Unique Paper Code	**42171103**
Name of the paper	**Atomic Structure , Bonding, General Organic Chemistry and Aliphatic Hydrocarbons**
Name of the course	**B.Sc. (Prog)**
Semester	**I**

Duration : 3 Hours *Maximum Marks : 75*

Attempt **SECTION A** and **SECTION B** on separate answer sheets

Q. 1 and 4 carry 19 marks each. Q. 2, 3,5,6 carry 18.5 marks each

SECTION A

(INORGANIC CHEMISTRY)

Attempt **ANY TWO** questions

1. (a) Derive the expression for BORN LANDE equation for calculation of Lattice Energy of a crystal lattice. Assume the ions to be as point charges.

(b) Draw the MO diagram of CO molecule and explain it.

(c) Explain the probable structures of ClF_3 on the basis of number of paired and unpaired electrons. Which of them is the stable one?

(d) Draw the radial distribution function curves for 2s and 3s orbitals of H atom. Also explain what are the properties to be possessed by acceptable solutions to the Schrodinger wave equation.

(5,5,4,5)

2. (a) Predict the molecular hybridization and geometry of $XeOF_2$ and IF_5 on the basis of VSEPR theory.
   (b) (i) Why is NaCl soluble in water whereas $AlCl_3$ is not?

   (ii) Why does LiF have more lattice energy than CsI?

   (c) Define Lattice Energy of an ionic crystal. Also write the expression for lattice energy and explain the terms involved.

   (d) Explain the difference in shapes of NH_3 and NF_3 although they both have same number of orbitals on the central atom and same number of bond pairs.

(5,5,5,3.5)

3. (a) Calculate the lattice energy of CsCl using the following information: ΔH_s=79.9KJ/mol, $\Delta H_{I.E.}$=374KJmol^{-1}, $\Delta H_{dissociation}$=241.84KJmol^{-1}, $\Delta H_{formation}$= -623KJmol^{-1}.

(b) (i) Find the possible values of l and m_s for 4d and 5d. Which of these orbitals does not exist and why?

(ii) Why are Be salts generally covalent?

(c) Give the limitations of VSEPR Theory.

(d) Draw the resonance structures of CO_3^{2-} and CO_2.

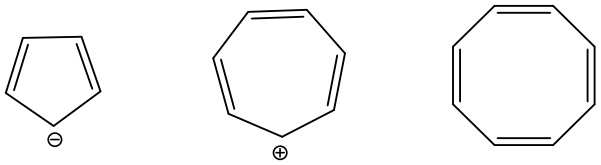
(5,5,3.5,5)

Section B

ORGANIC CHEMISTRY

Attempt **ANY TWO** questions

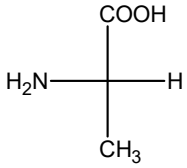
Q4. a) Predict the aromaticity of the following compounds and justify your answer:

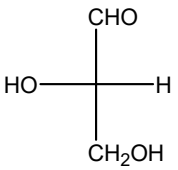


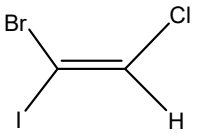
b) Arrange the following compounds in the increasing order of their stability and justify your answer

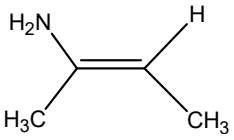
$(CH_3)_2\overset{+}{C}H$, $(CH_3)_3\overset{+}{C}$, $CH_3\overset{+}{C}H_2$, $\overset{+}{C}H_3$

c).Assign the R/S configuration or E/Z notation of the following compounds (justify your answer).

i) 

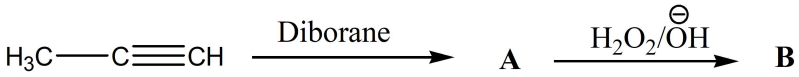
ii) 

iii) 

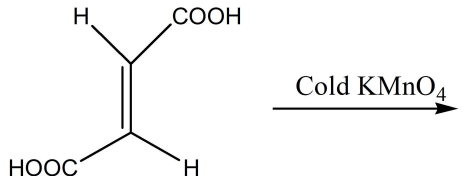
iv) 

(6, 5, 8)

Q5. a) Draw the various conformations of n-butane in Newmann projection formula and draw the potential energy diagram explaining their relative order of stability.

b) 

Identify **A** and **B** and explain the reactions involved.

c) 

Identify the correct stereochemistry of the product(s).

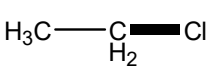
d) $H_3C-C\equiv CH + O_3 \longrightarrow$ **??**

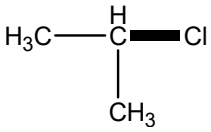
(6, 6, 4, 2.5)

Q6. a) What happens when 2-bromopentane is treated with alcoholic KOH. Which name the rule which governs the formation of product.

b) How would you convert ethane to *n*-butane and ethane into *iso*-butane.

c) Explain which of the following will undergo heterolytic cleavage of carbon chlorine Bond (shown below as a thick line) much faster?





d) How many stereoisomers are possible for Tartaric Acid? Draw structures in Fischer projection formula. Also, explain how these stereoisomers are related to each other. Predict their optical activity also.

(4, 4, 4, 6.5)