

Objective Type Questions

(1 mark each)

[A] Multiple Choice Questions

- Q. 1. Ethane, with the molecular formula C_2H_6 has
 (a) 6 covalent bonds (b) 7 covalent bonds
 (c) 8 covalent bonds (d) 9 covalent bonds

[NCERT Exemp.]

Ans. Correct option : (b)

Explanation : Ethane has 7 covalent bonds. One bond is between two carbon atoms and rest of the six are between hydrogen atoms.

- Q. 2. Carbon forms four covalent bonds by sharing its four valence electrons with four univalent atoms, e.g. hydrogen. After the formation of four bonds, carbon attains the electronic configuration of
 (a) helium (b) neon
 (c) argon (d) krypton

[NCERT Exemp.]

Ans. Correct option : (b)

Explanation : The nearest inert gas from carbon is Neon and it is an element which attempts to attain the electronic configuration of its nearest noble gas while attaining a fully-filled outermost shell.

- Q. 3. The correct electron dot structure of a water molecule is

- (a) $H \cdot \ddot{O} \cdot H$ (b) $H : \ddot{O} : H$
 (c) $H : \ddot{O} : H$ (d) $H : O : H$

[NCERT Exemp.]

Ans. Correct option : (c)

Explanation : Oxygen has a complete octet while each atom of hydrogen has two electrons in outermost shell.

- Q. 4. Which among the following are unsaturated hydrocarbons?

- (i) $H_3C-CH_2-CH_2-CH_3$
 (ii) $H_3C-C \equiv C-CH_3$
 (iii) $H_3C-\underset{\text{CH}_3}{\text{C}}-CH_3$
 (iv) $H_3C-\underset{\text{CH}_3}{\text{C}}=CH_2$

- (a) (i) and (iii) (b) (ii) and (iii)
 (c) (ii) and (iv) (d) (iii) and (iv)

[NCERT Exemp.]

Ans. Correct option : (c)

Explanation : Unsaturated hydrocarbons have multiple covalent bonds (double or triple bond) like alkene and alkyne.

- Q. 5. Oils on treating with hydrogen in the presence of palladium or nickel catalyst form fats. This is an example of

- (a) Addition reaction (b) Substitution reaction
 (c) Displacement reaction (d) Oxidation reaction

[NCERT Exemp.]

Ans. Correct option : (a)

Explanation : Hydrogenation reaction means addition of hydrogen to double bonds of unsaturated

compounds found in oil in the presence of catalysts such as palladium or nickel to give saturated hydrocarbons.

- Q. 6. In which of the following compounds, $-OH$ is the functional group?

- (a) Butanone (b) Butanol
 (c) Butanoic acid (d) Butanal

[NCERT Exemp.]

Ans. Correct option : (b)

Explanation : Compounds with $-OH$ functional group are ended with suffix $-ol$.

[B] Passage Based Questions

- Q. 1. Read the passage and answer the following questions.

A homologous series is a series of organic compounds which belong to the same family (i.e. possess same functional group) and show similar chemical properties. The members of this series are called homologous and differ from each other by the number of CH_2 units in the main carbon chain.

- (a) The chemical properties of which of the following compounds is similar to the butane ?

- (i) Butyne (ii) Propene
 (iii) Propyne (iv) Pentane

- (b) What is the difference between two consecutive members in a homologous series in alkanes in terms of :

- (i) Molecular mass
 (ii) Number of atoms of elements.

- (c) The compound $CH_3CH(OH)CH_3$ belongs to which homologous series ?

- (d) Which of the following is not the property of a homologous series ?

- (i) They show similar chemical properties.
 (ii) They differ by 14 units by mass.
 (iii) They all contain double bond
 (iv) They can be represented by a general formula.

Ans. (a) (iv) Pentane

- (b) (i) Molecular mass = 14 a.m.u.

- (ii) Number of atoms of elements = CH_2

- (c) Alcohols

- (d) (iii) They all contain double bond $1+1+1+1$

- Q. 2. Carbon has the unique property to form bonds with other atoms of carbon.

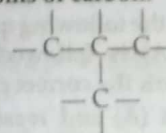


Fig.A

- (a) Name the characteristic property of carbon as depicted in the fig. A

- (b) Give reason for this unique property of carbon.

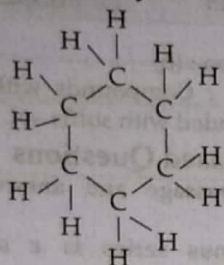
- (c) Write the name and structure of a saturated compound in which the carbon atoms are arranged in a ring.

- (d) Give the number of single bonds present in this

compound.

