Central University of Haryana
Term End Examination July, 2023
B.Tech. Programmes

Branch: CE and CSE
Course Code: BT CH 102A
Course Title: Chemistry

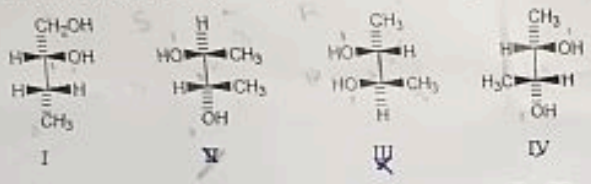
Max Time: 03:00 Hrs
Max Marks: 70

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q 1.

a. Which of the following alkane exhibit optical activity?
Neopentane b) Isopentane c) 3–Methylpentane d) 3–Methylhexane
b. How many kinds of protons are in CH_3-CCl=CH_2?
c. Calculate the bond order of NO^+ molecule using molecular energy level diagram?
d. How you will differentiate between π to π* and n to π* transitions in acetone in UV spectroscopy?
e. In extrinsic semiconductors, the conduction is due to the addition of ..... and ....., whereby conductivity can be increased .....times.
f. When does a real gas obey the ideal gas equation closely?
g. Which compound (I-IV) is a meso compound? (7×2=14)



I II III IV

PART –II

Q 2.

a. What do you mean by the angular probability distribution of d orbitals? Give the pictorial presentation.
b. Calculate the number of unpaired e^- and CFSE value in the following complexes:
I. $[Fe(CN)_6]^{-4}$ ion and II. $[Co(NH_3)_6]^{+3}$ ion
c. What is meant by "Effective nuclear charge"? Calculate Z_{eff} experienced by a 3p electron in the Cr atom? 5, 5, 4

Or

a. How many unpaired electrons are there in a strong field iron(II) octahedral complex?
b. Calculate the wavelength of a ball of mass 5×10^{-2} kg moving as 120 miles per hour.
c. Construct the π-molecular orbitals of benzene in increasing energy order. Designate HOMO and LUMO orbitals in benzene. 4, 5,5

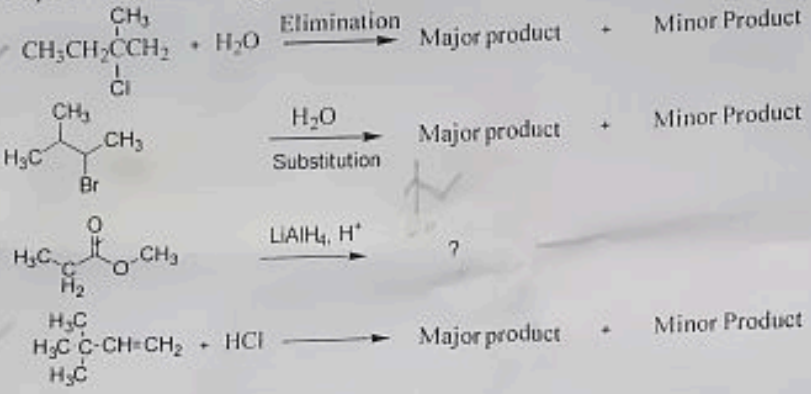
Q 3.

a. What is stereoisomers? Differentiate between enantiomers and diastereomers giving examples.
b. Give the pictorial presentation of conformational analysis in butane considering rotation about C2-C3 bond? Also mention the relative stabilization energies for different conformations.
c. Give stereoisomerism in tartaric acid. Explain that chiral centre is not the necessary condition for a molecule to be chiral. 5,5,4

Or

3.5×4=14

a. Complete the following reactions with mechanistic details.



Q 4. 5, 4, 5

a. What is the cell reaction and the cell emf at 298 K of the cell
$Zn \mid Zn^{2+}$ (a = 1) $\parallel Pb^{2+}$ (a = 1) $\mid Pb$?
Given $E^0_{Zn^{2+}/Zn}$ = -0.762 V and $E^0_{Pb^{2+}/Pb}$ = -0.126 V. Calculate ΔG^0 for the reaction. Will zinc precipitate lead from a solution in which the activity of lead ion is unity?

b. Which of the following processes are reversible?
i) Diffusion of a gas into another gas at constant temperature and pressure.
ii) Vaporization of a liquid at its boiling point.
iii) Dissolution of solid chloride in water at room temperature
iv) Expansion of a gas in vacuum

c. What is Nernst Equation? Describe the application and effect of temperature on Nernst equation?

Or

a. Explain ideal gas equation and describe the idea gas equation at high temperature and low pressure.

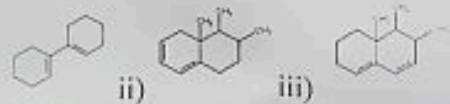
b. What do you mean by "Dry and Wet corrosion"? How will you prevent the process of corrosion?

c. What is Ellingham Diagram? Discuss its silent features, application and limitations. 5, 4, 5

Q 5.

a. i) Convert the wavelengths: 12.5 μ and 285 nm in terms of wave-number in cm^{-1}.
ii) The wavelength associated with a ultra-violet radiation is 285 nm. Determine the energy associated with it in kcal $mole^{-1}$.

b. Calculate the absorption maxima value for the following compounds:



i) ii) iii)

c. How will you differentiate between CH_3CH_2CHO and CH_2=CH-CH_2OH compounds using Infra-red spectra? 5.6. 3

Or

a) Write brief notes on the following:
i) Chemical Shift ii) Spin-spin coupling iii) Coupling constant

b) Which of the following atoms do not exhibit nuclear magnetic resonance?
C^{12}, O^{16}, N^{14}, N^{15}, H^2, F^{19}, C^{13} and P^{31}, also describe some important applications of nuclear magnetic resonance.

c) What is surface characterization techniques? Explain one technique in detail? 6.4.4