

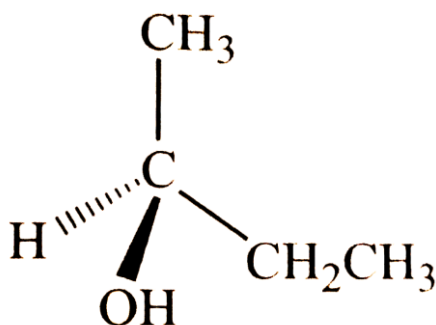
Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER B.TECH DEGREE EXAMINATION (R,S), DECEMBER 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. Write any three differences between electrochemical cell and electrolytic cell.
2. Calculate the equilibrium constant at 25°C for an electrochemical cell, when $E^{\circ}_{\text{cell}} = 0.0260\text{V}$ and $n = 2$.
3. Out of the following molecules, which is/are IR inactive? Give the reason.
a) CO b) HCl c) N₂ d) H₂S
4. When a monochromatic radiation is incident on a CuSO₄ solution of concentration, 0.04M taken in a 5 cm cell, the intensity of the radiation is reduced to one-half of its initial value. Calculate molar extinction coefficient of the substance.
5. Draw the DTA curve of calcium oxalate monohydrate, CaC₂O₄.H₂O with relevant equations.
6. Write any three visualization techniques used in Thin layer chromatography (TLC).
7. Assign R or S configuration for the following chiral carbon



8. Differentiate between enantiomers and diastereomers with suitable examples.
9. A water sample contains 60 mg MgSO₄ per litre. Calculate the CaCO₃ equivalent hardness of this water sample. (Atomic masses: Mg = 24, S = 32, O = 16)
10. Differentiate between COD and BOD.

PART B

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

MODULE I

11. a) Draw a neat labeled diagram of a calomel electrode. Write its electrode reactions. How calomel electrode is used for the determination of unknown electrode potential of an electrode. (8)
- b) Describe the principle and procedure for the estimation of ferrous sulphate solution using a suitable oxidizing agent by potentiometric redox titration. (6)

OR

12. a) Explain the construction of Li-ion cell with a neat diagram. Write its charging and discharging reactions. (8)
- b) Explain the two methods of cathodic protection. (6)

MODULE II

13. a) Describe all the electronic transitions possible for an organic compound with suitable examples. (8)
- b) Sketch all the vibrational modes of CO₂ and H₂O. Which are the IR active vibrations in each case? (6)

OR

14. a) How will you distinguish CH₃-CO-CH₂-CH₃ from CH₃-O-CH₂-CH₃ by NMR spectroscopy? Which are the most shielded and deshielded protons in each case? (8)
- b) Define chemical shift in NMR spectroscopy. Explain any two factors affecting chemical shift. (6)

MODULE III

15. a) Explain the principle, instrumentation and applications of TGA. (8)
- b) Explain the classification of nanomaterials based on dimensions using suitable examples. (6)

OR

16. a) Describe the principle, instrumentation and applications of Gas chromatography (GC). (8)
- b) With a neat labeled diagram, explain the working of scanning electron microscopy (SEM). (6)

MODULE IV

17. a) Explain any four types of structural isomerism with suitable examples. (8)
- b) Write the preparation, properties and applications of Polyaniline. (6)

OR

18. a) Write the preparation, properties and applications of ABS and Kevlar. (8)
- b) With a well labeled diagram, describe the construction and working of OLED. (6)

MODULE V

19. a) 15g of CaCO_3 was dissolved in HCl and the solution diluted to 1L. 20ml of this solution required 25ml EDTA solution while 100ml of sample water required 18 ml of the same EDTA solution. On the other hand, 100ml of boiled water sample when titrated against EDTA required 12 ml of EDTA solution. Calculate total, permanent and temporary hardness. (8)
- b) Explain ion-exchange method for softening of hard water. (6)

OR

20. a) Describe Trickling filter process and UASB sewage water treatments with the help of diagrams. (8)
- b) Explain Reverse osmosis (RO) with a diagram. (6)