- Ans. (a) Catenation.
 (b) Carbon forms large number of compounds due to the following :
 (i) **Catenation** : Carbon forms bond with other atoms of carbon.
 (ii) **Tetravalency** : Carbon share four electrons with other atoms.
 (c) Name : Cyclohexane

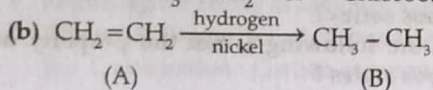
Structure of Cyclohexane



- (d) Total no. of single bonds = 18 1+1+1+1
 Q.3. An organic compound A of molecular formula C_2H_4 on reduction gives another compound B of molecular formula C_2H_6 . B on reaction with chlorine in the presence of sunlight gives C of molecular formula C_2H_5Cl .

- (a) Name the compounds A, B and C.
 (b) Write the chemical equation for the conversion of A to B.
 (c) Name the type of reaction.
 (d) State the condition required for this reaction to take place.

Ans. (a) A : $CH_2 = CH_2$ Ethene
 B : $CH_3 - CH_3$ Ethane
 C : $CH_3 - CH_2 - Cl$ Chloroethane



- (c) Type of reaction: Addition reaction.
 (d) Essential conditions required for the addition reaction to occur :
 (i) Multiple bonds (double and triple bonds) must be present between carbon atoms in the chain of hydrocarbon.
 (ii) Addition of hydrogen should be carried out in the presence of catalyst such as nickel or platinum.

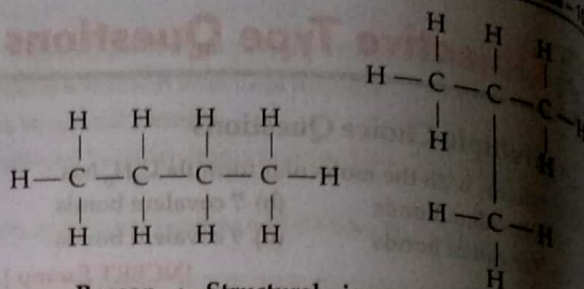
1+1+1+1+1

[C] Assertion and Reason

Directions : In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as :

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
 (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
 (c) Assertion (A) is true but reason (R) is false.
 (d) Assertion (A) is false but reason (R) is true.

Q. 1. Assertion : Following are the structural isomers of butane.



Reason : Structural isomers have the same molecular formula but they differ in their structures.

Ans. Correct option : (a)

Explanation : Isomers are defined as those compounds that possess same molecular formula but different structural arrangement. Butane has the molecular formulae C_4H_{10} . Therefore, the structural isomers of butane will be n-butane and iso-butane.

Q. 2. Assertion (A) : Third member of alkane is propane (C_3H_8)

Reason (R) : It is obtained from general formula C_nH_{2n+2}

Ans. Correct option : (a)

Explanation : C_3H_8 can be obtained from general formula, C_nH_{2n+2} .

Q. 3. Assertion (A) : Iso-butane is the isomer of C_4H_{10}

Reason (R) : Iso-butane has four C and ten-H atom.

Ans. Correct option : (b)



Explanation : $CH_3 - CH - CH_3$ is the structural isomer of butane.

Q. 4. Assertion (A) : CH_3Cl is obtained from CH_4 by the action of Cl_2 in the presence of sunlight.

Reason (R) : It is obtained by addition reaction.

Ans. Correct option : (c)

Explanation : CH_3Cl is obtained from CH_4 by substitution reaction by the action of Cl_2 in the presence of sunlight.

Q. 5. Assertion (A) : Most of the carbon compounds are good conductors of electricity.

Reason (R) : They do not dissociate to form ions and remain as molecules.

Ans. Correct option : (d)

Explanation : Carbon compounds are mainly poor conductors of electricity.

[D] Very Short Answer Type Questions

Q. 1. Define catenation.

[Board SQP, 2020]

Ans. The property of self-linking of atoms of an element through covalent bonds in order to form straight chain, branched chains or cyclic chains of different sizes is called catenation.

[CBSE SQP Marking Scheme, 2020]

Q. 2. What is a homologous series of carbon compounds?

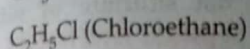
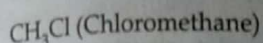
[Board Term II, Foreign Set-II, 2016]

Ans. A homologous series is the family of organic compound having the same functional group, and the successive (adjacent) members of which differ by CH_2 unit or 14 mass unit.

[CBSE Marking Scheme, 2016]

Q. 3. Write the molecular formula of first two members of homologous series having function group - Cl.

Ans. The molecular formula of first two consecutive members of this series is :



$\frac{1}{2} + \frac{1}{2}$

Q. 4. Write the molecular formula of the 2nd and the 3rd member of the homologous series whose first member is methane.

Ans. Ethane (C_2H_6)

Propane (C_3H_8)

$\frac{1}{2} + \frac{1}{2}$

OR

Handwritten notes in a box:

→ Alkane series

2nd Member - Ethane - C_2H_6

3rd Member - Propane - C_3H_8

[Topper's Answer, 2017]

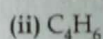
Commonly Made Error

- Usually students get confused between the first few members of alkane, alkene and alkyne series.

Answering Tip

- Learn and practice the first few members of alkane, alkene and alkyne series with their formulae.

