

This question paper contains 7 printed pages]

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S. No. of Question Paper : 7790

Unique Paper Code : 2171201

F-2

Name of the Paper : Organic : Aliphatic Hydrocarbons

Name of the Course : Bachelor with Honours in Chemistry

Semester : II

Duration : 3 Hours

Maximum Marks : 75

*(Write your Roll No. on the top immediately on receipt of this question paper.)*

All questions carry equal marks.

Attempt 6 questions in all, selecting 3 questions from each of the Sections A and B.

Do each section in continuation.

Do not mix Section A with Section B.

### Section A

#### (Organic Chemistry)

1. (a) Deduce the structural formula of a compound (A)  $C_6H_{12}$  that decolorizes  $Br_2$  and is oxidized by hot acidified  $KMnO_4$  to a resolvable carboxylic acid,  $C_4H_9COOH$ .  
Explain.

P.T.O.

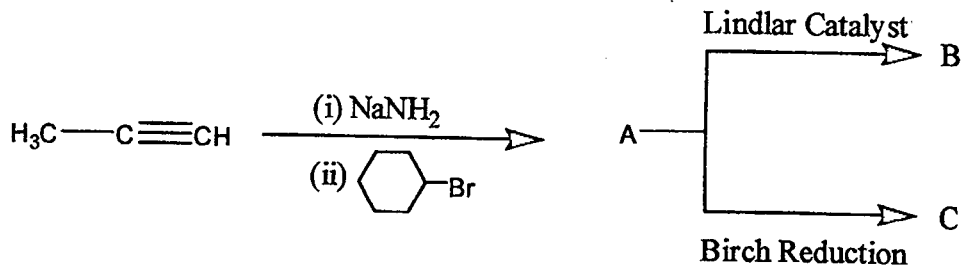
- (b) How many monochlorinated products are possible for isopentane when it is photochlorinated? Write their structures and calculate their percentage. Relative reactivity for different types of hydrogen towards chlorination :

$$3^{\circ} : 2^{\circ} : 1^{\circ} :: 5.0 : 3.8 : 1.$$

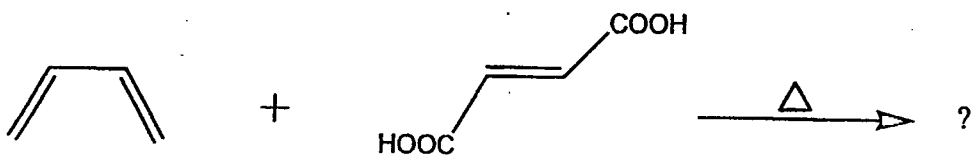
- (c) Why are *trans* alkenes more stable than *cis* alkenes ?
- (d) What is the major product obtained when  $\text{Ph}-\text{CH}=\text{CH}-\text{CH}_3$  reacts with  $\text{HBr}$  in presence of peroxide? Explain. (4, 4, 2, 2.5)

2. (a) Prepare 1-butanol and 2-butanol respectively from butene.

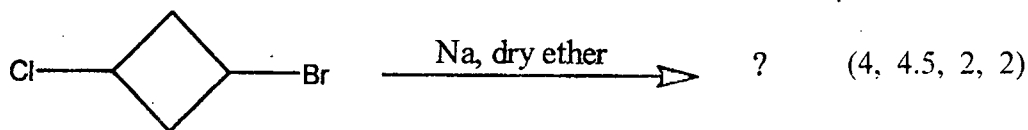
- (b) Identify compounds A, B, C.



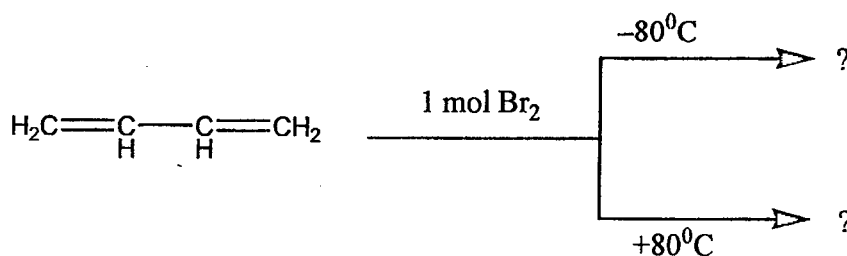
- (c) Give the name of the reaction involved and the product obtained in the following reaction :



(d) Complete the reaction :



3. (a) Identify the major product(s) obtained. Explain with mechanism :



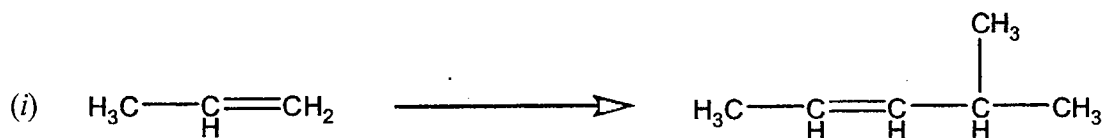
(b) Explain the stability of cycloalkanes.

