Carbon Compounds

Exercise

Q. 1. Match the pairs.

Group 'A'	Group 'B'
a. C_2H_6	1. Unsaturated hydrocarbon
b. C_2H_2	2. Molecular formula of an alcohol
c. CH_4O	3. Saturated hydrocarbon
d. C_3H_6	4. Triple bond

Answer :

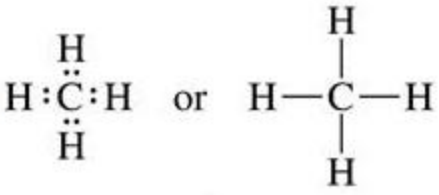
Group A	Group A	Explanation
a. C_2H_6	3. Saturated hydrocarbon	The valencies of the carbon is satisfied by the single bonds thus called saturated hydrocarbon.
b. C_2H_2	4. Triple bond	The valency of both the carbon is satisfied by the presence of triple bond.
c. CH_4O	2. The molecular formula of an alcohol	The molecular formula is of alcohol i.e. Methanol
d. C_3H_6	1. Unsaturated hydrocarbon	The valencies of the carbon atoms are satisfied by the double bond, therefore, is an unsaturated hydrocarbon.

Q. 2. Draw an electron dot structure of the following molecules. (Without showing the circles)

a) Methane
b) Ethene
c) Methanol
d) Water

Answer :

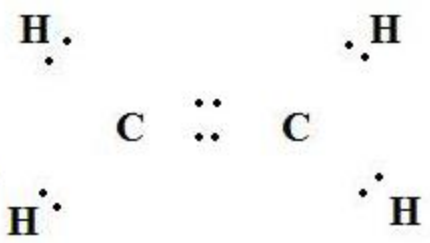
(a)



or

methane

(b)



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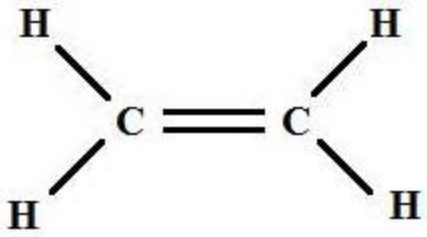
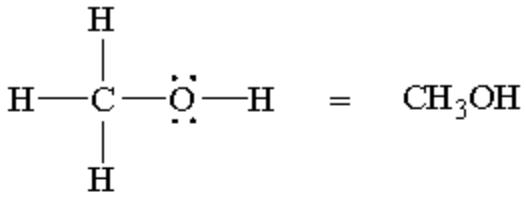


Electron dot structure of ethene

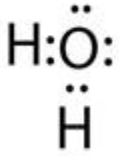
Structural formula of ethene

(c)



Methanol

(d)



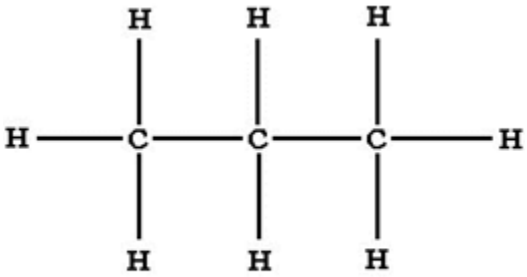
Electron dot structure of Water

Q. 3. Draw all possible structural formulae of compounds from their molecular formula given below.

(a) C_3H_8
(b) C_4H_{10}
(c) C_3H_4

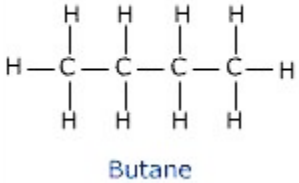
Answer : (a) C_3H_8

Propane (C_3H_8) has no isomers. There is only one possible structure for propane:

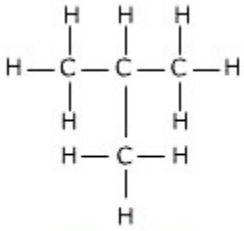


Propane

(b) C_4H_{10}



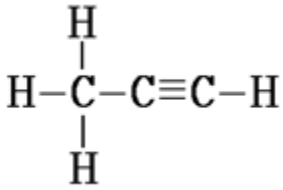
Butane
C_4H_{10}



Iso-Butane
C_4H_{10}

(c) C_3H_4

Only one structure is possible

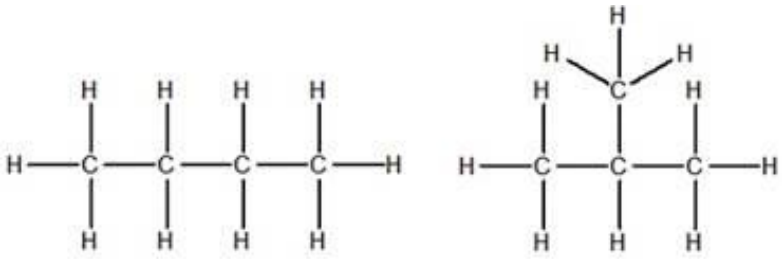


Q. 4. A. Explain the terms with an example.

Structural isomerism

Answer : The phenomenon in which compounds having different structural formulae have the same molecular formula is called structural isomerism