Q. 5. Write the next homologue of each of the following :



[Board Term II, Delhi Set-I, 2016]

Ans. (i) C_3H_6 ,

(ii) C_5H_8 .

$\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2016]

Q. 6. Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n} .

[Delhi Set-I, 2015]

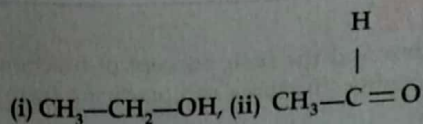
Ans. Name : Propene

Formula : C_3H_6

$\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2015]

Q. 7. Name the following compounds :



[Board Term II, Delhi Set-I, 2016]

Ans. (i) Ethanol, (ii) Ethanal.

$\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2016]

Q. 8. Which element exhibits the property of catenation to maximum extent and why ?

[Board Term II, Delhi Set-I, 2016]

Ans. Carbon, due to strong C—C bond.

1

[CBSE Marking Scheme, 2016]

Q. 9. Select saturated hydrocarbons from the followings : C_3H_6 , C_5H_{10} , C_4H_{10} , C_6H_{14} , C_2H_4

[Board Term II, Delhi Set-III, 2016]

Ans. C_4H_{10} , C_6H_{14} .

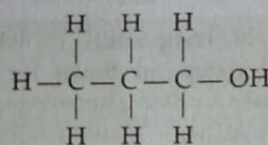
$\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2016]

Q. 10. Write the name and structure of an alcohol with three carbon atoms in its molecule.

[Board Term II, O.D. Set-I, 2016]

Ans. Propanol,



Or $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—OH}$

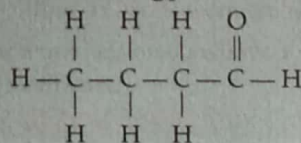
1

Q. 11. Write the name and structure of an aldehyde with four carbon atoms in its molecule.

[Board Term II, OD. Set-III, 2016]

Ans. Butanal, $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CHO}$

Or



1

[CBSE Marking Scheme, 2016]

OR

Handwritten notes in a box:

$\begin{array}{ccccccc} & \text{H} & & \text{H} & & \text{H} & & \text{H} \\ & | & & | & & | & & | \\ \text{H} & - \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & = \text{O} \end{array}$ → Structure of Butanal

The name of the compound is Butanal.

[Topper's Answer, 2016]

Commonly Made Error

- Sometimes students get confused and do mistakes while writing the structure, its name and also with the functional group involved.

Answering Tip

- Please understand the basic concept of functional groups. Drawing structures and practicing them is mandatory.

[AI] Q. 12. Name the process of converting vegetable oil to vegetable ghee. **[R]** [Board Term II SQP, 2016]

OR

Name the process by which unsaturated fats gets changed to saturated fats.

[R] [Board Term II Foreign Set-I, 2015]

Ans. Hydrogenation. **1**

[CBSE Marking Scheme, 2016]

Q. 13. Write the number of covalent bonds in the molecule of ethane.

[U] [Board Term II O.D. Set-I, 2015]

Ans. Seven covalent bonds. **1**

[CBSE Marking Scheme, 2015]

Commonly Made Error

- Students do mistakes in counting the covalent bonds in the structure.

Answering Tip

- Draw the structure and count the covalent bonds by numbering them.

[AI] Q. 14. An organic compound burns with a sooty flame. Is it saturated or unsaturated compound? Justify. **[A]** [Board Term II, 2013, 2012]

Ans. It is an unsaturated compound because it burns with a sooty flame. It burns with sooty or smoky flame.

[CBSE Marking Scheme, 2012]

Q. 15. Draw the electron dot structure of nitrogen molecule. **[R]** [Board Term II, 2013, 2012]

Ans.  **[CBSE Marking Scheme, 2012]**

Short Answer Type Questions

(3 marks each)

Q. 1. What is a homologous series of carbon compounds? Give an example and list its three characteristics.

[R] [Outside Delhi, Set-I, 2019]

Ans. A series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called a homologous series. **1**

Example : Alkane / Alkene / Alkyne / Alcohol or any other one correct example. **½**

Characteristics :

- They have same general formula.
- They have same functional group.
- The difference in the molecular mass of two successive member in $14u$.
- The difference in the molecular formula of two successive member is of CH_2 unit.
- They have similar chemical properties.

(Any three points) $\frac{1}{2} \times 3$

[CBSE Marking Scheme, 2019]

[AI] Q. 2. Which compounds are called (i) alkanes, (ii) alkenes and (iii) alkynes? C_4H_{10} belongs to which of these? Draw two structural isomers of this compound.

