Carbon and Its Compounds

(A) Objective Type Questions — 1 Mark Each

Stand Alone MCQs (1 Mark Each)

1. Which of the following is not observed in a homologous series? [CBSE SQP 2020]

(A) Change in chemical properties
(B) Difference in —CH_2 and 14u molecular mass
(C) Gradation in physical properties
(D) Same functional group U

Ans. Option (A) is correct.

Explanation: No change in chemical properties due to the presence of same functional group.

2. 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 U

Ans. Option (B) is correct.

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

3. 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 U

Ans. Option (B) is correct.

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

AI **4. The correct electron dot structure of a water molecule is :**

(A) H·Ö·H **(B)** H:Ö·H
(C) H:Ö:H **(D)** H:O:H C

Ans. Option (C) is correct.

Explanation: In electron dot structure, Oxygen has a complete octet, while each atom of hydrogen has two electrons in outermost shell.

5. Which of the following statements are usually correct for carbon compounds?

(i) These are good conductors of electricity.
(ii) These are poor conductors of electricity.
(iii) These have strong forces of attraction between their molecules.
(iv) These do not have strong forces of attraction between their molecules.

(A) (i) and (iii) **(B)** (ii) and (iii)
(C) (i) and (iv) **(D)** (ii) and (iv) K

Ans. Option (D) is correct.

Explanation: The atomic number of carbon is 6. So, its electron configuration is 2, 4. Carbon having four valence electrons forms covalent compounds which show less intermolecular attractions and do not have any free electrons to transmit electric current. Therefore, these are poor conductors of electricity.

6. A molecule of ammonia (NH_3) has :

(A) only single bonds
(B) only double bonds
(C) only triple bonds
(D) two double bonds and one single bond K

Ans. Option (A) is correct.

Explanation: In ammonia covalent bond is present in which center nitrogen atom is bonded with three hydrogen atoms through single covalent bond.

7. Which of the following does not belong to the same homologous series?

(A) CH_4 **(B)** C_2H_6
(C) C_3H_8 **(D)** C_4H_8 K

Ans. Option (D) is correct.

Explanation: A series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called as homologous series. The option (d) is alkene that follows the general formula C_nH_{2n}, while others follow the general formula C_nH_{2n+2}.

Assertion and Reason Based MCQs (1 Mark Each)

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 A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is NOT the correct explanation of A.
(C) A is true but R is false.
(D) A is false and R is true.

AI **1. Assertion (A):** In a homologous series of alcohols, the formula for the second member is C_2H_5OH and the third member is C_3H_7OH.
Reason (R): The difference between the molecular masses of the two consecutive members of a homologous series is 144.

Ans. Option (C) is correct.

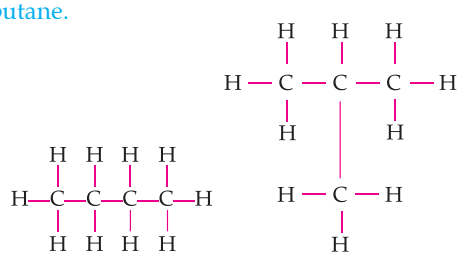
Explanation: In homologous series of alcohols, the formula for the second member is C_2H_5OH and the third member is C_3H_7OH. The difference between the molecular masses of the two consecutive members of a homologous series is 14*u*.

2. **Assertion (A):** Following are the members of a homologous series : CH_3OH, CH_3CH_2OH, $CH_3CH_2CH_2OH$
Reason (R): A series of compounds with same functional group but differing by —CH_2 – unit is called a homologous series.
[CBSE Delhi Set-II, 2020]

Ans. Option (A) is correct.

Explanation: Homologous series is a series of compounds in which the members present have the same functional group and similar chemical properties and any two successive members in a particular series differ in their molecular formula by a – CH_2 unit. For example, the series like methanol, ethanol, propanol and so on is a homologous series of alcohol.

3. **Assertion (A):** Following are the structural isomers of butane.



Reason (R): Structural isomers have the same molecular formula but they differ in their structures.
[CBSE SQP, 2020]

Ans. Option (A) is correct.