Example: Molecular Formulae= C4H10

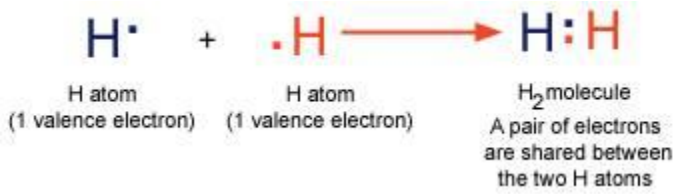


n-Butane Iso-Butane

Q. 4. B. Explain the terms with an example.

Covalent bond

Answer : The chemical bond formed by sharing of two valence electrons between the two atoms is called the covalent bond. Examples:- H_2

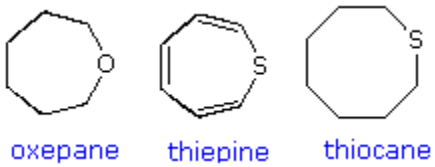


Q. 4. C. Explain the terms with an example.

Hetero atom in a carbon compound

Answer : The atoms of the elements such as halogen, oxygen, nitrogen substitute one or more hydrogen atoms in the hydrocarbon chain and thereby the tetra valency of carbon is satisfied. The atom of the element which is a substitute for hydrogen is referred as a hetero atom in carbon compounds.

A heteroatom is any atom that is not carbon or hydrogen. Example:



Note: Typical heteroatoms are nitrogen, oxygen, sulfur, phosphorus, chlorine, bromine, and iodine.

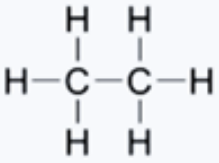
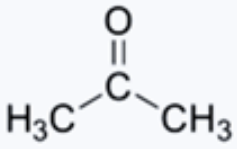
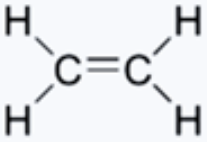
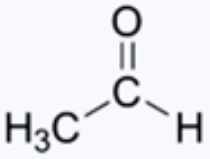
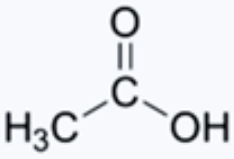
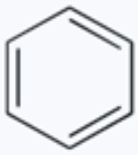
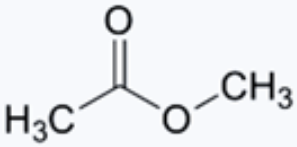
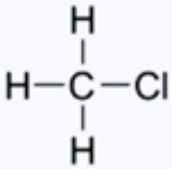
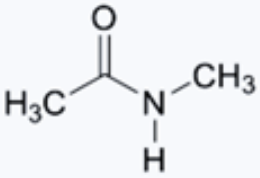
Q. 4. D. Explain the terms with an example.

Functional group

Answer : The compounds acquire specific chemical properties due to the hetero atoms or the groups. These hetero atoms or the groups containing hetero atoms are called functional groups.

Examples: - alcohol (-OH), aldehyde (– CHO)

The major functional groups are shown below:

alkane		ketone	
alkene		aldehyde	
alkyne		carboxylic acid	
aromatic		ester	
alkyl halide		amide	

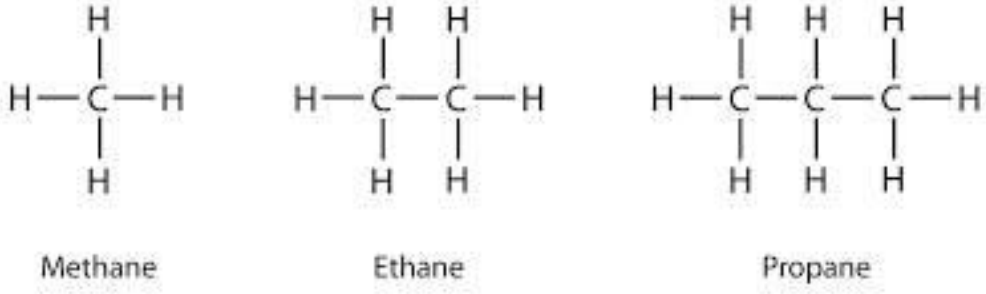
Q. 4. E. Explain the terms with an example.

