

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
First Semester B.Tech Degree Examination December 2021 (2019 scheme)

Course Code: CYT100

Course Name: ENGINEERING CHEMISTRY
(2019-Scheme)

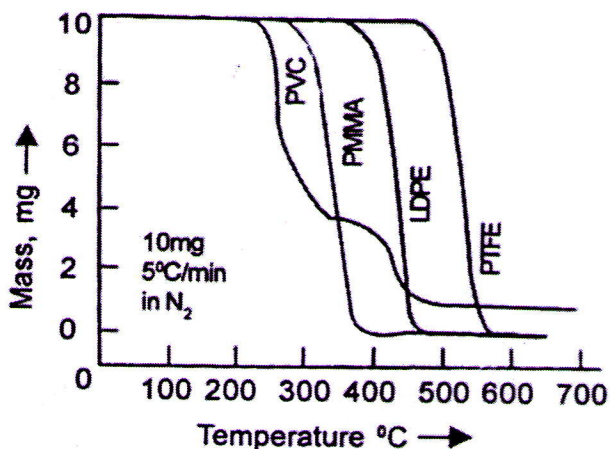
Max. Marks: 100

Duration: 3 Hours

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

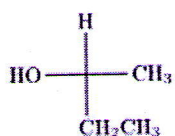
Marks

- | | | |
|---|--|-----|
| 1 | How is Helmholtz electrical double layer formed? | (3) |
| 2 | Calculate the single electrode potential of dichromate electrode at 25 ⁰ C when [Cr ₂ O ₇ ²⁻] is 0.3M, [Cr ³⁺] is 0.02M and [H ⁺] is 1M. Given: Cr ₂ O ₇ ²⁻ + 14 H ⁺ + 6e → 2Cr ³⁺ + 7H ₂ O ; E ⁰ = 1.33 V | (3) |
| 3 | Recognize the atoms showing NMR phenomenon among the following. Give reason. a) ¹ H b) ² H c) ³ H d) ¹⁶ / ₈ O e) ¹⁸ / ₈ O f) ¹⁴ / ₇ N | (3) |
| 4 | IR spectroscopy can be used to differentiate intra molecular and inter molecular hydrogen bonds. Explain with an example. | (3) |
| 5 | Compare the thermal stability of PVC, PMMA, LDPE and PTFE using TG given below. Justify your answer. | (3) |

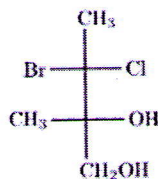


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|---|---|-----|
| 6 | Give the principle of TLC. Mention two applications of TLC. | (3) |
| 7 | Assign the R/S notation to the following compounds. | (3) |

i.



ii



- 8 Explain doping in conducting polymers. (3)
- 9 A sample of water on analysis gives the following results. $\text{Ca}^{2+} = 200 \text{ mg/L}$, $\text{Mg}^{2+} = 180 \text{ mg/L}$, $\text{HCO}_3^- = 360 \text{ mg/L}$, $\text{Cl}^- = 200 \text{ mg/L}$ and $\text{Na}^+ = 80 \text{ mg/L}$. Calculate temporary and permanent hardness. (3)
- 10 Differentiate between aerobic and anaerobic oxidation. (3)

PART B

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

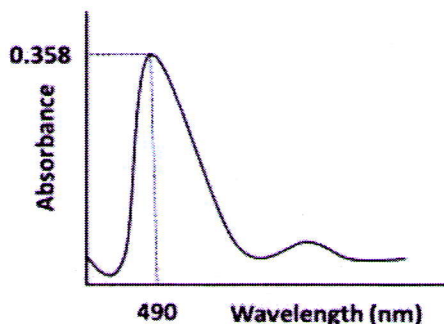
Module-I

- 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 copper plating. (6)
- 12 a) Write the principle and procedure for the estimation of ferrous ion using dichromate solution potentiometrically. $E^0_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.77 \text{ V}$ (8)
- b) Emf of an electrochemical cell is 1.5175 V at 20°C and 1.5213 V at 35°C . If the cell reaction involve 2 electrons, find the standard emf of the cell and the reaction quotient. (6)

Module-II

- 13 a) What are the various types of electronic transitions possible in organic molecules? Give examples of each. Also give the instrumentation of UV Visible spectrophotometer. (8)
- b) Suggest structural formula for the following compounds such that they give a single signal in proton NMR spectroscopy. a) $\text{C}_9\text{H}_{18}\text{O}$ and b) $\text{C}_{12}\text{H}_{18}$ (6)
- 14 a) Write the various modes of vibration possible for HCl, CO_2 and H_2O and state which of these modes are IR active. Write reason for their IR activity. (8)

- b) State Beer- Lambert's law and explain the term molar extinction co-efficient. (6)
- Given is the absorption spectrum of a compound A of 2.5×10^{-6} M concentration, when measured using 1 cm cuvette in a UV-Vis spectrometer. Calculate the unknown concentration of a test sample of compound A if the absorbance is 0.518, when measured in the same condition.



Module-III

- 15 a) Sketch the instrumentation of DTA and explain the principle. Explain the DTA of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$. (8)
- b) Briefly explain the principle and instrumentation of SEM with the help of a diagram. (6)
- 16 a) Describe the principle and steps to be followed in column chromatography. (10)
- b) How are nanomaterials classified on the basis of dimension? (4)

Module-IV

- 17 a) How many isomers (both structural and stereo) are possible for $\text{C}_4\text{H}_{10}\text{O}$? Draw the structure of each. (8)
- b) What are OLEDs? Explain the construction and working of OLEDs. (6)
- 18 a) Draw the cis and trans isomers of 1, 3-dimethyl cyclohexane. Which will be optically active? Draw all the conformers. Which conformer is more stable and why? (8)
- b) How is polyaniline synthesized? List any two properties and applications. (6)

Module-V

- 19 a) Explain the EDTA method for the estimation of hardness of water with calculation steps. (10)
- b) Write the procedure for estimating COD of a sample of waste water. (4)
- 20 a) Discuss the action of chlorine as a disinfectant. How is it applied? What is break point chlorination? Write any two advantages of breakpoint chlorination. (10)
- b) A pure water sample is added with 90 mg carbohydrate (CH_2O) per litre find the maximum BOD possible for the water sample. (4)