(c) Giving reason place each of the following alkanes in order of increasing boiling points (bp<sup>°C</sup>) : pentane, hexane, and 2, 3-dimethylbutane.

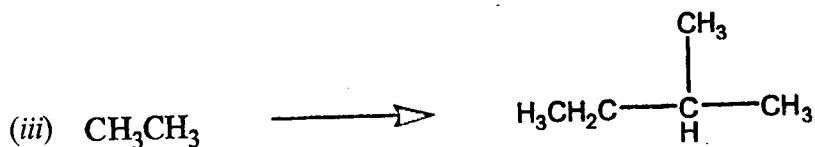
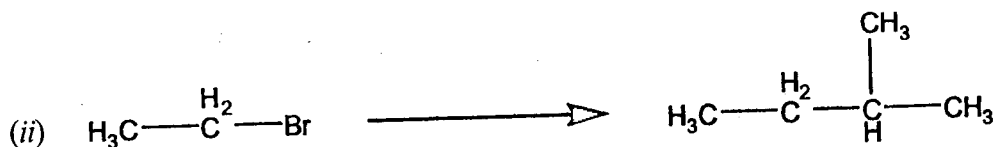
(d) How will you distinguish between but-2-yne and but-1-yne ? (5, 2.5, 2.5, 2.5)

4. (a) Compare the reactivity of alkenes and alkynes towards electrophilic addition.

(b) Complete the following conversions :



P.T.O.



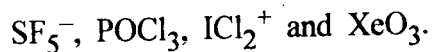
- (c) *Cis*-but-2-ene react with Baeyer's reagent to give meso-butane-2, 3-diol. Explain with mechanism. (2, 6, 4.5)

### Section B

#### (Inorganic Chemistry)

5. (a) In metal carbonyls carbon acts as  $\sigma$ -donor and  $\pi$ -acceptor. Explain it with Coulson MO diagram of CO molecule.
- (b) In case of  $\text{B}_2$ ,  $\text{C}_2$  and  $\text{N}_2$  molecules  $s-p_z$  mixing cannot be neglected while in case of  $\text{O}_2$  and  $\text{F}_2$ , MO diagrams explain most of the characteristics of these molecules without considering  $s-p_z$  mixing. Justify the statement.
- (c) What do you understand by partial ionic character in a covalent bond? Calculate percentage of ionic character of Si-H bond in  $\text{SiH}_4$  (Pauling's electronegativities of Si and H are 1.8 and 2.1 respectively). (6.5, 3, 3)

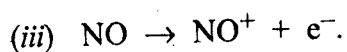
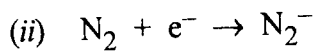
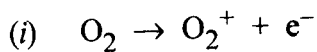
6. (a) For any *three* of the following species :



- (i) Determine the electron pair arrangement and molecular shape.
- (ii) Identify the hybridisation around the central atom.
- (b) Each Lithium atom has only one valence electron, yet it is linked to eight neighbouring Lithium atoms in its lattice. Explain.

Or

What is the expected change in Bond order during the following ionisation processes :



- (c) Why compared to hydrocarbons, fluorocarbons have low boiling points ? (7.5, 3, 2)

7. (a) What is the observed order of boiling points of the following compounds ?



Explain the trend.

P.T.O.

Or

In a  $sp^3d$  hybridised phosphorous atom in a TBP molecule, will the substituent atom have a greater electronegativity when bonding through equatorial or axial orbitals ?

Explain.

- (b) The bond angle in  $H_2O$  is  $104.5^\circ$ . What is the  $s$ -character of the bond pair and lone pair ?
- (c) On the basis of given value of dipole moments discuss the structures of the following molecules :

$$SO_2 = 1.6D, BF_3 = 0.0D, H_2O = 1.84D \text{ and } PF_3 = 0.12D.$$

- (d)  $COF_2$  molecule is indeed planar but distorted rather severely from a trigonal arrangement. Explain. (4, 2.5, 4, 2)
8. (a) Which of each of the following pairs might be expected to be more ionic :
- (i)  $TiCl_3$  or  $TiCl_4$
- (ii)  $CaCl_2$  or  $ZnCl_2$
- (iii)  $ZnO$  or  $ZnS$ .

- (b) Discuss the nature of interaction responsible for solubility of  $I_2$  in KI solution.
- (c) Silicon is an insulator but becomes a conductor when doped with As. Explain the mechanism.
- (d) Which of the combinations can be classified as zero overlap :
- (i)  $s-p_x$
  - (ii)  $p_x-p_y$
  - (iii)  $p_x-p_z$
  - (iv)  $s-p_z$
- (4.5, 3, 3, 2)