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Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
First Semester B.Tech Degree Regular and Supplementary Examination December 2023 (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	Distinguish between galvanic series and electrochemical series	(3)
2	Calculate the voltage of cell $Zn \mid ZnSO_4$ (0.0004M) $\parallel CdSO_4$ (0.02M) $\mid Cd$. The standard reduction potential of Zn and Cd are -0.763 V and -0.403 V respectively	(3)
3	Alkanes are colourless. Explain this in terms of electronic transitions possible in a molecule	(3)
4	Which of the following nuclei can give NMR spectrum? Explain a) $_6C^{12}$ b)$_6C^{13}$ c)$_1H^1$ d)$_1H^2$	(3)
5	Distinguish between TGA and DTA	(3)
6	Give any three applications of nanomaterials	(3)
7	Demonstrate the structure and two uses of ABS	(3)
8	Draw the mirror image and assign the R,S notation of asymmetric carbon atom.	(3)
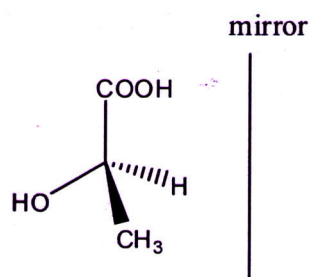
9	What do you understand by hardness of water? How is it expressed?	(3)
10	What is reverse osmosis? Discuss any one of its merits	(3)

PART B

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

MODULE 1

11	a	Discuss the mechanism of electrochemical corrosion of iron under different environments	(10)

b   What are the advantages of electroless plating? (4)

12 a   Why do we prefer glass electrode for the measurement of pH? Explain (10)
determination of pH with neat diagram

b   Iodine (I_2) and bromine (Br_2) are added to solution containing (I^-) and (Br^-) ions. (4)
What reaction would occur if the concentration of each species is 1 M? You are
given with standard reduction potentials of I_2 & Br_2

$I_2 + 2e^- \rightarrow 2 I^-$ $E^o = +0.54$ V

$Br_2 + 2e^- \rightarrow 2 Br^-$; $E^o = +1.08$ V

MODULE 2

13 a   What is meant by the term chemical shift in ^1H NMR spectroscopy? Explain the (10)
factors affecting it with suitable examples

b   Why 1,3-butadiene absorbs at longer wavelength compared to 1,4-pentadiene and (4)
n-butane?

14 a   Describe how IR spectroscopy is used for (8)

i)   determination of functional groups

ii)   determination of force constant

iii)   detection of impurities

iv)   distinguishing intra and inter molecular hydrogen bond

b   Find the ratio of force constants of HF to that of HCl. Given that observed (6)
vibrational wave number of HF is 3958 cm^{-1} and HCl is 2886 cm^{-1}. Masses of H,
F, and Cl are 1u, 19 u, and 35 u respectively.

MODULE 3

15 a   Explain the classification of nanomaterials with examples (8)

b   Elucidate the DTA of Calcium oxalate monohydrate (6)

16 a   Discuss the instrumentation and working of HPLC (10)

b   Discuss the visualisation techniques used in TLC (4)

MODULE 4

17 a   Discuss the construction, working and advantages of OLED (10)

b   Draw the conformations of ethane, give its potential energy-dihedral angle graph (4)

18 a   What is stereo isomerism? Explain the classification of stereo isomerism. (10)

b   Discuss the synthesis of Kevlar (4)

MODULE 5

19 a   Define COD. How is it determined? Find COD of water sample, if 200 mL of (7)

water sample after reaction with fixed amount of acidified $K_2Cr_2O_7$ on titration consumes 18.3 mL of 0.125 N ferrous solution. For blank titration the ferrous solution consumed is 26.4 mL.

b What are ion exchange resins? How is it used for demineralisation of water and how exhausted resins are regenerated? (7)

20 a What is meant by dissolved oxygen in water? What are the factors which govern the amount of dissolved oxygen in water? How it is determined by titration? (8)

b Distinguish between aerobic and anaerobic decomposition of sewage water (6)

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