecular energy level diagrams of ethene and 1,3-butadiene.
- Identify the NMR inactive nucleus from the following. Justify your answer.
a) 1_1H b) ${}^{16}_8O$ c) ${}^{13}_6C$ d) ${}^{10}_5B$
- What are the differences between thermograms of TGA and DTA?
- How nanomaterials are classified based on dimension?
- What is chain isomerism? Give an example.
- How will you prepare ABS polymer? Write any one application of ABS.
- Write any three disadvantages of using hardwater.
- Why Calcium Carbonate is chosen as the standard for expressing hardness. Write the expression for calculating calcium carbonate equivalent hardness.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

- Explain the construction and working of calomel electrode. Mention its applications. (7)
 - What are secondary cells? What are the main components of lithium-ion battery. Explain the reactions occurring during charging and discharging of a lithium-ion battery. (7)

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OR

12. a) Explain the principle and procedure for potentiometric estimation of ferrous ions in the given solution. How its endpoint is determined graphically? (8)
- b) What is single electrode potential? Derive Nernst equation for single electrode potential. (6)

MODULE II

13. a) State and explain Beer-Lambert's law. What are the various types of electronic transitions possible in UV-Visible spectroscopy? Write any two applications of UV-Visible spectroscopy (8)
- b) How does IR spectroscopy help in the identification of functional groups in organic compounds? CO molecule absorbs at 2143 cm^{-1} . Calculate force constant of the molecule. Given that atomic masses of C and O are 12u and 16u respectively. $1\text{ u} = 1.67 \times 10^{-27}\text{ Kg}$. (6)

OR

14. a) What is chemical shift? Explain any two factors affecting chemical shift. Explain the spin-spin splitting pattern observed in the $^1\text{H-NMR}$ spectrum of $\text{CH}_3\text{CH}_2\text{Cl}$. (7)
- b) Explain the principle of $^1\text{H-NMR}$ spectroscopy. Give the principle and applications of MRI. (7)

MODULE III

15. a) Detail the instrumentation of GC and HPLC with the help of labeled block diagrams. (8)
- b) Explain the principle used in thin layer chromatography. How is it carried out? (6)

OR

16. a) Explain any two chemical methods of preparation of Nano materials. Give any two applications of nanomaterials (8)
- b) Explain the components of a scanning electron microscope with a labeled block diagram. List any two applications of SEM (6)

MODULE IV

17. a) What is conformational isomerism? Explain conformational isomerism in n-butane with the help of the energy profile diagram. (8)
- b) What are copolymers? Explain different types of co-polymers (6)

OR

18. a) What are conducting polymers? Explain the preparation of polyaniline and polypyrrole. Write one application for each polymer. (8)
- b) Explain keto-enol tautomerism and metamerism with examples. (6)

MODULE V

19. a) Explain aerobic and anaerobic methods for secondary sewage treatment. (8)
- b) Explain the ion-exchange process for softening of hardwater. How ion-exchange resins are regenerated? (6)

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OR

20. a) Explain the principle and procedure of estimation of total hardness of water by complexometric titration. (8)
- b) 1.0 g of CaCO_3 was dissolved in HCl and diluted to 1 litre. 50 ml of this standard hard water requires 45 ml of EDTA while 50 ml of sample hard water requires 18 ml of EDTA. On the other hand, 50 ml of boiled hard water sample requires 12 ml of EDTA solution. Calculate total, temporary and permanent hardness of the water sample. (6)
