

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

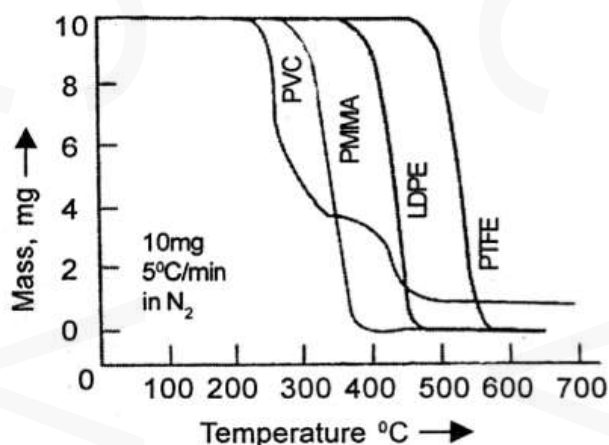
Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

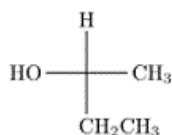
Marks

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| 1 | How is Helmholtz electrical double layer formed? | (3) |
| 2 | Calculate the single electrode potential of dichromate electrode at 25 ^o 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 ^o = 1.33 V | (3) |
| 3 | Recognize the atoms showing NMR phenomenon among the following. Give reason. a) ¹ ₁ H b) ² ₁ H c) ³ ₁ 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) |

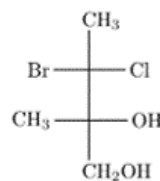


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|---|---|-----|
| 6 | Give the principle of TLC. Mention two applications of TLC. | (3) |
| 7 | Assign the R/S notation to the following compounds. | (3) |

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

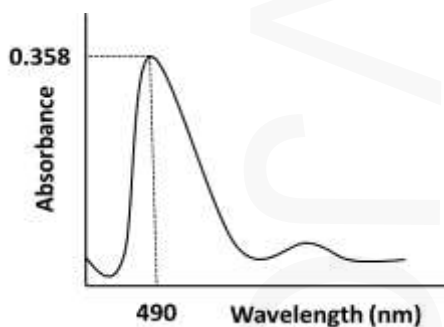
Module-I

- 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)