[R] [Board Outside Delhi, Set-II, 2019]

Ans. • Alkane

Saturated Hydrocarbon with C-C Single Bond

- Alkene

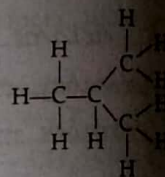
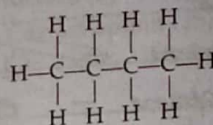
Unsaturated Hydrocarbon with double bond in C=C

- Alkyne

Unsaturated Hydrocarbon with triple bond in $C \equiv C$
(or any other) $\frac{1}{2} \times 3$

- Alkane

2 structural isomers



[CBSE Marking Scheme, 2019] $\frac{1}{2} + \frac{1}{2}$

Q. 3. What is a homologous series of carbon compounds? List its any two characteristics. Write the name and formula of next higher homologous of $HCOOH$.

[U] [Delhi Set Comptt. 1, 2017]

Ans. A group of organic compounds having the same functional group and similar structures in which any two successive members differ by $-CH_2-$.

- All members have similar chemical properties
- There is gradation in the physical properties.

(or any other)

Name — Ethanoic acid/Acetic acid

Formula — CH_3COOH

[CBSE Marking Scheme, 2017] $1 + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$

[AI] Q. 4. What are covalent compounds? How are they different from ionic compounds? List any two properties of covalent compounds.

[A] [OD Comptt. 2017]

Ans. The compounds that are formed due to sharing of electrons between two atoms/compounds having covalent bonds. 1

Ionic compounds are formed due to transfer of electrons from one atom to another/compounds having ionic bonds/compounds having attraction between oppositely charged ions 1

(i) They are poor conductors of electricity ½

(ii) They have low melting and boiling point. ½

(or any other)

[CBSE Marking Scheme, 2017]

Q.5. Give reason why carbon can neither form C^{4+} cations nor C^{4-} anions, but forms covalent compounds. Also, state the reason to explain why covalent compounds are bad conductors of electricity and have low melting and boiling points? [AE] [Delhi Set Comptt. II, 2017]

Ans. Carbon cannot form C^{4+} cation because removal of 4 electrons from a carbon atom would require a large amount of energy. ½

Carbon cannot form C^{4-} anion because it would be difficult for the nucleus with 6 protons to hold on to 10 electrons. ½

Hence, carbon atoms share electrons forming covalent compounds 1

Covalent compounds do not form ions/ charged particles and therefore do not conduct electricity. ½

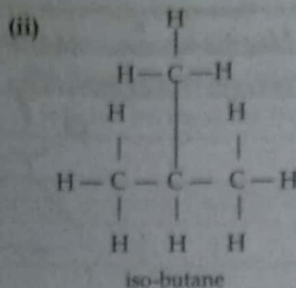
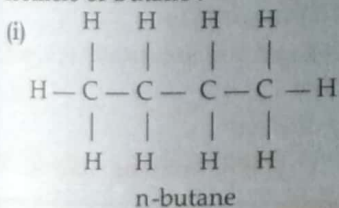
Inter molecular forces of attraction are weak, hence they have low melting and boiling points. ½

[CBSE Marking Scheme, 2017]

Q.6. What is meant by isomers ? Draw the structure of two isomers of butane, C_4H_{10} . Explain why we cannot have isomers of first three members of alkane series. [AE] [Board Term II, Delhi Set-I, 2015]

Ans. Isomers are the compounds which have the same molecular formula but different structural formula.

Isomers of Butane :



We cannot have isomers of the first three members of the alkane series because of the following laws of isomers :

(i) The parent chain should have the most number of carbon atoms.

(ii) The branching cannot be done from the first and the last atom carbon atom of the structure. 1+1+1

[CBSE Marking Scheme, 2015]

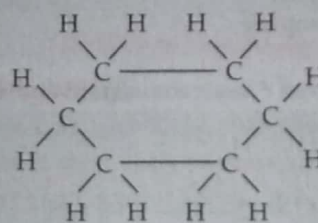
Q.7.(a) Why most of the carbon compounds are poor conductor of electricity ?

(b) Write the name and structure of a saturated compound in which the carbon atoms are arranged in a ring. Give the number of single bonds present in this compound.

[U + R] [Delhi/Outside Delhi, 2018]

Ans. (a) Carbon compounds form covalent bonds/ do not dissociate into ions/do not have charged particles (ions)

(b) Cyclohexane



Total no. of single bonds = 18

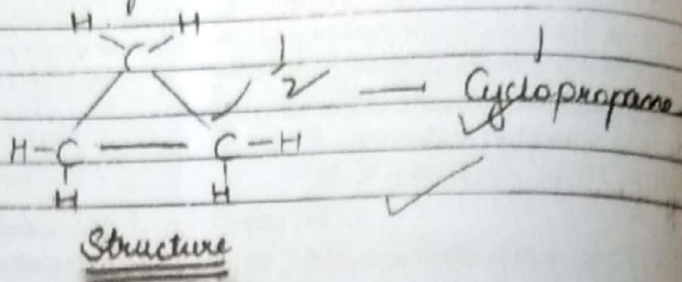
(OR any other cycloalkane with corresponding number of bonds) 1 + 1 + 1

[CBSE Marking Scheme, 2018]

Ans. (a) Carbon compounds are covalently bonded and hence the bond is formed by sharing of 1 electron between two or more combining atoms. Due to this, they don't form any ions or charged particles within the solution nor they give free electrons. As we know, conduction of electricity requires flow

of free electrons in solids & ions in fluids, 'they' don't conduct electricity.

