Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1,S2(S,FE) Examination May 2021(2015 Scheme)

Course Code: CY100
Course Name: ENGINEERING CHEMISTRY

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all Questions. Each question carries 2 Marks Marks

1 Write the equation for the number of vibrational degrees of freedom in a linear molecule if the number of atoms in the molecule is 'n' and hence predict the number of vibrational degrees of freedom in HCl. (2)

2 Write Nernst equation for equilibrium reduction potential of a half cell and explain the terms. (2)

3 What is R_f factor in TLC? (2)

4 What are fullerenes? (2)

5 Define aniline point. (2)

6 What is natural gas? Distinguish between LNG and CNG (2)

7 Calculate the carbonate and non-carbonate hardness of a water sample having 14.6mg/L of $Mg(HCO_3)_2$, 16.2 mg/L of $Ca(HCO_3)_2$, 6 mg/L of $MgSO_4$. (2)

8 What are the factors affecting dissolved oxygen in water? (2)

PART B

Answer all questions. Each question carries 3 Marks

9 Calculate the C-H stretching frequency, provided that the force constant of the bond is 5×10^2 Nm^{-1} and mass of carbon atom is 20×10^{-27} Kg and hydrogen atom is 1.6×10^{-27} Kg. (3)

10 With the help of a diagram explain the determination of standard electrode potential of a zinc electrode using SHE. (3)

11 A resistance of 0.15 N solution of a salt contained in a volume between two electrodes 5 cm apart and 12.5 cm^2 in area was found to be 80 ohms. Calculate specific conductance of the solution. (3)

12 Write the preparation and any two properties of ABS. (3)

13 Calculate the gross and net calorific values of coal having the following (3)

compositions. carbon = 85 %, hydrogen = 8 %, sulphur = 1%, nitrogen = 2%, ash = 4 %, latent heat of steam = 587 cal/gm.

14 Write a note on solid lubricants using suitable examples. (3)

15 Explain the chemical reactions when soluble soap (sodium salt of a higher fatty acid) is added to hard water (3)

16 Explain UASB process for the treatment of waste water (3)

PART C

Answer all questions. Each question carries 10 Marks

17 a. Explain the phenomenon of spin-spin splitting (4)

b. Predict the number of signals, chemical shift and spin – spin-splitting in the NMR spectra of 2-bromopropanoic acid (CH_3-CHBr-COOH) and ethane (CH_3-CH_3). (6)

OR

18 a. Write a note on various types of electronic transitions (6)

b. A solution shows a transmittance of 20 % when taken in a cell of 2.5 cm thickness. Calculate its concentration if the molar absorption coefficient is 12000 $dm^3mol^{-1}cm^{-1}$. (4)

19 a. What are reference electrodes? Give the electrode representation of standard hydrogen electrode. (2)

b. The standard electrode potential of a zinc electrode at 25^oC is -0.76 V. Calculate the electrode potential of zinc electrode when a zinc electrode is immersed in 0.02 M $ZnSO_4$ solution at 25^oC assumes complete ionization of $ZnSO_4$. (2)

c. Explain the construction of a glass electrode and write the pH determination of a solution using glass electrode with a neat labelled sketch. (6)

OR

20 Explain the construction, working and advantages of a H_2-O_2 fuel cell with a labelled figure. (10)

21 Discuss the principle, instrumentation and applications of HPLC with the help of a block diagram. (10)

OR

22 a. Explain the principle and instrumentation of DTA. (6)

b. Describe the differential thermogram of calcium oxalate with a figure. (4)

23	a.	Explain preparation, properties and applications of silicone rubber	(6)
	b.	Explain the synthesis of nanomaterials by sol-gel method	(4)

OR

24	a.	Give the preparation and properties of polypyrrole.	(4)
	b.	Write a note on the various mechanisms of conduction in conducting polymers.	(6)
25		Explain the determination of calorific value of a lubricant using a bomb calorimeter with the help of a diagram.	(10)

OR

26	a.	What is biodiesel? How is it prepared?	(5)
	b.	Distinguish between Octane number and Cetane number	(5)
27		What are ion exchange resins? Discuss the water softening method by ion exchange method.	(10)

OR

28		Explain principle and detailed procedure of EDTA method for the determination of hardness.	(10)

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