APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
First Semester B.Tech Degree (S, FE) Examination June 2024 (2019 Scheme)

Course Code: CYT 100
Course Name: ENGINEERING CHEMISTRY
(2019 -Scheme)

Max. Marks: 100   Duration: 3 Hours

PART A
Answer all questions, each carries 3 marks

Marks

1   Write the cell reactions, cell representation and calculate the standard EMF of   (3)
     the cell formed by iron and aluminium electrodes.

     $E^0_{Fe\ 2+/Fe}$= -0.44, $E^0_{Al3+/Al}$= -1.66V

2   Briefly explain sacrificial anodic protection method.   (3)

3   Calculate the number of vibrational modes of the following molecules.   (3)

     a) CO_2 b) C_6H_6 c) CH_4

4   At definite wavelength, an absorber when placed in a cell of 1cm path length   (3)
     transmits 80% of the incident light. If the molar absorptivity of the absorber at
     this wavelength is $200mol^{-1}dm^2$, find out its concentration.

5   Write a note on synthesis of nanoparticle by sol-gel method.   (3)

6   Define R_f value. Explain its importance in chromatography.   (3)

7   Explain keto-enol tautomerism and metamerism with suitable examples.   (3)

8   What are conducting polymers? How is polyaniline synthesized?   (3)

9   How is the exhausted resin regenerated in ion exchange process?   (3)

10   Discuss the difference between BOD and COD.   (3)

PART B

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

MODULE 1

11   a   Explain the construction and working of Li-ion battery. Write any two   (8)
         advantages of it.

     b   What is electroless plating? Explain the electroless plating of nickel.   (6)

12   a   Describe the principle and procedure for the estimation of ferrous iron   (10)
         potentiometrically. Explain how the end point is determined. Give any two
         advantages.

b   Find the potential of hydrogen electrode at 25^0C for solution of pH= 0 and   (4)
pH=14. Why does Mg metal reacts with both acids and bases to liberate H_2 gas;
whereas Fe metal can liberate H_2 only from acids? ($E^0_{Fe2+/Fe}$= -0.44; $E^0_{Mg2+/Mg}$= -2.37V)

MODULE 2

13   a   What is spin-spin splitting? Explain the splitting pattern in the ^{1}HNMR spectrum   (8)
of CH_3CH_2Cl and CH_3CHCl_2

    b   Discuss the principle and instrumentation of UV-Visible spectrophotometer.   (6)

14   a   Define the term chemical shift. Discuss the various factors that affect the   (8)
chemical shift of protons with examples.

    b   State the principle of vibrational (IR) spectroscopy. Arrange the following bonds   (6)
in the order of increasing stretching frequencies C-C, C=C and C≡C; Write
suitable explanations for your answer.

MODULE 3

15   a   Explain the principle and instrumentation of TGA with a neat diagram. Sketch   (8)
the thermogram of $CaC_2O_4.H_2O$.

    b   Describe the principle and procedure of column chromatography.   (6)

16   a   Explain the principle, instrumentation and working of SEM.   (8)

    b   What is the principle of GC? Discuss any two detectors used in GC.   (6)

MODULE 4

17   a   Explain the sequence rules for assigning R-S configuration. Assign the R-S   (8)
configuration of all the asymmetric carbon atoms in the following molecule by
converting the Newman projection formula into Fischer projection formula.
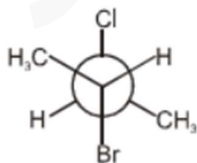
    b   Discuss the synthesis of ABS and Kevlar.   (6)

18   a   Briefly explain the principle, construction and working of OLED with the help   (8)
of a neat labelled sketch.

    b   Discuss conformational analysis of n-butane. Give its potential energy-dihedral   (6)
angle graph.

MODULE 5

19 a   With the help of a flow diagram describe the steps involved in sewage treatment.   (10)

b   A sample of water on analysis gave the following results. Ca^{2+}=200mg/L, Mg^{2+}=180mg/L, HCO_3^- =360mg/L, Na^+=80mg/L and Cl^-=200mg/L. Calculate the temporary, permanent and total hardness of the sample.   (4)

20 a   Explain the principle and procedure for the estimation of hardness of water by EDTA method.   (8)

b   Discuss desalination by reverse osmosis with a labelled figure and mention its advantages.   (6)

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