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

Course Code: CYT100

Course Name: ENGINEERING CHEMISTRY



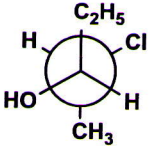
(2019-Scheme)

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 25⁰C:-
 $\text{Fe}_{(s)} + \text{Cu}^{2+}_{(aq)} = \text{Fe}^{2+}_{(aq)} + \text{Cu}_{(s)}$ 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 AlCl₃ and (ii) 0.04 N MgCl₂. (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)

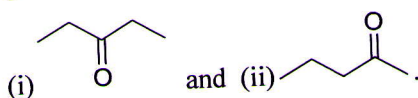
B

- b) Why Mg corrodes in both acidic and alkaline oxygen deficient conditions, whereas Fe does not corrode in alkaline oxygen deficient condition? (6)
- $\text{Mg}^{2+} + 2\text{e} \rightarrow \text{Mg}$, $E^0 = -2.36 \text{ V}$, $\text{Fe}^{2+} + 2\text{e} \rightarrow \text{Fe}$, $E^0 = -0.44 \text{ V}$, $\text{H}^+ + \text{e} \rightarrow \frac{1}{2}\text{H}_2$, $E^0 = 0 \text{ V}$

- 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. (8)
- $\text{Na}^+ + \text{e} \rightarrow \text{Na}$, $E^0 = -2.71 \text{ V}$, $\text{Cu}^{2+} + 2\text{e} \rightarrow \text{Cu}$, $E^0 = 0.34 \text{ V}$, $\text{Cl}_2 + 2\text{e} \rightarrow 2\text{Cl}^-$, $E^0 = 1.36 \text{ V}$, $\text{H}^+ + \text{e} \rightarrow \frac{1}{2}\text{H}_2$, $E = -0.41 \text{ V}$ (at pH=7), $\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e} \rightarrow 4\text{OH}^-$, $E = 0.82 \text{ V}$ (at pH=7)

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

- 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.
