Unique Paper Code : 42171103_ OC

Name of the Paper : C-I Atomic Structure bonding, general Organic

Chemistry and aliphatic hydrocarbons.

Name of the Course : B.Sc. (Prog)

Semester : I

Duration : 3 hrs

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on the receipt of the paper.
2. Use of Calculator is permitted.

Attempt any three questions from each section.

Section- A (37½)

(Inorganic Chemistry)

Question No. 1 is Compulsory.

Ques.1. Marks 12.5

a) Draw Radial Probability Distribution Curves for 3s, 3p and 3d subshells. (2.5)

b) What are Normal and Orthogonal wave functions? Write mathematical expression for these wave functions? (2.5)

c) All P-Cl bonds in PCl_5 are not equivalent. Explain. (2.5)

d) Electronic Configuration of Cu is $3d^{10} 4s^1$ and not $3d^9 4s^2$. Explain. (2.5)

e) How Born Haber's Cycle can explain the stability of ionic compounds? (2.5)

Ques.2. Marks 12.5

a) What are the conditions which should be fulfilled by a wave function to become an Eigen function? (4)

b) What are Polar Coordinates? Derive a relationship between the Cartesian coordinates and polar coordinates? (4.5)

c) Derive time independent Schrodinger wave equation for an electron in Hydrogen atom. Name the three quantum numbers obtained from this equation. (4)

Ques.3   Marks 12.5

a) Define Lattice and Solvation energy. What is the role of these terms in deciding the solubility of ionic solids? (4)

b) Calculate the Heat of formation, of MgF_2 from its elements using the Born Haber's Cycle from the following thermo-chemical data: Sublimation energy of $Mg(s)= 146.4$ $kJmol^{-1}$,Dissociation energy of $F_2(g)= 158.9$ $kJmol^{-1}$, Ionization energy of $Mg(g)/Mg(g)^{2+}= 2184$ $kJmol^{-1}$, Electron affinity of $F(g)/F^-(g)=-334.7$ $kJmol^{-1}$, lattice energy of $MgF_2(s)= -2922.5$ $kJmol^{-1}$. (4.5)

c) Explain Fajan's Rule and on the basis of this rule compares the solubility of NaCl and CuCl in water. (4)

Ques.4   Marks 12.5

a) Using VSEPR Theory justify that ClF_3 is T-shaped while XeF_4 is a square planar molecule. (4)

b) How does Molecular Orbital Theory accounts for the following? (4.5)

       i.   Bond order of O_2^+ is more than O_2 molecule

       ii.   Paramagnetic character in NO molecule

c) Give the hybridization of the central atom and shape of the following molecules: (4)
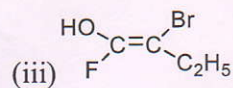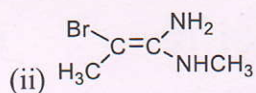
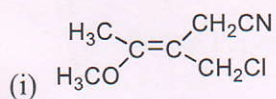 NO_3^-, CO_3^{2-}, SF_4 and ClO_4^-

Section B

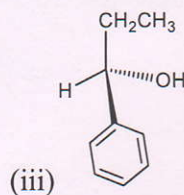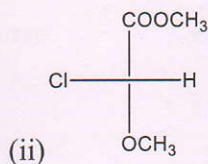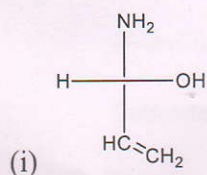## Organic Chemistry

Ques 1   Marks 12.5

(a) How many stereoisomers are possible for 2,3-butanediol? Write their structures (3)

(b) Assign E/Z to the following compounds: (4.5)
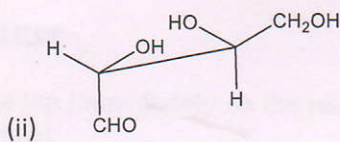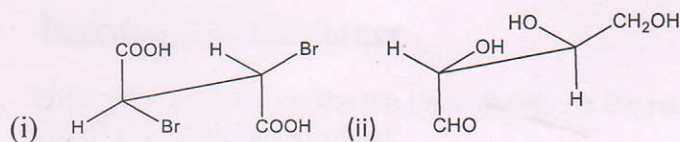
(i) H_3C, H_3CO $C=C$ CH_2CN, CH_2Cl

(ii) Br, H_3C $C=C$ NH_2, $NHCH_3$

(iii) HO, F $C=C$ Br, C_2H_5

(c) Assign R/S to the carbon in the following compounds: (4.5)

(i) NH_2 — H—$\vert$—OH — $HC\!\equiv\!CH_2$

(ii) $COOCH_3$ — Cl—$\vert$—H — OCH_3

(iii) CH_2CH_3 H—C—$'''OH$ (phenyl)

Ques. 2   Marks 12.5

(a) Convert the following into fisher projection: (3.5)

(i) $COOH$ H Br / H Br $COOH$

(ii) H HO OH CH_2OH / H CHO

(b) Explain the **any three** of following terms using appropriate examples: (9)
(i) Chirality
(ii) Diastereoisomers
(iii) Racemic mixture

Ques. 3   Marks 12.5

(a) Discuss the free radical mechanism of chlorination of methane. (4)

(b) Carry out any two conversions: (4)
(i) propyne to 2-pentyne
(ii) ethyl chloride to butane
(iii) propene to 1-bromopropane.
(iv) propene to n- propyl alcohol

(c) Discuss the oxymercuration-demercuration reaction of 1-propene. (4.5)

Ques.4   Marks 12.5
Write short notes on any three of the following:
(i) Inductive effect
(ii) Saytzeff's rule
(iii) Hydroboration- oxidation
(iv) Wurtz reaction