(b)



Name of the structure :-
Cyclopropane

No. of single bonds :- '9' single covalent bonds

[Topper's Answer 2019]

Commonly Made Error

- Students usually get confused in the structure and the number of single bonds present in the compound.

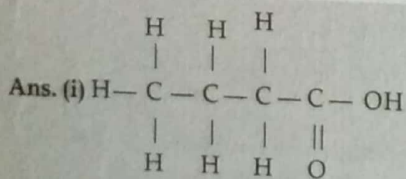
Answering Tip

- Practice the structure of different compounds involved in the homologous series.

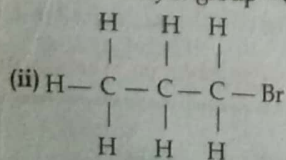
Q. 8. Draw the structures of the following compounds and identify the functional group present in them :

- Butanoic acid
- Bromopropane
- Butyne

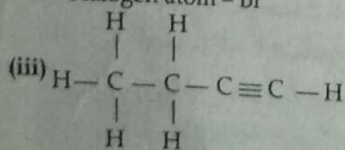
[AE] [Board Term-II, 2015]



Carboxylic group - COOH



Halogen atom - Br



Triple bond - C≡C-

[CBSE Marking Scheme, 2015] 1+1+1

Commonly Made Error

- Mostly student commit errors in writing structural formulae.

Answering Tip

- Give sufficient practice to write the structural formulae of organic compounds with correct functional groups.

Q. 9. What happens when hydrogen is added to a vegetable oil in the presence of nickel? Name the reaction and write one difference between the physical property of the vegetable oil and the product obtained in this reaction. Write the role of nickel in this reaction.

[C] [Comptt. Set 1, 2, 3, 2019]

- Ans. (i) Vegetable oil is converted into saturated fat.
(ii) The reaction is Hydrogenation
(iii) Vegetable oil is liquid and saturated fat is solid at room temperature
(iv) Nickel acts as a catalyst.

[CBSE Marking Scheme, 2019]

Commonly Made Error

- Students write irrelevant stories. Be specific. Read question carefully and write only what is asked.

Answering Tip

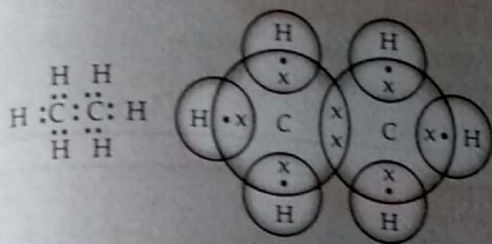
- Do not overlook any part of a question and avoid being in a hurry to conclude the answer.

Q. 10. Write the molecular formula of the following compounds and draw their electron-dot structures :

- (i) Ethane
- (ii) Ethene
- (iii) Ethyne

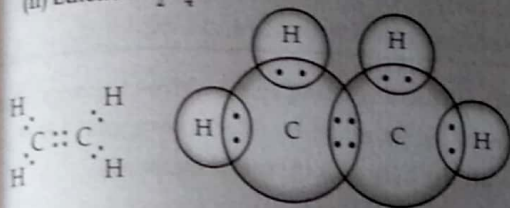
[Board Term II, Foreign Set-I, 2015]

Ans. (i) Ethane : C_2H_6



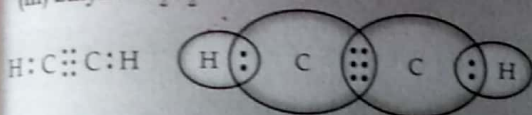
$\frac{1}{2} + \frac{1}{2}$

(ii) Ethene : C_2H_4



$\frac{1}{2} + \frac{1}{2}$

(iii) Ethyne : C_2H_2



[CBSE Marking Scheme, 2015] $\frac{1}{2} + \frac{1}{2}$

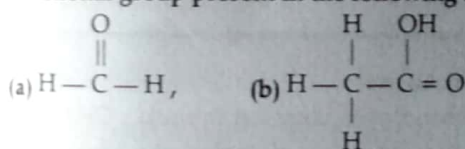
Commonly Made Error

- Students often make mistake while drawing electron dot structures.

Answering Tip

- Understand the basic concepts involved in drawing the dot structure. Make sure that you have made dots for all shared bonds.

Q. 11. (i) Define the term functional group. Identify the functional group present in the following :



(ii) What happens when 5% alkaline $KMnO_4$ solution is added drop by drop to warm ethanol taken in a test-tube ? State the role of alkaline $KMnO_4$ solution in this reaction.