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.

4. **Assertion (A):** Third member of alkane is propane (C_3H_8)
Reason (R): It is obtained from general formula C_nH_{2n+2}

Ans. Option (A) is correct.

Explanation: C_3H_8 can be obtained from general formula, C_nH_{2n+2}. Where $n = 3$

AI 5. **Assertion (A):** Carbon atoms have the ability to form four strong covalent bonds.
Reason (R): Carbon has the ability to make single, double and triple bonds with itself.

Ans. Option (B) is correct.

Explanation: Carbon contains four electrons in its outermost shell. Therefore, it can form four covalent bonds with other atoms or molecules to complete its octet and reach noble gas configuration. Also, carbon has the ability to make single, double and triple bonds with it.

6. **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. Option (D) is correct.

Explanation: Carbon compounds are mainly poor conductors of electricity because there is no free electrons present to transmit electricity.

Case-based MCQs (1 Mark Each)

I. Read the passage and answer the given 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.

1. **The chemical properties of which of the following compounds is similar to the butane ?** R
(A) Butyne **(B)** Propene
(C) Propyne **(D)** Pentane

Ans. Option (D) is correct.

Explanation: Methane, ethane, propane, butane, pentane etc. are all part of the alkane homologous series and have similar chemical properties.

2. **The difference between two consecutive members in a homologous series in alkanes in terms of molecular mass and number of atoms of elements is:** U
(A) 14 a.m.u and CH_2 respectively
(B) 12 a.m.u and CH_3 respectively
(C) 14 a.m.u and CH respectively
(D) 12 a.m.u and CH_3 respectively

Ans. Option (A) is correct.

Explanation: Homologous series is a series of compounds in which the members present have the same functional group and similar chemical properties and any two successive members in a particular series differ in their molecular formula by a –CH_2 unit.

3. **Which of the following is not the property of a homologous series ?** R
(A) They show similar chemical properties.
(B) They differ by 14 units by mass.
(C) They all contain double bond
(D) They can be represented by a general formula.

Ans. Option (C) is correct.

Explanation: **The characteristics of a homologous series are :**
- They have same general formula.
- Successive compounds differ by –CH_2 unit.
- Successive compounds have molecular mass difference of 14u.
- Molecular mass increases down the series. Therefore members of homologous series show gradation in physical properties such as melting point and boiling points.
- Members of homologous series show similar chemical properties.

4. **Which of the following represent the name and formula of the 2nd member of homologous series having general formula C_nH_{2n+2} ?** U

(A) Methane CH_4 **(B)** Ethane C_2H_6
(C) Ethene C_2H_4 **(D)** Ethyne C_2H_6

Ans. Option (B) is correct.

Explanation: Methane, ethane, propane, butane, etc. are all part of the alkane homologous series. The general formula of this series is C_nH_{2n+2} Ethane (C_2H_6) is 2nd member as $n = 2$.

II. Read the given passage and answer the questions given below :

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

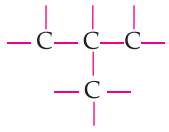


Fig.A

1. **Name the characteristic property of carbon as depicted in the fig. A** A

(A) Catenation **(B)** Polymerisation
(C) Isomerisation **(D)** None of the above.

Ans. Option (A) is correct.

Explanation: Carbon forms bond with other atoms of carbon. This property of carbon is known as catenation.

2. **Carbon forms large number of compounds due to :** U

(A) Catenation only
(B) Tetravalency only
(C) Both catenation and tetravalency
(D) None of the above

Ans. Option (C) is correct.

Explanation: 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.

3. **Carbon is :** R

(A) Divalent **(B)** Monovalent
(C) Tetravalent **(D)** Trivalent

Ans. Option (C) is correct.

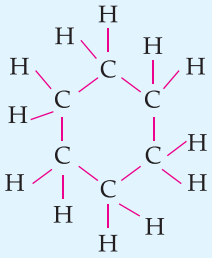
Explanation: Carbon has valency of four. It is capable of bonding with four other atoms of carbon or atoms of some other monovalent element. Carbon can form bond with Oxygen, Hydrogen, Nitrogen, Sulphur, Chlorine and many other elements giving rise to compounds with specific properties.

