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Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech S1 (Special Improvement) Examinations January 2021 (2019 scheme)

Course Code: CYT100

Course Name: ENGINEERING CHEMISTRY
(2019-Scheme)

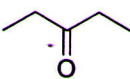
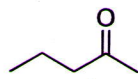
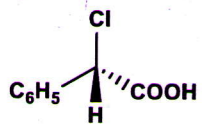
Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- 1 Compare electrolytic and electrochemical cells. (3)
- 2 Write the cell reactions, cell representation and calculate the standard EMF of the cell formed by silver and aluminium electrodes. $E^0_{Ag^+/Ag} = 0.8V$, $E^0_{Al^{3+}/Al} = -1.66V$ (3)
- 3 What is the requirement for a molecule to be IR active? Write two examples for IR active and inactive molecules. (3)
- 4 Predict number of signals for the following and justify your answer. (3)
 - a)  (3)
 - b)  (3)
- 5 TGA will not give information regarding phase changes. Give reason. (3)
- 6 Mention any three applications of SEM. (3)
- 7 Assign the **R-S** configuration for the following molecule and also write its Fischer projection formula. (3)

- 8 What are co-polymers? Give one example each for addition and condensation co-polymers. (3)
- 9 What is the chemistry behind the removal of temporary hardness by boiling? (3)
- 10 What are the factors that affect DO level in water? (3)

PART B

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

Module-I

- 11 a) Which are the different types of electrodes? Give examples for each type. Also write the equation for the electrode potential of each type. (7)
- b) Illustrate the applications of electrochemical series with suitable examples. (7)
- 12 a) What is the principle in potentiometric titration? Explain the end point determination of a redox reaction by potentiometric titration. (7)
- b) Describe the methods of cathodic protection. (7)

Module-II

- 13 a) Draw the expected NMR spectrum of methyl propanoate and point out how it differs from ethyl acetate (10)
- b) Write the mathematical representation of the law governing absorption of light by molecules of a solution. Also calculate the concentration of a solution if it shows a transmittance of 20% when taken in a cell of 2.5 cm thickness (Molar absorption coefficient is $12000 \text{ dm}^2 \text{ mol}^{-1}$). (4)
- 14 a) How can you differentiate NMR spectrum of $\text{CH}_3\text{CH}_2\text{Cl}$ and CH_3CHCl_2 using the concept of spin-spin splitting? (8)
- b) Comment on the various electronic transitions that are possible in the following molecules (i) C_2H_6 (ii) $\text{CH}_3\text{CH}_2\text{OH}$ and (iii) 1,3 butadiene. (6)

Module-III

- 15 a) Explain the principle and instrumentation of DTA with a neat diagram. Interpret the DTA thermogram of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$. (10)
- b) Discuss the classification of nanomaterials based on materials. (4)
- 16 a) Describe the principle, instrumentation, procedure and applications of GC. (10)
- b) Explain hydrothermal method of synthesis of nanomaterials. (4)

Module-IV

- 17 a) What is optical isomerism? What are the conditions for a molecule to be optically active? What are enantiomers and diastereoisomers? Give two examples for each. Mention two properties each of enantiomers and diastereoisomers. (8)
- b) What is polypyrrole? How is it synthesised? Mention two properties and two applications of polypyrrole. (6)

- 18 a) Draw and explain the conformational isomerism in (*cis*) and (*trans*) 1,2-dimethyl cyclohexane. Which conformer is more stable in each case? Give reason. (10)
- b) Write the structure of Kevlar and explain why it is used in cryogenic applications? (4)

Module-V

- 19 a) Explain aerobic and anaerobic methods for the waste water treatment. (10)
- b) A water sample contains 16.2 mg/L $\text{Ca}(\text{HCO}_3)_2$, 7.3 mg/L $\text{Mg}(\text{HCO}_3)_2$, 9.5 mg/L MgCl_2 and 13.6 mg/L CaSO_4 . Calculate the temporary and permanent hardness of water and what will happen if 10.6 mg/L NaHCO_3 is added? (4)
- 20 a) Explain the complexometric titration method for the estimation of hardness of water. Write necessary calculation steps. (10)
- b) Write any four disadvantages of hard water. (4)
