

[This question paper contains 5 printed pages]

Sr. No. of Question Paper : 2265 Roll No. ....

Unique Paper Code : 2171201-P

Name of the Paper : Organic & Inorganic Chemistry

Name of the Course : B.W. Hons. in Chemistry

Semester : II Semester

Duration : 3 Hours

Maximum Marks : 75

F-4

### Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. All questions carry equal marks.
3. Attempt 6 questions in all, selecting 3 questions from each of the sections A and B.
4. Do each section in continuation. Do not mix section A with section B.

### Section A

#### (Organic Chemistry)

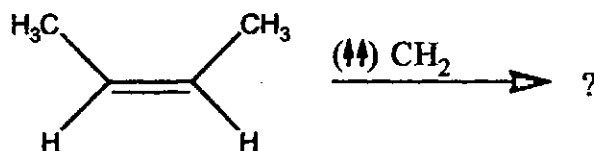
#### Question 1

[4, (2.5, 1.5, 2), 2.5]

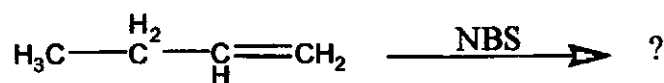
(a) Two isomeric compounds (A) and (B) having molecular formula  $C_4H_6$  decolorize bromine in  $CCl_4$  and react slowly with conc.  $H_2SO_4$ . (A) forms white precipitate with amm.  $AgNO_3$  and on oxidation yields propanoic acid and  $CO_2$ . Compound (B) on oxidation gives oxalic acid and  $CO_2$ . Identify compound (A) and (B) by giving explanation.

(b) Identify the products obtained.

(i)



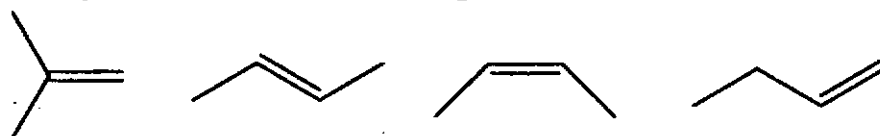
(ii)



(iii)



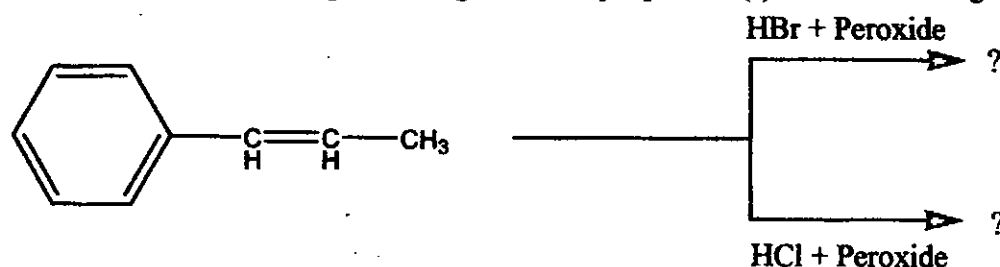
(c) Giving reason, arrange the following alkenes in order of increasing stability.



## Question 2

(4, 4.5, 2, 2)

(a) Giving the appropriate explanation give the major product(s) of the following reaction:



(b) Write the mechanism involved when one mole of bromine reacts with Z-but-2-ene to give racemic 2,3-dibromobutane.

(c) Compare the boiling points of cis-butene and trans-butene.

(d) Why cyclohexane is more stable than cyclobutane.

**Question 3**

(4, 6, 2.5)

(a) Give the product(s) obtained when 1,3-butadiene reacts with one mole of HBr at  $+80^{\circ}\text{C}$  and  $-80^{\circ}\text{C}$  respectively. Give reasons for the same.

(b) How will you convert the following

(i)



(ii) Propane  $\longrightarrow$  2,3-dimethyl-butane

(iii) Ethyne  $\longrightarrow$  Butan-2-one

(c) Identify an optical active compound (X) having molecular formula  $\text{C}_6\text{H}_{12}$  which on catalytic reduction gives achiral compound  $\text{C}_6\text{H}_{14}$ .