4. **Write the name and structure of a saturated compound in which 6 carbon atoms are arranged in a ring.** U

(A) Hexane **(B)** Cyclohexane
(C) Pentane **(D)** Cyclopentane

Ans. Option (B) is correct.

Explanation: Cyclohexane is the carbon compounds in which carbon atoms are arranged in the form of a ring. It is a cyclic carbon compounds. Its structure is :



III. Read the passage and answer the questions given below :

Homologous series is a series of compounds with similar chemical properties and same functional group differing from the successive member by —CH_2 unit. Carbon chains of varying length have been observed in organic compounds having the same general formula. Such organic compounds that vary from one another by a repeating unit and have the same general formula form a series of compounds. Alkanes with general formula C_nH_{2n+2}, alkenes with general formula C_nH_{2n} and alkynes with general formula C_nH_{2n-2} form the most basic homologous series in organic chemistry.

All the members belonging to this series have the same functional groups. They have similar physical properties and follow a fixed gradation with increasing mass. This series has enabled scientists to study different organic compounds systematically. They can predict the properties of organic compounds belonging to a particular homologous series based on the data available from the other members of the same series. The study of organic compounds has been simplified.

1. **Which of these statements is correct about the members of a homologous series ?** R

(A) They have same empirical formula.
(B) They have same general formula.
(C) They have same molecular formula.
(D) They have same physical properties.

Ans. Option (B) is correct.

Explanation: Homologous series is a series of compounds in which the members present have the same functional group and similar chemical properties and any two successive members in a particular series differ in their molecular formula by a – CH_2 unit. *e.g.*, series of alkanes *i.e.*, Methane, ethane, propane, butane and so on is a homologous series.

2. **Two compounds CH_3OH and C_2H_5OH are provided. The difference in its formulae and molecular masses are ___I___ and ____II____.** U

(A) I- CH_3, II- 16 units
(B) I- CH_2, II- 14 units
(C) I- CH_4, II- 18 units
(D) I - CH_3, II- 16 units

Ans. Option (B) is correct.

Explanation: CH_3OH and C_2H_5OH are homologous because difference in its formulae and molecular masses are CH_2 and 14 units.

3. What is the molecular formula of the 5th member of the homologous series of carbon compounds is represented by the general formula $C_nH_{2n+1}OH$? U

(A) C_5H_{10} **(B)** $C_5H_{11}OH$

(C) $C_5H_{12}OH$ **(D)** $C_5H_{11}CHO$

Ans. Option (B) is correct.

Explanation: The molecular formula of the fifth member of the homologous series of carbon compounds is represented by the general formula $C_nH_{2n+1}OH$ is $C_5H_{11}OH$.

4. The general formula for alkene is : R

(A) C_nH_{2n} **(B)** C_nH_{2n+2}

(C) C_nH_{2n-2} **(D)** C_nH_{2n+1}

Ans. Option (A) is correct.

Explanation: The General formula for alkenes are C_nH_{2n}, where n = number of carbon atoms. C_2H_4, C_3H_6, C_4H_8.

(B) Subjective Questions

Very Short Answer Type Questions (1 Mark Each)

1. Define catenation. R **[CBSE 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. **1**

[CBSE SQP Marking Scheme, 2020]

2. Name a cyclic unsaturated carbon compound. R **[CBSE, 2020]**

Ans. Benzene. **1**

AI **3. Name the functional group present in propanone.** R **[CBSE Delhi Set-II, 2020]**

Ans. Ketone. **1**

4. How are covalent bonds formed ? R **[CBSE OD Set-I, 2020]**

Ans. Covalent bonds are formed by the sharing of electrons between the atoms. **1**

AI **5. Write the molecular formula of first two members of homologous series having function group – Cl.** U **[CBSE Delhi Set-I, 2017]**

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

CH_3Cl (Chloromethane)