Alkane

Answer : The valencies of all the atoms are satisfied by the single bonds. Such compounds are called saturated compounds. Saturated hydrocarbons are called alkanes.

Examples:- butane, methane

The following are the structures of alkanes:



Q. 4. F. Explain the terms with an example.

Unsaturated hydrocarbon

Answer : The compound in which the valency of all the atoms is either satisfied by the double or triple bond is called unsaturated hydrocarbon.

Examples:- ethene, propyne

Q. 4. G. Explain the terms with an example.

Homopolymer

Answer : The polymers which are formed by the repetition of a single monomer is called as homopolymers.

Examples:- Polyethylene, Teflon etc.

Q. 4. H. Explain the terms with an example.

Monomer

Answer : The smallest unit that repeats regularly to form a polymer is called monomer.

Example: Polyvinyl is formed from the monomer 'vinyl chloride'

Q. 4. I. Explain the terms with an example.

Reduction

Answer : Chemical reaction that involves the gaining of electrons by one of the atoms involved in the reaction.

Example: conversion of an aldehyde to alcohol.

Q. 4. J. Explain the terms with an example.

Oxidant

Answer : Substances that can give oxygen to other substances are called oxidants or oxidizing agents.

Examples:- potassium permanganate, potassium dichromate.

Q. 5. A. Write the IUPAC names of the following structural formulae.

$CH_3 – CH_2 – CH_2 – CH_3$

Answer : Butane

Explanation: The parent chain consists of Four carbons and the valency of all the atoms is satisfied by single bond so It is a saturated hydrocarbon with the name Butane.

Q. 5. B. Write the IUPAC names of the following structural formulae.

$CH_3 – CHOH – CH_3$

Answer : Propane-2-ol

Explanation: (i) The parent chain consists of three carbons so 'prop' is used and the numbering can be done from either left to right or right to left since this a symmetrical molecule.

(ii) On the second carbon, OH group is present which means alcohol group so the suffix used is 'ol'

Q. 5. C. Write the IUPAC names of the following structural formulae.

$CH_3 – CH_2 – COOH$

Answer : Propanoic Acid

Explanation: (i) The parent chain consists of three carbons so the prefix 'propan' is used.

(ii) There is also a presence of COOH group indicating acid so the suffix used in this case is ' oic acid'

Q. 5. D. Write the IUPAC names of the following structural formulae.

$CH_3 – CH_2 – NH_2$

Answer : Ethan amine

Explanation: (i) The parent chain consists of two carbon atoms so the prefix 'eth' is used.

(ii) The presence of NH2 groups indicates the presence if amine and the same is used as the suffix

Q. 5. E. Write the IUPAC names of the following structural formulae.

$CH_3 – CHO$

Answer : Ethanal

Explanation: (i) The parent chain consists of two carbon atoms so the prefix used is 'Eth'

(ii) There is also a presence of aldehyde group I.e. CHO so the suffix used is 'al'.

Q. 5. F. Write the IUPAC names of the following structural formulae.

$CH_3 – CO – CH_2 – CH_3$

Answer : But-2-one

Explanation: (i) The parent chain consists of four carbon atoms so the prefix used is 'But'

(ii) There is also a presence of ketones group I.e. CO so the suffix used is 'one' and 2 is indicating the position of the ketone group.

Q. 6. Identify the type of the following reaction of carbon compounds.

a. $CH_3 – CH_2 – CH_2 – OH \rightarrow CH_3 – CH_2 – COOH$
b. $CH_3 – CH_2 – CH_3 \rightarrow 3\ CO_2 + 4\ H_2O$
c. $CH_3 – CH= CH – CH_3 + Br_2 \rightarrow CH_3 – CHBr – CHBr – CH_3$
d. $CH_3 – CH_3 + Cl_2 \rightarrow CH_3 – CH_2 – Cl + HCl$
e. $CH_3 – CH_2 – CH_2 – CH_2 – OH \rightarrow CH_3 – CH_2 – CH= CH_2 + H_2O$
f. $CH_3 – CH_2 – COOH + NaOH \rightarrow CH_3 – CH_2 – COO – Na^+ + H_2O$
g. $CH_3 – COOH + CH_3 – OH \rightarrow CH_3 – COO – CH_3 + H_2O$

Answer : (a) Oxidation Reaction

Propanol is oxidized to propanoic acid

(b) Combustion reaction

Propane in the presence of air gives carbon dioxide and water.