**Question 4**

(4, 2, 2.5, 4)

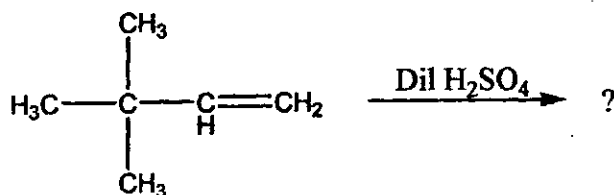
(a) Explain why bromination is more selective and less reactive than chlorination of alkanes.

(b) Prepare 2-methyl pentane from 1-bromo propane.

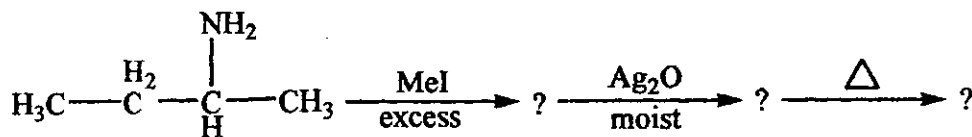
(c) Even numbered alkanes have higher melting point than odd numbered alkanes, why?

(d) Complete the following reactions:

(i)



(ii)



**Section – B**  
**(Inorganic Chemistry)**

**Question 5**

**(5, 3, 3, 1.5)**

(a) The bond angles in difluoromethane are :

$$\angle \text{HCH} = 119.4^\circ \quad \angle \text{FCF} = 108.3^\circ$$

- (i) Calculate the s-character used by the carbon atom in the orbitals directed to the hydrogen and fluorine atoms.
  - (ii) Discuss the results in terms of Bent's Rule.
- (b) Which of the following substances exhibit hydrogen bonding? Draw the hydrogen bond diagram for those substances.



(c) What do you understand by "ionic potential"? Using the ionic potential concept, select the most covalent and the least covalent in the following series:



OR

Predict the order of bond angles for  $\text{NO}_2^+$  and  $\text{NO}_2^-$  species and account for the trend.

(d) State the d-orbitals involved in  $sp^3d$  and  $sp^3d^2$

**Question 6**

**(4.5, 4, 4)**

(a) Predict the shape of the following species using VSEPR Theory



(b) Using hybridization concept find out which one of the following species has distorted structure and why?



- (c) Using a band diagram, show how Mg exhibits metallic character when its 3s band is completely filled and what will be the effect of increase in temperature on its electrical conductivity.

(6.5, 3, 3)

**Question 7**

- (a) Predict giving reasons which of the following has a higher

- (i) Ionization Energy :  $N_2$ ,  $O_2$  or  $NO$
- (ii) Dipole Moment :  $PF_5$  or  $IF_5$
- (iii) Bond Length (C-H) :  $C_2H_6$ ,  $C_2H_4$  or  $C_2H_2$

- (b) The bond dissociation energies of diatomic molecules of B, C, N, O and F follow the trend;  $B_2 < C_2 < N_2 > O_2 > F_2$ . Justify it on the basis of MO Theory

- (c) In a molecule LiH whose  $\mu = 5.88D$  and Li-H bond distance is  $11.6\text{\AA}$ , find out the fractional charge,  $\delta$  on each atom. Also indicate the nature of bond.

(6.5, 4, 2)

**Question 8**

- (a) Using Coulson MO diagram, explain how ligand CO behaves as Lewis Base and Lewis Acid through carbon.

- (b) Discuss the forces that hold the non polar molecules together and arrange the following hydrocarbons in the increasing order of their boiling points:

n-pentane, neo-pentane and iso-pentane

- (c) Justify the difference in melting points of  $CaCl_2$  ( $772^\circ C$ ) and  $HgCl_2$  ( $276^\circ C$ ) though  $Ca^{2+}$  and  $Hg^{2+}$  have similar ionic radii.

OR

Ortho-bromophenol shows hydrogen bonding though there is no evidence of hydrogen bonding in HBr. Explain.