[Board Term II Foreign Set-I, 2016]

Ans. (i) Functional group : Hetero atom or group of atoms attached to the carbon chain, which gives specific properties to the compounds, is called a functional group. 1

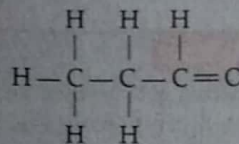
(a) Aldehyde group, (b) Carboxylic acid $\frac{1}{2} + \frac{1}{2}$

(ii) Acetic/Ethanoic acid is formed. It is an oxidizing agent. [CBSE Marking Scheme, 2016] $\frac{1}{2} + \frac{1}{2}$

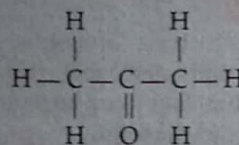
Q. 12. An aldehyde as well as a ketone can be represented by the same molecular formula, say C_3H_6O . Write their structures and name them. State the scientific relation between the two.

[OD. Set-I, 2016]

Ans. (i) Propanal (aldehyde); $\frac{1}{2} + \frac{1}{2}$



(ii) Propanone (Ketone); $\frac{1}{2} + \frac{1}{2}$



(iii) Isomers (same molecular formula but different structural formula/different functional group) 1

[CBSE Marking Scheme, 2016]

[AI] Q. 13. Explain the following :

- (i) CH_3COOH is a weak acid.
- (ii) Propene undergoes addition reaction.
- (iii) The gas stoves have inlets for air.

[Board Term II, 2015]

Ans. (i) Due to the incomplete ionization of acetic (CH_3COOH) acid.

(ii) $CH_3 - CH = CH_2$ undergoes addition reaction because of double bond.

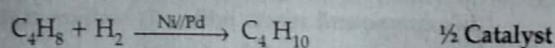
(iii) Sufficient supply of O_2 for complete combustion.

[CBSE Marking Scheme, 2015] 1+1+1

Q. 14. Two carbon compounds X and Y have the molecular formula C_4H_8 and C_5H_{12} respectively. Which one of these is most likely to show addition reaction? Justify your answer. Also, give the chemical equation to explain the process of addition reaction in this case.

[Delhi 31/1/2017]

Ans. C_4H_8 , it is an unsaturated hydrocarbon due to the presence of a double bond. 1 + 1



$\frac{1}{2}$ Equation

(or any other) $\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2017]

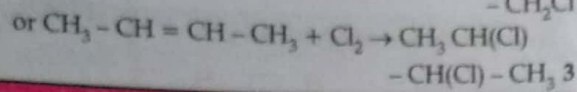
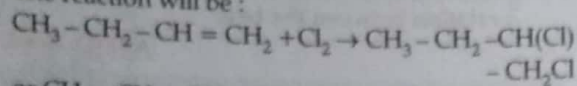
Detailed Answer :

Saturated compound — C_5H_{12} (Compound Y) undergo substitution reaction.

Unsaturated compound — C_4H_8 (Compound X) undergo addition reaction at the multiple bonds.

For example, 1-butene and 2-butene will add a chlorine molecule (Cl_2) to form 1, 2-dichlorobutane and 2, 3-dichlorobutane respectively.

The reaction will be :



Commonly Made Error

- Generally students get confused between saturated and unsaturated compounds and their molecular formula.

Answering Tip

- Be clear with basic concepts, saturated and unsaturated compounds, their molecular formulas. Also remember how saturated and unsaturated compounds react differently.

Q. 15. (i) Differentiate between alkanes and alkenes. Name and draw the structure of one member of each. [Board Term-II, Foreign Set-I 2014]

(ii) Alkanes generally burn with clean flame. Why?

[Board Term II Delhi Set-II, 2013]

Ans. (i) Difference between alkanes and alkenes.

S. No.	Alkanes	Alkenes
(i)	They are saturated compounds in which carbon and hydrogen are attached with single bonds.	These are unsaturated hydrocarbons which have one or more double bonds.
(ii)	Member : Methane (CH_4) $\begin{array}{c} \text{H} \\ \\ \text{H} - \text{C} - \text{H} \\ \\ \text{H} \end{array}$	Member : Ethene ($\text{CH}_2 = \text{CH}_2$) $\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H} - \text{C} = \text{C} - \text{H} \end{array}$ 1 + 1



Long Answer Type Questions

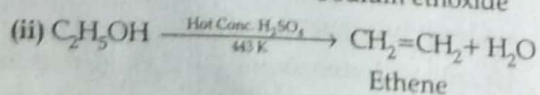
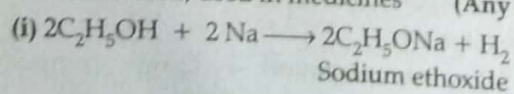
(5 marks each)

Q. 1. Write the chemical formula and name of the compound which is the active ingredient of all alcoholic drinks. List its two uses. Write chemical equation and name of the product formed when this compound reacts with : (i) sodium metal (ii) hot concentrated sulphuric acid.

[CBSE Board Delhi, Set-I, 2019]

Ans. • $\text{C}_2\text{H}_5\text{OH}$, Ethanol/Ethyl alcohol

- Good solvent; used in medicines (Any other)



[CBSE Marking Scheme, 2019] 1+1+1+ 1/2 + 1 + 1/2

(ii) Alkanes are saturated hydrocarbons which burn with a clean blue flame because combustion takes place in sufficient oxygen to give CO_2 and H_2O with the liberation of large amount of heat and light.

