Sub Code: AHT002 **ROLL NO……..……..**

SEMESTER EXAMINATION, 2022 – 23

Ist yr B.Tech. – All Branch
Engineering Chemistry

Duration: 3:00 hrs **Max Marks: 100**

Note: - Attempt all questions. All Questions carry equal marks. In case of any ambiguity or missing data, the same may be assumed and state the assumption made in the answer.

Q 1.	Answer any four parts of the following. a) Explain metallic bonding in metal based on molecular orbital theory. b) Discuss the hybridization, molecular geometry and shape of H_2O and NH_3 molecule. c) Explain reverse osmosis process and also give its advantage. d) Give the classification of polymer based on monomer. e) Explain the shielding effect in NMR spectroscopy with the help of suitable example. f) Explain the basic principle of lime-soda process. Give the reaction of lime and soda with hardness causing ions	5x4=20
Q 2.	Answer any four parts of the following. a) Differentiate between liquid lubricant and solid lubricant. Explain why MoS_2 is better lubricant than graphite. b) Explain Heisenberg's uncertainty principle. The uncertainty for the calculation of radius of the 1st Bohr orbit is 2% for the hydrogen atom. What will be the uncertainty in velocity of electron in the 1st Bohr orbit ($h = 6.626\times10^{-34}$ Joule.sec and $m_e = 9.1\times10^{-31}$ Kg). c) Give the synthesis of aspirin and phenacetin. d) Discuss the electrochemical theory of corrosion in alkaline medium along with its prevention. e) By passing 50 litres of NaCl solution containing 250 g/l of NaCl, an exhausted zeolite softener bed was regenerated. Calculate the litres of hard water sample (hardness equal to 200 ppm as $CaCO_3$) which can be softened by regenerated bed of zeolite softener. f) Explain type of doping that can increase electrical conductivity in conjugated conducting polymer.	5x4=20
Q 3.	Answer any two parts of the following. a) Calculate Crystal field stabilization energy (CFSE) for $[Fe(H_2O)_6]^{2+}$ and $[Fe(CN)_6]^{4-}$. Give their hybridization, spin only magnetic moment and magnetic properties. b) Write short note on (i) bimolecular Nucleophilic substitution reaction and (ii) Diels-Alder reaction c) Define alkalinity of water. What is its cause? Sample of water was alkaline to both phenolphthalein and methyl orange. 100 ml of this water sample require 6 ml of N/50 HCl for phenolphthalein end point and 10 ml of the acid to methyl orange end point. Determine the type and extent of alkalinity present.	10x2= 20
Q 4.	Answer any two parts of the following. a) Give the significance of electrochemical series. Consider a cell reaction:	10x2= 20

	$Zn/Zn^{2+}[0.1M]\|\|Cu^{2+}[0.2M]/Cu$. Standard reduction potential of Zn^{2+} and Cu^{2+} are -0.76V and0.34V respectively. Write half-cell reactions, complete cell reaction and calculate EMF of the cell. b) Give the construction and working of bomb calorimeter along with correction associated with GCV. Calculate GCV and NCV of coal having the following compositions: C = 85%, H = 7%, S = 1%, N= 2%, ash = 4% and heat capacity of steam = 587 cal/g. c) Differentiate between enthalpy and entropy. Calculate the ΔH^0 and ΔG^0 for the reaction: $CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(l)$. Given that enthalpies of formation of CH_4, CO_2 and H_2O are 74.8 $kJmol^{-1}$, − 393.5 $kJmol^{-1}$, and − 286 $kJmol^{-1}$, respectively and change in entropy for the above reaction is 0.07538 kJ/K.	
Q 5.	Answer any two parts of the following. a) Give the preparation, properties and application of PMMA, Teflon, PET and Nylon-6. b) Explain various shift possible in UV-Visible spectroscopy. Give the all other possible electronic transition in any molecule if it shows $n \rightarrow \pi^*$ transition and also give one example of it. c) Give the principle of rotational spectroscopy and its selection rule. The first rotational line in the rotational spectrum of CO is observed at 3.84235 cm^{-1}. Calculate the rotational constant (B) and bond length of CO. The relative atomic weight C =12.00 and O = 15.9994.	10x2= 20

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