C_2H_5Cl (Chloroethane) ½ + ½

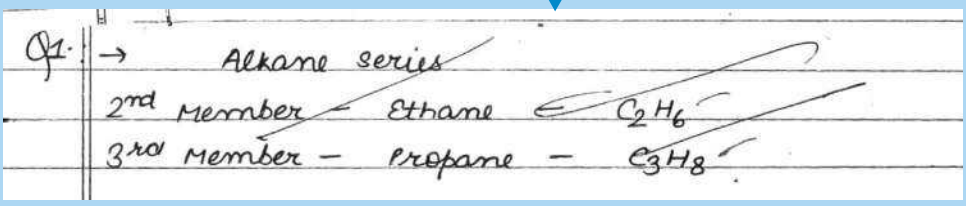
6. Write the molecular formula of the 2nd and the 3rd member of the homologous series whose first member is methane. AE **[CBSE OD Set-I, 2017] [SA-II, OD. Set-I, 2017]**

Ans. Ethane (C_2H_6)

Propane (C_3H_8) ½ + ½

Topper Answer, 2017

Ans.



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.

7. Write the molecular formula of first two members of homologous series having functional group -Br. U

Ans. CH_3Br, C_2H_5Br **1**

[CBSE Marking Scheme, 2017]

AI **8. Write the molecular formula of the 2nd and 3rd member of the homologous series whose first member is ethene.** **[O.E.B.]** C

Ans. C_3H_6 and C_4H_8 **1**

[CBSE Marking Scheme, 2017]

9. Write the molecular formula of the 2nd member of the homologous series where the first member is ethyne. U [CBSE OD Set-III, 2017]

Ans. C_3H_4, C_4H_6 **1**
[CBSE Marking Scheme, 2017]

10. What is a homologous series of carbon compounds ?
R [CBSE 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 atomic mass unit. **1**
[CBSE Marking Scheme, 2016]

11. **Write the next homologue of each of the following:**
(i) C_2H_4 **(ii)** C_4H_6
U [CBSE Term II, Delhi Set-I, 2016]

Ans. (i) C_3H_6 **(ii)** C_5H_8 ½+½
[CBSE Marking Scheme, 2016]

12. Name the following compounds:
(i) $CH_3—CH_2—OH$, **(ii)** $CH_3—\overset{\overset{H}{|}}{C}=O$
R [CBSE Term II, Delhi Set-I, 2016]

Ans. (i) Ethanol, **(ii)** Ethanal. ½ + ½
[CBSE Marking Scheme, 2016]

13. Which element exhibits the property of catenation to maximum extent and why ?
R [CBSE Term II, Delhi Set-I, 2016]

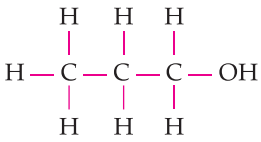
Ans. Carbon, due to strong C—C bond. **1**
[CBSE Marking Scheme, 2016]

AI 14. Select saturated hydrocarbons from the followings:
C_3H_6, C_5H_{10}, C_4H_{10}, C_6H_{14}, C_2H_4
A [CBSE Term II, Delhi Set-III, 2016]

Ans. C_4H_{10}; C_6H_{14}. ½ + ½
[CBSE Marking Scheme, 2016]

15. Write the name and structure of an alcohol with three carbon atoms in its molecule.
R [CBSE Term II, O.D. Set-I, 2016]

Ans. Propanol,

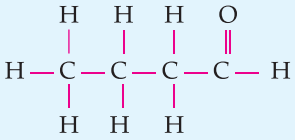


Or $CH_3 — CH_2 — CH_2 — OH$ **1**

16. Write the name and structure of an aldehyde with four carbon atoms in its molecule.
R [CBSE Term II, OD. Set-III, 2016]

Ans. Butanal, $CH_3 — CH_2 — CH_2 — CHO$

Or

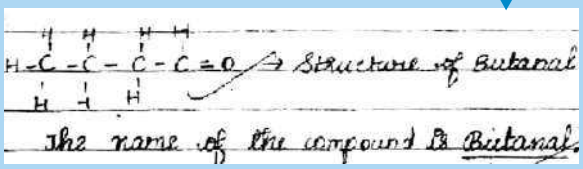


1
[CBSE Marking Scheme, 2016]

OR

Topper Answer, 2016

Ans.