Commonly Made Error

- Students often get confused and write incorrect differences. Many of them write opposite differences.

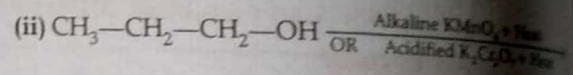
Answering Tip

- Be clear with concepts and remember alkanes are saturated compounds with single bonds and alkenes and alkynes are unsaturated compound which have one or more double bonds and triple bonds.

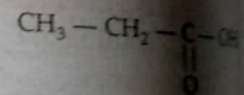
Q. 16. What is an oxidising agent? What happens when an oxidising agent is added to propanol? Explain with the help of a chemical equation.

[Delhi Set-II, 2016] [CBSE 2016]

Ans. (i) It is a substance which can give oxygen to other substances.



Propanol



Propanoic acid

(iii) Propanol is oxidised to Propanoic acid.

[CBSE Marking Scheme, 2016]

Detailed Answer :

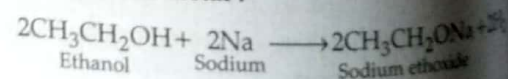
Ethanol with chemical formula : $\text{CH}_3\text{CH}_2\text{OH}$ is the active ingredient of all alcoholic drinks.

Two uses are :

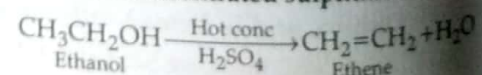
- It is used in the manufacture of paints and varnishes.
- It is used in medical swabs and hand sanitizers.

Chemical reactions of ethanol :

(i) With sodium metal :



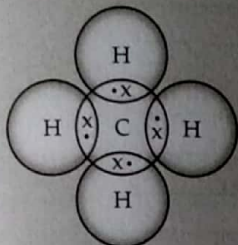
(ii) With hot concentrated sulphuric acid :



Q. 2. What is methane ? Draw its electron dot structure. Name the type of bonds formed in this compound. Why are such compounds : (i) poor conductors of electricity ? and (ii) have low melting and boiling points ? What happens when this compound burns in oxygen ?

[R] + [A] [CBSE Board Delhi, Set-1, 2019]

Ans. • CH₄/Simplest hydrocarbon



- Covalent bonds
- (i) No ions or charged particles are formed
- (ii) Due to weak covalent bonds
- Carbon dioxide and water are produced/
 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

[CBSE Marking Scheme, 2019] ½ + 1 + ½ + 1+1+1

Detailed Answer :

Methane is a colourless and highly flammable gas produced on decomposition of vegetation naturally in marshlands. It is the simplest hydrocarbon (CH₄).

Electron dot structure :

All the bonds present between four hydrogen atoms and one carbon atom at the center are covalent bonds.

- Methane is a poor conductor of electricity as all the bonds present are covalent bonds. Hence, no free electrons are available for conduction of electricity.
- As force of attraction between the molecules are not very strong in covalently bonded carbon compounds, therefore, methane being a covalent compound has very low melting and boiling point.

Q. 4. Why are certain compounds called hydrocarbons ? Write the general formula for homologous series of alkanes, alkenes and alkynes and also draw the structure of the first member of each series. Write the name of the reaction that converts alkenes into alkanes and also write a chemical equation to show the necessary conditions for the reaction to occur.

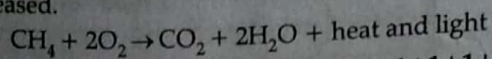
[U] [OD Set-1 2017]

Ans.

→ Compounds containing carbon & hydrogen are called hydrocarbons. Oxides, carbonates, hydrogen carbonates of carbon are not called hydrocarbons as they are inorganic compounds.

	General Formula	First Member's Structure
Alkanes	C_nH_{2n+2} where n = 1, 2, 3, ...	$\begin{array}{c} H \\ \\ H - C - H \\ \\ H \end{array}$ Methane

When methane burns in oxygen, carbon dioxide, water and large amount of heat and light is released.



[CBSE Marking Scheme, 2019] 1+1+1+1+1

Q. 3. The formulae of four organic compounds are given below:

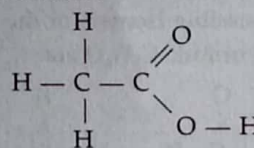
A	B	C	D
C ₂ H ₄	CH ₃ COOH	C ₂ H ₅ OH	C ₂ H ₆

- Which one of these compounds A, B, C or D is a saturated hydrocarbon?
- Identify the organic acid and give its structural formula.
- Which of the above compounds when heated at 443K in the presence of concentrated H₂SO₄ forms ethene as the major product? What is the role played by concentrated H₂SO₄ in this reaction? Also, write the chemical equation involved.
- Give a chemical equation when B and C react with each other in presence of concentrated H₂SO₄. Name the major product formed and mention one of its important use. [A] [Board SQP, 2020]

Ans. (i) D is a saturated hydrocarbon.

