

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

**SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**SECOND SEMESTER B.TECH DEGREE EXAMINATION (Regular), JULY 2022****(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. Distinguish between Galvanic series and electrochemical series?
2. Calculate the equilibrium constant for the following reaction at 25°C;  
 $\text{Fe(s)} + \text{Cu}^{2+}(\text{aq}) \longrightarrow \text{Fe}^{2+}(\text{aq}) + \text{Cu(s)}$  Given  $E^0_{\text{Fe}^{2+}/\text{Fe}} = -0.44 \text{ V}$ ,  $E^0_{\text{Cu}^{2+}/\text{Cu}} = 0.34 \text{ V}$
3. Which of the following molecules can give IR absorption? Give reason.  
(a) H<sub>2</sub> (b) CO (c) N<sub>2</sub> (d) HCl
4. State Beer-Lambert's Law.
5. What are the visualization techniques used in TLC?
6. Write any three applications of DTA.
7. What are the advantages of OLED over conventional LED?
8. Write the structure of a) Polypyrrole b) ABS.
9. What is break point chlorination?
10. A sample of water on analysis gives the following results. Ca<sup>2+</sup> = 200 mg/L, Mg<sup>2+</sup> = 180 mg/L, HCO<sub>3</sub><sup>-</sup> = 360 mg/L, Cl<sup>-</sup> = 200 mg/L and Na<sup>+</sup> = 80 mg/L. Calculate temporary and permanent hardness.

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

11. a) How is glass electrode used in determining the pH of a solution? What are the advantages and limitations of a glass electrode? (8)  
b) Describe the principle and applications of electroless nickel plating. (6)

**OR**

12. a) Derive Nernst equation for single electrode potential and write the Nernst equation for the cell potential of Daniel cell. (8)  
b) Describe the construction and working of Li-ion battery. (6)

**MODULE II**

13. a) What are the various modes of vibration possible for CO<sub>2</sub> and H<sub>2</sub>O? State which of these modes are IR active. Write reason for their IR activity. (8)

- b) What is the principle involved in MRI scanning? Mention its applications and advantages. (6)

OR

14. a) Draw the molecular orbital energy diagram of i) Ethene, ii) 1, 3-butadiene iii) 1,3,5- hexatriene and iv) benzene to explain their UV-Vis absorption. (8)
- b) Explain the origin of spin-spin splitting and draw the splitting pattern in  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-Cl}$ . (6)

### MODULE III

15. a) Explain the principle, instrumentation and procedure involved in gas chromatography (8)
- b) Explain the principle and instrumentation of SEM with the help of a schematic diagram. (6)

OR

16. a) Explain the principle, instrumentation, procedure and any two applications of HPLC. (10)
- b) Interpret TGA of  $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$  (4)

### MODULE IV

17. a) Draw the cis and trans isomers of 1, 3-dimethyl cyclohexane. Which will be optically active? Draw all the conformers of 1, 3-dimethyl cyclohexane. Which conformer is more stable and why? (8)
- b) How is polyaniline synthesized? List any two properties and applications. (6)

OR

18. a) Explain different types of structural isomerism with suitable examples. (10)
- b) What is Kevlar ? Give any two applications (4)

### MODULE V

19. a) What are the different steps in sewage treatment? Give the flow diagram. Explain the working of Trickling filter with a diagram (10)
- b) Discuss the procedure for the determination of DO in water. (4)

OR

20. a) Explain the estimation of total hardness of water by EDTA method. (10)
- b) Describe one method used for desalination of water. (4)

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