

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Second Semester B.Tech Degree Examination June 2022 (2019 scheme)

Course Code: CYT100

Course Name: ENGINEERING CHEMISTRY
(2019 -Scheme)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks

Marks

- 1 How will you determine the standard electrode potential of Fe/Fe²⁺ electrode using calomel electrode? (3)
- 2 A Zn rod is dipped in 0.3 M CuSO₄ solution at 25°C. Displacement reaction takes place then it attains equilibrium. Find the equilibrium constant for this reaction. The standard reduction potential of Zn and Cu are -0.76 V and +0.34 V respectively. (3)
- 3 Which of the following molecules can give UV visible spectrum (200nm - 800nm)? (3)
a) CH₄ b) N₂ c) Butadiene d) Benzene
- 4 How many vibrational modes are possible for CO₂ molecule? Sketch the vibrational modes (3)
- 5 List any three application of DTA (3)
- 6 Distinguish between isocratic elution and gradient elution in HPLC (3)
- 7 What is tautomerism? Illustrate tautomerism in CH₃-CO-CH₃ (3)
- 8 What are conducting polymers? Draw the structure of polyacetylene and polyaniline (3)
- 9 Calculate the temporary and permanent hardness of water sample having following composition, Ca²⁺=300 ppm Mg²⁺= 192 ppm, HCO₃⁻ = 122 ppm (3)
- 10 What is COD? How is it determined? (3)

PART B

Answer one full question from each module, each question carries 14 marks.

MODULE 1

- 11 a What is electrochemical series? Discuss any five applications. (7)

- b Define conductivity. How cell constant is determined? How conductivity of a water sample is determined? (7)
- 12 a Explain the principle of electroless copper plating and give two applications (7)
- b Explain various types of cathodic protection (7)

MODULE 2

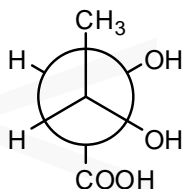
- 13 a Write a note on magnetic resonance imaging (MRI). List applications of it in medical diagnosis (8)
- b Predict high resolution ^1H NMR spectra of 1-Chloroethane and 2-Chloropropane (6)
- 14 a Define Beer Lambert law and deduce the integrated form. Discuss the plot of absorbance verses concentration, what does the slope of the graph represents? (8)
- b The CO molecule absorbs infrared radiation of wavenumber 2154 cm^{-1} . Calculate the force constant of the chemical bond, given that atomic masses of C =12 amu and O=16 amu (Given that $1\text{ amu} = 1.66 \times 10^{-27}\text{ Kg}$) (6)

MODULE 3

- 15 a What is thermogravimetric analysis? Explain the instrumentation. Illustrate the thermogram of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ (10)
- b How will you compare thermal stability of polymers from TGA? (4)
- 16 a What is thin layer chromatography? Explain the procedure and visualisation techniques (7)
- b What is gas chromatography? Explain the instrumentation and working. What is the importance of temperature programme in GC? (7)

MODULE 4

- 17 a What is optical isomerism and give the condition for optical activity? Explain with an example. How can we distinguish enantiomers based on physical, chemical and biological properties? (7)
- b Convert the Newman projection formula into Fischer projection formula and assign R,S notation (7)



- 18 a What is ABS? How it is synthesised? Discuss any two properties and applications. (7)

- b What is Kevlar? How is it synthesised? Discuss any two properties and applications. (7)

MODULE 5

- 19 a What are ion exchange resins? Explain ion exchange process used for demineralisation of water. How exhausted resins are regenerated? (8)
- b What is reverse osmosis? How is it used for the purification of sea water? Give the advantages (6)
- 20 a Explain primary, secondary and tertiary process involved in sewage water treatment with the help of flow diagram (10)
- b 100 mL of sewage water sample is diluted to 600 mL with dilution water, the initial dissolved oxygen was 7.4 ppm. The dissolved oxygen level after 5 days of incubation was 3.8 ppm. Find the BOD of the water sample. (4)