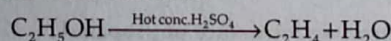
(ii) B is an organic acid.

Structural formula :



(iii) C is an alcohol.

It acts as a dehydrating agent and removes a water molecule from ethanol.



(iv) $CH_3COOH + C_2H_5OH \xrightarrow{\text{conc } H_2SO_4} CH_3COOC_2H_5 + H_2O$

Major product is an ester and it is used in making perfumes / flavouring agents. ½ + 1 + 2 + 1 ½

Alkenes C_nH_{2n} where $n=2,3,\dots$

Alkynes C_nH_{2n-2} where $n=2,3,\dots$

Ethene $H_2C=CH_2$

Ethyne $H-C\equiv C-H$

Addition Reaction converts alkenes to alkanes
(unsaturated) (saturated)

$H_2C=CH_2 \xrightarrow[+H_2]{Ni/Pd} H_3C-CH_3$

Reactions occur at high temperature & in presence of catalysts such as nickel or palladium.

[Topper's Answer, 2017] 5

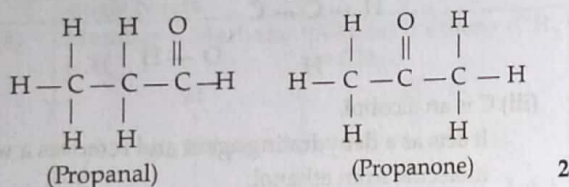
Q. 5. (i) Define the term 'isomers'.

(ii) Draw two possible isomers of the compound with molecular formula C_3H_6O and write their names.

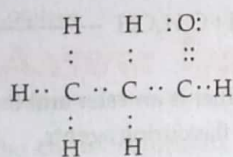
(iii) Give the electron dot structures of the above two compounds. [R] [Delhi Set-I, 2013]

Ans. (i) The compounds that contain the same molecular formula but different structures are called isomers. The isomers of a compound have different physical properties. 1

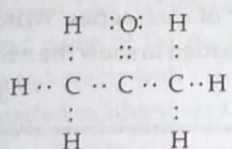
(ii) The two possible isomers of the compound with molecular formula C_3H_6O are :



(iii) Electron dot structure of propanal :



Electron dot structure of propanone :



Commonly Made Error

- Students get confused in writing isomeric structures and make mistake while drawing electron dot structures.

Answering Tip

- Learn the concept of isomerism and practice structures accordingly.

Q. 6. (i) Give a chemical test to distinguish between saturated and unsaturated hydrocarbon.

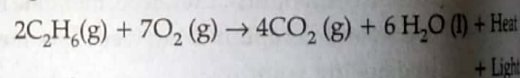
(ii) Name the products formed when ethane burns in air. Write the balanced chemical equation for the reaction showing the types of energies liberated.

(iii) Why is reaction between methane and chlorine in the presence of sunlight considered a substitution reaction ?

[U] [OD Comptt., 2017] [Delhi Set-I, 2013]

Ans. (i) Pass the vapours of the given samples of saturated and unsaturated hydrocarbons into bromine water taken in two separate test-tubes. The one which discharges the colour of bromine water is that of unsaturated hydrocarbon and the other represents saturated hydrocarbon. (Or any other test) 1

(ii) On burning ethane in air, the products obtained are carbon dioxide and water, along with heat and light.



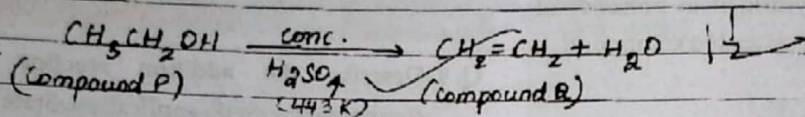
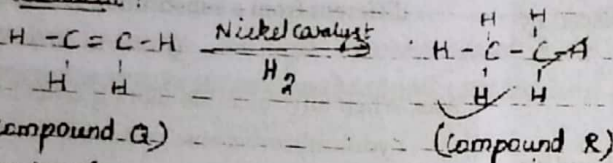
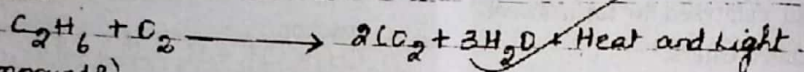
(iii) It is considered a substitution reaction because the hydrogen atoms of methane (CH_4) are replaced by chlorine atoms one by one. 1 + 1

[AI] Q. 7. Describe the following chemical properties of carbon compounds briefly and give one chemical reaction for each :

- Combustion
- Addition
- Substitution
- Esterification
- Oxidation

[R] [Board Term II, 2016]

OR

The compound P is ethanol ✓Compound Q is Ethene ✓Compound R is Ethane ✓Addition:Combustion:

The compounds P, Q, R are ethanol, ethene and ethane respectively.

[Topper's Answer, 2016]



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