

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester B.Tech Degree Regular and Supplementary Examination December 2022 (2019 Scheme)

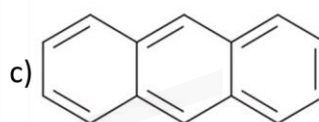
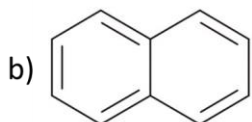
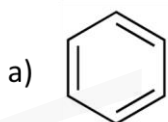
Course Code: CYT 100**Course Name: ENGINEERING CHEMISTRY
(2019 -Scheme)**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 3 marks*

- | | | Marks |
|---|---|-------|
| 1 | Describe different types of electrodes of an electrochemical cell. | (3) |
| 2 | What will be the standard electrode potential of Ni ²⁺ / Ni electrode if the cell potential of the cell Ni / Ni ²⁺ (0.1M) // Cu ²⁺ (0.01M) / Cu is 0.59 V at 25°C?
E ⁰ Cu ²⁺ / Cu = 0.34 V. | (3) |
| 3 | Arrange the molecules in the increasing order of their λ_{\max} . Justify your answer. | (3) |



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|----|---|-----|
| 4 | Give three applications of IR spectroscopy. | (3) |
| 5 | Define R _f value. What is its use in chromatography? | (3) |
| 6 | Write a note on sol-gel method of nanoparticle synthesis. | (3) |
| 7 | What is keto-enol tautomerism? Show how propan-2-one is transformed to its enol form. | (3) |
| 8 | Draw the structure of two different conformers of mono methyl cyclohexane. Which form is more stable and why? | (3) |
| 9 | Explain any two methods for de-chlorination. | (3) |
| 10 | What are the important sources of water pollution? | (3) |

PART B*Answer one full question from each module, each question carries 14 marks.***MODULE 1**

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|----|---|------|
| 11 | a) Derive the Nernst Equation for a cell. Explain any three application of Nernst Equation. | (10) |
| | b) Calculate the conductivity of a given sample of water at 298 K which shows a conductance of 620 μ S in the given cell at 298K. A standard solution of 0.1M | (4) |

KCl shows a conductance of 12.34 mS in that cell. (Given that conductivity of 0.1 M KCl at 298 K is 0.01288 Scm^{-1} .)

- 12 a) What are reference electrodes? Give examples for primary reference and secondary reference electrodes and give their electrode reactions. (9)
- b) Calculate the emf of the cell $\text{Fe}/\text{Fe}^{2+}(0.01)//\text{Ag}^{+}(0.1)/\text{Ag}$ at 298 K if standard electrode potentials of Fe and Ag are -0.44 V and 0.8 V respectively. Write the cell reaction. (5)

MODULE 2

- 13 a) Explain chemical shift. Discuss any four factors affecting chemical shift with proper examples. (10)
- b) Describe the vibrational modes of carbon dioxide and determine which ones absorb infrared radiation. (4)
- 14 a) What is spin-spin coupling? Draw the NMR spectra with spin-spin coupling of (i) 1-chloropropane, (ii) 2-chloropropane, (iii) 2, 2-dichloropropane. (8)
- b) Discuss the instrumentation of UV-visible spectroscopy with labelled sketch. Write two applications of UV-visible spectroscopy. (6)

MODULE 3

- 15 a) Explain the principle, instrumentation, working and applications of differential thermal analysis. (10)
- b) Explain the instrumentation of scanning electron microscope with a neat sketch. (4)
- 16 a) Explain the principle, instrumentation, working and applications of high performance liquid chromatography. (10)
- b) Describe the classification of nanomaterials based on dimension. (4)

MODULE 4

- 17 a) Explain the construction and working of OLED with the help of a neat labelled sketch. (8)
- b) Write the Fischer projection structure for all the optical isomers possible for tartaric acid ($\text{HOOC}-\text{CH}(\text{OH})-\text{CH}(\text{OH})-\text{COOH}$)? Classify them as optically active or inactive and give reason for your answer. (6)
- 18 a) Explain the classification of conducting polymer. (8)
- b) Write the structure of all possible isomers for $\text{C}_4\text{H}_9\text{Cl}$. Classify them as optically active or inactive. (6)

MODULE 5

- 19 a) Define COD (chemical oxygen demand) and briefly explain the procedure for the estimation of COD. (8)
- b) 100 ml of sewage water sample after reaction with a fixed amount of acidified dichromate solution consumes 18 mL, 0.12 N ferrous solutions. For the blank titration the ferrous solution consumed is 27 mL, find the COD of sewage water. (6)
- 20 a) Explain the various steps involved in municipal water treatment. (10)
- b) Explain breakpoint chlorination with the help of the graph (4)
