

Register No.: ..... Name: .....

**SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**SECOND SEMESTER B.TECH DEGREE EXAMINATION (R,S), MAY 2024****(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. Define single electrode potential. Write an expression connecting single electrode potential with concentration of ions.
2. What is electroless plating? Mention one use of electroless plating.
3. Write the expression for finding the vibrational frequency for a chemical bond. The fundamental vibrational frequency of  $^{12}\text{C}^{16}\text{O}$  is more than that of  $^{13}\text{C}^{17}\text{O}$ . Justify the statement.
4. Define chemical shift. Comment on the chemical shift ( $\delta$ ) values of each type of protons in the  $^1\text{H}$ NMR spectrum of following molecule.  
 $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{Cl}$   
 $\delta$  values: 1.0 1.4 3.4 (ppm)
5. Draw the TGA curve of Calcium oxalate monohydrate ( $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ ). Mention the chemical changes during the different stages of decomposition.
6. Explain any one chemical method for the synthesis of nanomaterials.
7. Draw the eclipsed and staggered conformations of ethane in Newman projection formula. Identify the most stable conformer among them.
8. Draw the structure of polypyrrole. Write one of its use.
9. 100 mL sewage water is diluted to 500 mL, the initial dissolved oxygen was 6.5 ppm. The dissolved oxygen level after 5 days of incubation was 2.5 ppm. Find BOD of the sewage.
10. Write the ion-exchange reactions happening when hardwater is passed through ion exchangers.

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

11. a) Explain the construction and working of glass electrode. How pH of a given solution is measured using the glass electrode? (10)  
b) How will you measure conductivity of a solution? (4)

**OR**

12. a) Explain the principle and procedure of potentiometric titration for the estimation of ferrous ion in a solution. Write the advantages of potentiometric titration over conventional volumetric titration. (10)  
b) What do you mean by electrochemical series? Explain any three uses of (4)

electrochemical series.

### MODULE II

13. a) State and explain Beer-Lambert's law. Explain the instrumentation of a double beam UV Visible spectrometer with the help of a neat labeled diagram. (10)
- b) A solution of a substance of concentration 0.05 M shows absorbance of 0.045 at 530 nm, while a test solution of the same substance shows absorbance of 0.022 under same conditions. Find the concentration of test solution. (4)

OR

14. a) What is spin-spin splitting? Predict the <sup>1</sup>HNMR spectra of CH<sub>3</sub>CHBr<sub>2</sub> and CH<sub>3</sub>CH<sub>2</sub>Br. (10)
- b) Write any four applications of IR spectroscopy. (4)

### MODULE III

15. a) Explain the principle, instrumentation and applications of scanning electron microscopy (SEM). (10)
- b) Write any two visualization techniques used in Thin Layer Chromatography. (4)

OR

16. a) Explain the principle, instrumentation and applications of Gas Chromatography. (10)
- b) What are the differences between TGA and DTA? (4)

### MODULE IV

17. a) Explain the principle, construction, working and applications of OLED. (10)
- b) Explain the classification of co-polymers. (4)

OR

18. a) Explain the following terms with example for each (10)
- |                  |                    |
|------------------|--------------------|
| i) chain isomers | iii) diastereomers |
| ii) enantiomers  | iv) tautomers      |
- b) Explain geometrical isomerism in alkenes. (4)

### MODULE V

19. a) Explain the principle and procedure for the estimation of total hardness of a given water sample using EDTA. (10)
- b) Differentiate between COD and BOD. (4)

OR

20. a) Explain the primary and secondary process involved in sewage treatment. (10)
- b) Explain the method of water purification using reverse osmosis with a neat labelled diagram. (4)

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