(c) Addition Reaction

Bromine attacks on the double bond to give Vic. Dihalide.

(d) Substitution reaction

Chlorine replaces the hydrogen and the second chlorine forms the byproduct HCl.

(e) Dehydration reaction

Butanol reacts in the presence of acid to give alkene with the removal of water.

(f) Neutralization reaction

Ethanoic acid in pre

Sence of base NaOH gives salt and water.

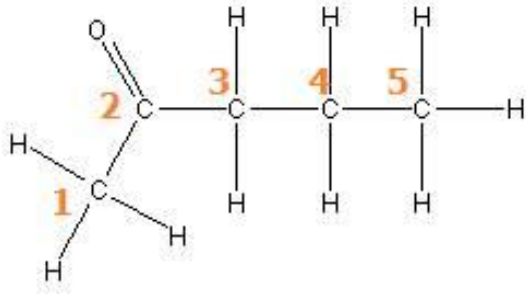
(g) Esterification reaction

Acetic acid and methanol reacts to give ester (methyl methanoate) as the product.

Q. 7. A. Write structural formulae for the following IUPAC names.

pent-2-one

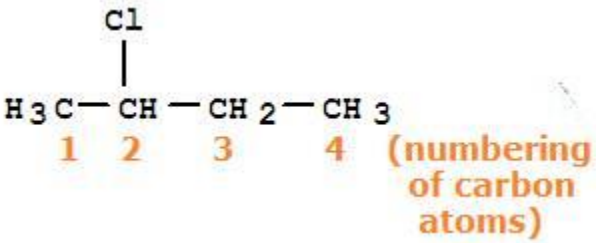
Answer :



Q. 7. B. Write structural formulae for the following IUPAC names.

2- chlorobutane

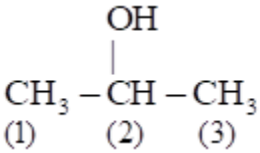
Answer :



Q. 7. C. Write structural formulae for the following IUPAC names.

propan- 2 ol

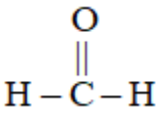
Answer :



Q. 7. D. Write structural formulae for the following IUPAC names.

methanal

Answer :



Q. 7. E. Write structural formulae for the following IUPAC names.

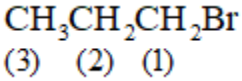
butanoic acid

Answer : $CH_3CH_2CH_2COOH$

Q. 7. F. Write structural formulae for the following IUPAC names.

1- bromopropane

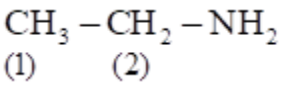
Answer :



Q. 7. G. Write structural formulae for the following IUPAC names.

Ethan amine

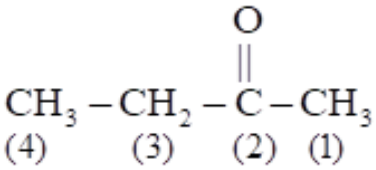
Answer :



Q. 7. H. Write structural formulae for the following IUPAC names.

butanone

Answer :



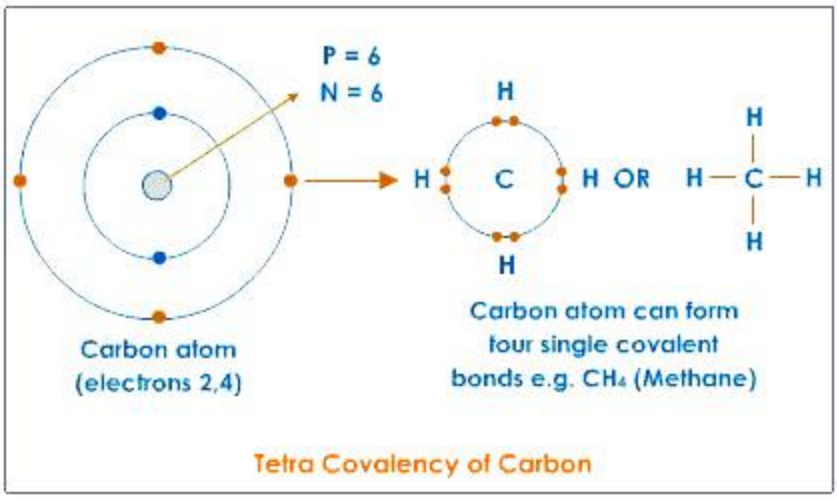
Q. 8. A. Write answers as directed.

