

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

First Semester B.Tech Degree Regular and Supplementary Examination December 2020 (2019 scheme)

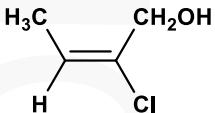
**Course Code: CYT100****Course Name: ENGINEERING CHEMISTRY****(2019-Scheme)**

Max. Marks: 100

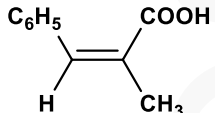
Duration: 3 Hours

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

Marks

- 1 What will be the standard electrode potential of Ni<sup>2+</sup> / Ni electrode if the cell potential of the cell Ni / Ni<sup>2+</sup>(1M) // Cu<sup>2+</sup>(0.1M) / Cu is 0.59 V at 25 °C?  
E<sup>0</sup><sub>Cu<sup>2+</sup>/Cu</sub> = 0.34 V (3)
- 2 Briefly explain the principle of electroless plating. (3)
- 3 Give the mechanism of interaction of electromagnetic radiation with oscillating dipole. (3)
- 4 State Beer-Lambert's law and write the differential form. (3)
- 5 Write any three differences of TGA and DTA. (3)
- 6 Explain sol-gel method for the synthesis of nano particles (3)
- 7 Determine the configuration of the following alkenes as *E* or *Z*: (3)
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A



B
- 8 Mention any three advantages of OLEDs over LED and LCD. (3)
- 9 Explain disinfection by chlorination. (3)
- 10 Compare BOD and COD. (3)

**PART B***Answer one full question from each module, each question carries 14 marks***Module-I**

- 11 a) Explain the mechanism of electrochemical corrosion in different environmental conditions. (10)
- b) How is the cell constant of a conductivity cell measured? (4)

- 12 a) Describe the construction and working of Li-ion battery. What are the major advantages of it? (10)
- b) Calculate the EMF of the cell at 25°C: (4)
- $$\text{Al} / \text{Al}^{3+}(0.1\text{M}) // \text{Sn}^{4+}(0.1\text{M}) / \text{Sn}^{2+}(0.01\text{M})$$
- $$E_{\text{Al}^{3+}/\text{Al}}^0 = -1.66 \text{ V}, \quad E_{\text{Sn}^{4+}/\text{Sn}^{2+}}^0 = 0.15 \text{ V}$$

### Module-II

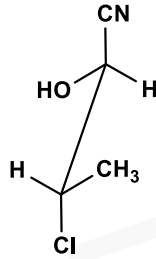
- 13 a) Define chemical shift in NMR and explain the factors affecting chemical shift with examples. (8)
- b) Calculate the force constant of H-F molecule that is showing IR absorption signal at 4000  $\text{cm}^{-1}$ . By what factor do you expect this frequency to shift if Deuterium is substituted for Hydrogen in this molecule? Given that atomic masses of H and F are 1u and 19 u, respectively. (6)
- 14 a) How many vibrational modes are possible for the molecules CO, NO, CO<sub>2</sub> and H<sub>2</sub>O? Draw the vibrational modes of CO<sub>2</sub> and H<sub>2</sub>O and explain their IR active modes. (8)
- b) Each compound gives only one signal in its <sup>1</sup>H-NMR spectrum. Propose a structural formula for each. a) C<sub>8</sub>H<sub>18</sub> and b) C<sub>8</sub>H<sub>18</sub>O (6)

### Module-III

- 15 a) Describe the instrumentation, principle and working of SEM with the help of a labelled diagram. Give any two applications. (10)
- b) Explain the visualization techniques used in thin layer chromatography. (4)
- 16 a) Describe the principle, instrumentation, procedure and applications of HPLC. (10)
- b) How TGA is used to analyze thermal stability of polymers? (4)

### Module-IV

- 17 a) Discuss the conformations in butane by depicting the Newman formula about C2-C3 bond of all the conformers. Also draw the energy level diagram with dihedral angle. (10)
- b) How is ABS synthesized? Mention some applications. (4)
- 18 a) Explain the rules for assigning *R-S* configuration and determine the *R-S* configuration of all the asymmetric carbon atoms in the molecule after writing its Fischer projection formula. (8)



- b) What is meant by doping of polymers? Describe the different types of doping. (6)

### Module-V

- 19 a) Describe the steps involved in municipal water treatment. (10)

- b) The following data are obtained for a hard water sample from an EDTA experiment (4)

i) 20 mL standard hard water (5 g/L  $\text{CaCO}_3$ ) = 25 mL EDTA solution

ii) 100 mL of hard water sample = 24 mL EDTA solution

iii) 100 mL of boiled hard water sample = 18 mL EDTA solution

Calculate the temporary and permanent hardness.

- 20 a) With the help of a flow diagram explain the steps involved in sewage treatment. (10)

- b) Calculate the temporary and permanent hardness of water sample containing the following dissolved salts. (4)

$\text{Ca}(\text{HCO}_3)_2 = 28 \text{ mg/L}$ ;  $\text{CaSO}_4 = 18 \text{ mg/L}$ ;  $\text{Mg}(\text{HCO}_3)_2 = 32 \text{ mg/L}$ ;

$\text{MgCl}_2 = 30 \text{ mg/L}$ ;  $\text{NaCl} = 58 \text{ mg/L}$ .

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