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NSA192009

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Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER B.TECH DEGREE EXAMINATION(2019 SCHEME), DECEMBER 2019

Course Code: CYT100

Course Name: ENGINEERING CHEMISTRY
(2019-Scheme)

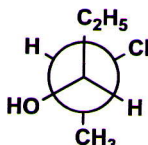
Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

- 1 Calculate the equilibrium constant for the following reaction at 25°C:-

$$\text{Fe}_{(s)} + \text{Cu}^{2+}_{(aq)} = \text{Fe}^{2+}_{(aq)} + \text{Cu}_{(s)}$$
 Given $E^0_{\text{Fe}^{2+}/\text{Fe}} = -0.44 \text{ V}$, $E^0_{\text{Cu}^{2+}/\text{Cu}} = 0.34 \text{ V}$ (3)
- 2 Give the electrochemical reaction taking place when an iron nail is dipped in dil.HCl. $E^0_{\text{Fe}^{2+}/\text{Fe}} = -0.44 \text{ V}$, $E^0_{\text{Fe}^{3+}/\text{Fe}} = -0.04 \text{ V}$, $E^0_{\text{H}^+/\text{H}_2} = 0 \text{ V}$. (3)
- 3 State and explain the law governing absorption of electromagnetic radiation by matter. Give any one limitation of this law. (3)
- 4 Which molecule will absorb at longest wavelength in UV? Explain.
 a)  b)  (3)
- 5 What are the classifications of chromatography based on physical state of mobile and stationary phases? (3)
- 6 Explain the synthesis of nanoparticles by chemical reduction. (3)
- 7 Write the IUPAC name and assign R/S notation.
 (3)
- 8 Write the different types of copolymers formed by the monomers A and B. (3)
- 9 Calculate the hardness of (i) 0.05 M AlCl_3 and (ii) 0.04 N MgCl_2 . (3)
- 10 What is the significance of measuring BOD of waste water? (3)

PART B

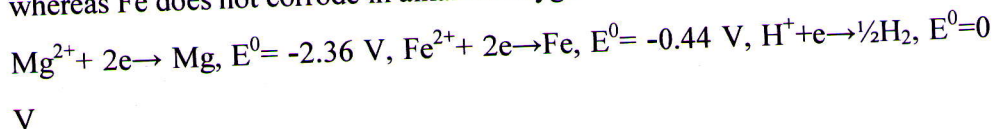
Answer one full question from each module, each question carries 14 marks

Module-I

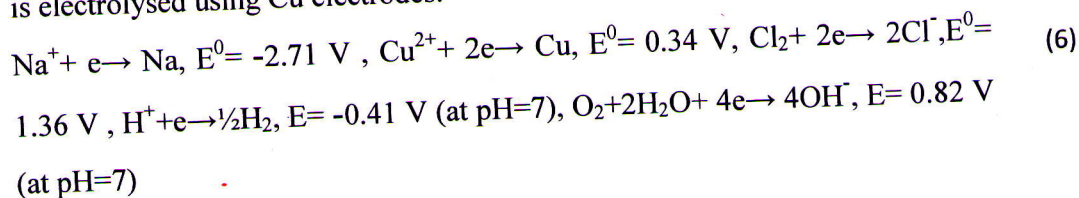
- 11 a) Explain the construction and working of a calomel electrode as a reference electrode. What is the variation in the potential of a calomel electrode with change in chloride ion concentration? (8)

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- b) Why Mg corrodes in both acidic and alkaline oxygen deficient conditions, whereas Fe does not corrode in alkaline oxygen deficient condition? (6)

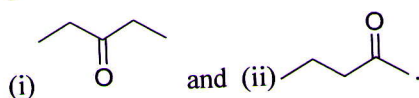


- 12 a) Write the construction, working and advantages of Li-ion cell. (8)
b) What are the products of electrolysis at cathode and anode when NaCl solution is electrolysed using Cu electrodes.



Module-II

- 13 a) Predict the number of signals, their relative positions and splitting pattern in the nmr spectrum of the following. (8)



- b) Compare the strengths of C-H bond and C=O bond if the absorption frequencies are 3000cm^{-1} and 1700cm^{-1} respectively. (6)
- 14 a) Give the instrumentation of UV spectrophotometer and explain the components in it. Comment on the role of conjugation in the wavelength of absorption with the help of examples. (8)
- b) Briefly explain the principle involved in MRI. Mention any two applications. (6)

Module-III

- 15 a) Discuss in detail the Instrumentation of TG and DTA with neat sketch. (8)
b) Discuss the various detectors used in GC and HPLC. (6)
- 16 a) Briefly explain the principle, instrumentation and applications of SEM. (8)
b) Differentiate between TGA and DTA. (6)

Module-IV

- 17 a) Draw and explain the conformational isomerism in ethane and butane. Draw the energy profile diagram. Which conformer is more stable in each case? (10)
b) Explain the classification of conducting polymers. (4)
- 18 a) What is meant by conformational isomerism? Draw the *cis* and *trans* isomers of 1,4-dimethyl cyclohexane. In each case, mention the more stable conformer. (8)
b) Brief out the basic principle, construction and working of OLED. (6)

Module-V

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- 19 a) Describe the various steps involved in sewage treatment. (10)
b) Write any four disadvantages of hard water. (4)
- 20 a) Write the principle and procedure of estimation of permanent and temporary hardness of water by complexometric titration. (8)
- b) 50 mL sewage water sample after reaction with 20 mL of $K_2Cr_2O_7$ required 12.4 mL of 0.2 N ferrous ammonium sulphate solution. For blank titration 20 mL $K_2Cr_2O_7$ required 20.4 mL of 0.2 N ferrous ammonium sulphate solution. (6)
Calculate the COD of the sample.