What causes the existence of very large number of carbon compound?

Answer: Carbon is able to form large number of compounds due to the property of catenation.

The atomic number of carbon = 6.

The two electrons are in the inner orbit, while the other four are valanceelectrons—outer electrons that are available for forming bonds with otheratoms.



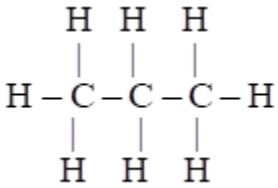
Due to this, carbon can form large number of compounds and catenation is thereason fo r the existence of large number of carbon compounds.

Q. 8. B. Write answers as directed.

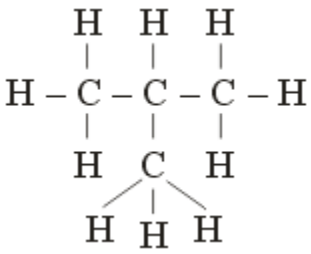
Saturated hydrocarbons are classified into three types. Write these names giving one example each.

Answer : The saturated hydrocarbons are classified into three types:-

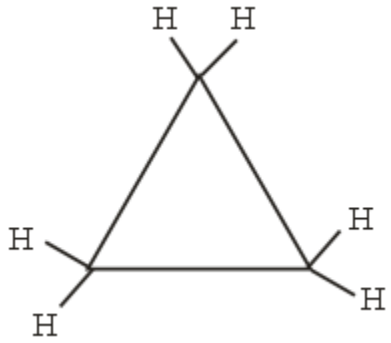
(i) Straight chains:- The carbon atoms are joined in a straight chain with single bond.



(ii) Branched chain:- Some carbon atoms are branched to other carbon atoms.



(iii) Rings:- Carbon atoms forms the rings.



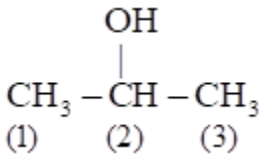
Q. 8. C. Write answers as directed.

Give any four functional groups containing oxygen as the heteroatom in it. Write name and structural formula of one example each.

Answer : Four functional groups are:-

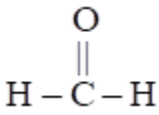
(i) Alcohol

Example: Propan-2-ol



(ii) Aldehyde

Example: methanal



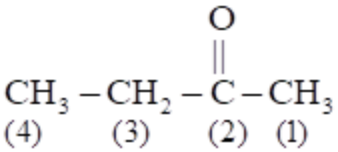
(iii) Carboxylic acid

Example: Butanoic acid

$CH_3CH_2CH_2COOH$

(iv) ketones

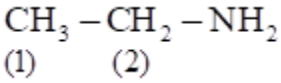
Examples:- butanone



Q. 8. D. Write answers as directed.

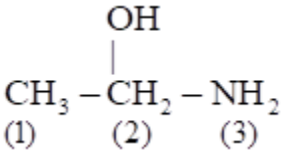
Give names of three functional groups containing three different hetero atoms. Write name and structural formula of one example each.

Answer : (i) Ethanamine containing nitrogen as the hetero atom

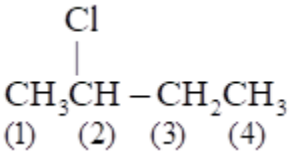


(ii) Alchol containing oxygen as the hetero atom

Example: propan-2-ol



(iii) 2-chlorobutane containing Chlorine as the hetero atom.



Q. 8. E. Write answers as directed.

Give names of three natural polymers. Write the place of their occurance and names of monomers from which they are formed.

Answer : Three Natural polymers are:-

Natural Polymers	Occurrence	Monomers
Rubber	Latex of rubber tree	Isoprene
R.N.A	chromosomes of plants	Nucleotide
Proteins	Muscles, hairs, egg	Alpha amino acids

Q. 8. F. Write answers as directed.

What is meant by vinegar and gashol? What are their uses?

Answer : Vinegar is liquid consisting of water and acetic acid and other Trace chemicals which includes flavoring.

Uses of Vinegar:-

(i) Eliminates odors

(ii) Kill bathroom germs

(iii) Freshen up the fridge

Gasohol is a mixture of petrol and alcohol used as an alternative fuel for cars and other vehicles.

Q. 8. G. Write answers as directed.

What is a catalyst? Write any one reaction which is brought about by use of catalyst?

Answer : Catalyst is a substance that causes a chemical reaction to occur but is not itself involved in the reaction.

Example: formation of ammonia

$N_2 + 3H_2 \rightarrow 2NH_3$

Catalyst used is iron and molybednum.