

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 2023**(2020 SCHEME)****Course Code : 20CYT100****Course Name: Engineering Chemistry****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. What is electrochemical series? Mention any two uses of it.
2. Calculate the conductivity of given sample of water at 298 K, which shows a conductance of 11.5 mS in a given cell at 298 K. A standard solution of 0.1 M KCl shows a conductance of 13.4 mS in that cell. Given that conductivity of 0.1 M KCl at 298 K is $0.011288 \text{ Scm}^{-1}$.
3. Define chemical shift. Identify the most shielded and deshielded protons in 1-chloropropane ($\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$).
4. Distinguish between absorption spectrum and emission spectrum.
5. Draw the TGA curve of Calcium oxalate monohydrate with relevant equations.
6. Explain any one method for the synthesis of nanomaterials with an example.
7. Draw the eclipsed and staggered conformation of ethane in Newman projection formula.
8. Explain the synthesis of polyaniline and mention any two applications of it.
9. Calculate the CaCO_3 equivalent hardness of
 - a) 0.06 N MgSO_4 solution
 - b) 0.04 M CaCl_2 solution
10. Explain any three differences between aerobic and anaerobic oxidation.

PART B***(Answer one full question from each module, each question carries 14 marks)*****MODULE I**

11. a) What is redox potentiometric titration? How potentiometry is used (10) for the quantitative estimation of given solution of ferrous ions using a standard oxidizing agent.
b) Explain impressed current method used for corrosion control. (4)

OR

12. a) What are ion selective electrodes? How a glass electrode acts as an (10) ion-selective electrode? Elucidate the pH determination of a given solution using glass electrode.

- b) List the anodic and cathodic materials used inside a Li-ion battery. (4)
Write the chemical reactions happening during charging and discharging of a lithium ion battery.

MODULE II

13. a) Explain the principle of IR spectroscopy. Draw the various modes of vibrations possible for water and carbon dioxide, which of them are IR active. Justify your answer. List any three applications of vibrational spectroscopy. (10)
- b) State Beer- Lambert's law. The absorbance of 0.01 M dye solution in ethanol is 0.52 in a 2 cm cell for light of wavelength 5000 Å. If the path length of light through the sample and concentration of the solution are doubled, what will be the value of absorbance? (4)

OR

14. a) Which of the following nuclei show NMR absorption a) ${}^1\text{H}^1$ b) ${}^9\text{F}^{19}$ c) ${}^{12}\text{C}^{12}$ d) ${}^{16}\text{O}^{16}$, why? (10)
Predict the number of H^1 -NMR signals, their relative positions and their multiplicities for $\text{CH}_3\text{CH}_2\text{Br}$ and $\text{CH}_3\text{-O-CH}_2\text{-CN}$.
- b) Explain the various electronic transitions possible in molecules when irradiated with UV-Visible radiation. (4)

MODULE III

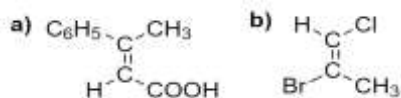
15. a) Explain the principle and types of gas chromatography. Explain the instrumentation of GC. How components in a volatile mixture get separated in GC? (10)
- b) How will you utilize thin layer chromatographic technique for identifying components in a mixture? (4)

OR

16. a) Explain the principle, instrumentation and applications of TGA and DTA. (10)
- b) Draw labelled block diagram and explain the instrumentation of SEM. (4)

MODULE IV

17. a) Define isomerism. Explain the types of structural isomerism with examples. (10)
- b) Assign the priority and identify the E-Z notation for the given molecules. (4)



OR

18. a) Explain the preparation, properties and applications of ABS and Kevlar. (10)

- b) Define copolymerization. Explain different types of co-polymers. (4)

MODULE V

19. a) What is demineralization? Explain the demineralization process of water using ion exchangers. How the exhausted ion exchangers are reused? (10)
- b) Differentiate between BOD and COD. Indicate their significance in sewage treatment. (4)

OR

20. a) Illustrate the sewage water treatment using trickling filter method and UASB process. (10)
- b) What are disinfectants? How water is disinfected by chlorination? (4)
