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SAINTGITS COLLEGE OF ENGINEERING
KOTTAYAM, KERALA

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

FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), JULY 2021

Course Code:	**20CYT100**
Course Name:	**ENGINEERING CHEMISTRY**
Max. Marks:	**100** **Duration: 3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. Water is added to the copper compartment of a Daniel cell at standard condition. Write the Nernst equation for the Daniel cell and point out how it's EMF will be affected?

2. Define the cell constant of a conductivity cell. How is it experimentally measured?

3. Nitrogen (N_2) and Hydrogen (H_2) molecule do not absorb IR radiations, whereas carbon monoxide (CO) and Hydrogen fluoride (HF) do. Why is this the case?

4. Mention any two applications of MRI technique along with any of its two advantages over other imaging techniques?

5. Name and specify the components of an instrument suitable for studying the surface characteristics of nanomaterial.

6. Compare Column Chromatography with TLC.

7. Differentiate between Addition polymers and Condensation polymers

8. List any two applications of Kevlar and ABS.

9. What is demineralization of hard water? Name the chemicals used to regenerate exhausted cation and anion exchangers.

10. What are the different units used to express degree of hardness? Give their inter relationship.

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

11. a) Describe the principle and procedure involved in electroless copper plating listing any of its two advantages?   (6)

    b) What are the different types of electrodes? Provide an adequate example of each type and write their respective Nernst equation.   (8)

OR

12. a) Explain the construction of **Li** ion battery? What are the chemical equations representing its charging and discharging? (8)

    b) Natural gas transmission pipes are sometimes protected against corrosion by maintaining a small potential difference between the pipe and an inert electrode buried in the ground. Describe how the method works? (6)

MODULE II

13. a) i. If two signals differ by 1.5 ppm in a 300 MHZ spectrometer, by how much do they differ in a 100 MHZ spectrometer? (6)

    ii. If two signals differ by 90 Hz in a 200 MHZ spectrometer, by how much do they differ in a 600 MHZ Instrument?

    b) Explain the different vibrations that occur during IR absorption using schematic representations. (8)

OR

14. a) What are the various types of electronic transitions possible for ethene, 1,3-butadiene and 1,3,5-hexatriene? Discuss the effect of conjugation using molecular orbital diagram (π-MOs) of ethene, 1,3-butadiene and 1,3,5-hexatriene. (8)

    b) State and explain Beer-Lambert's law. List its any two limitations. (6)

MODULE III

15. a) Briefly outline any two methods used for the preparation of nanomaterials. (6)

    b) Give the principles and instrumental details of HPLC. How does it differ from gas chromatography? (8)

OR

16. a) Write a note on: (8)

    i. Biological nanomaterials
    ii. Retention Factor
    iii. Retention time
    iv. 3D nanomaterials

    b) Draw TGA and DTA thermograms of Calcium oxalate monohydrate (6)

MODULE IV

17. a) Draw the geometrical isomers (Cis and Trans) of 1,2- ; 1,3- and 1,4-dimethyl cyclohexane. Draw their possible conformers and conclude which conformer is stable in each case. (10)

    b) With suitable examples explain tautomerism and metamerism. (4)

OR

18. a) What are the different types of Copolymers? (8)

    b) Write the synthesis of any two intrinsically conducting polymers. (6)

MODULE V

19. a) Explain RO process for desalination of brackish water? (6)

    b) Describe any two methods to remove biodegradable organic matter present in sewage? (8)

OR

20. a) Calculate the Hardness : (8)

    i.   Water sample contains 0.01 M $AlCl_3$.
    ii.   Water sample contains 0.01 N $AlCl_3$.
    iii. Water sample containing 0.1 M $CaCl_2$.
    iv. Water sample containing 0.1 M $NaHCO_3$.

b) In a hardness estimation by EDTA method 50 ml of a sample water required 25 ml of standard EDTA solution. Calculate hardness of sample water? Given that 1ml of EDTA solution is equivalent to 2.00 mg of $CaCO_3$. (6)

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