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. Learn the structures carefully.

AI 17. Name the process of converting vegetable oil to vegetable ghee. R [CBSE Term II SQP, 2016]

OR

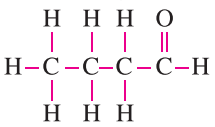
Name the process by which unsaturated fats gets changed to saturated fats.
R [CBSE Term II Foreign Set-I, 2015]

Ans. Hydrogenation. **1**
[CBSE Marking Scheme, 2016]

18. Write the name and structure of an aldehyde with four carbon atoms in its molecule.
R [CBSE OD, 2016]

Ans. Butanal, $CH_3 – CH_2 – CH_2 – CHO$

OR



AI 19. Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n}.
A [CBSE Delhi Set-I, 2015]

Ans. Name: Propene
Formula: C_3H_6 ½+½
[CBSE Marking Scheme, 2015]

20. Write the number of covalent bonds in the molecule of ethane.
U [CBSE 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.

Short Answer Type Questions-I
(2 Marks Each)

1. Give a test that can be used to confirm the presence of carbon in a compound. With a valency of 4, how is carbon able to attain noble gas configuration in its compounds? C [CBSE SQP 2020]

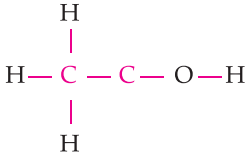
Ans. When carbon compound is burnt in the presence of oxygen, a gas is evolved.
Gas evolved turns lime water milky.
By sharing its four valence electrons with other elements, carbon attains stable noble gas configuration. **1 + 1**

2. The number of carbon compounds is more than those formed by all other elements put together. Justify the statement by giving two reasons.
U [CBSE SQP 2020]

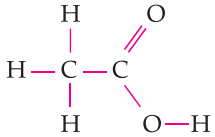
Ans. **(i)** Due to self linking ability of carbon/catenation.
(ii) Since carbon has a valency of four it can form bonds with four other atoms of carbon or atoms of some other monovalent element.
(iii) Due to small size of carbon it forms very strong and (or) stable bonds with other elements.
(Any two) 1+1

3. Draw the structures for (i) ethanol, (ii) ethanoic acid. C [CBSE Delhi Set-III 2020]

Structure of ethanol:



Structure of ethanoic acid:



1 + 1

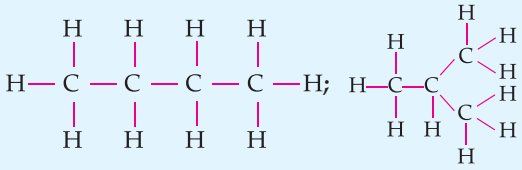
Short Answer Type Questions-II
(3 Marks Each)

1. What is a homologous series of carbon compounds? Give an example and list its three characteristics.
R [CBSE 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:
(i) They have same general formula.
(ii) They have same functional group.
(iii) The difference in the molecular mass of two successive member is 14*u*.
(iv) The difference in the molecular formula of two successive member is of CH_2 unit.
(v) They have similar chemical properties.
(Any three points) ½ × 3
[CBSE Marking Scheme, 2019]

AI **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 [CBSE Outside Delhi, Set- II, 2019]

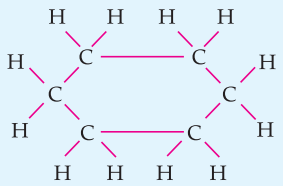
Ans. • **Alkane**
Saturated hydrocarbon with C–C single bond
• **Alkene**
Unsaturated Hydrocarbon with double bond in C=C
• **Alkyne**
Unsaturated Hydrocarbon with triple bond in C ≡ C
(or any other) ½ × 3
• **Alkane** ½
2 structural isomers



[CBSE Marking Scheme, 2019] ½ + ½

3.(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 [CBSE Delhi/Outside Delhi, 2018]

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

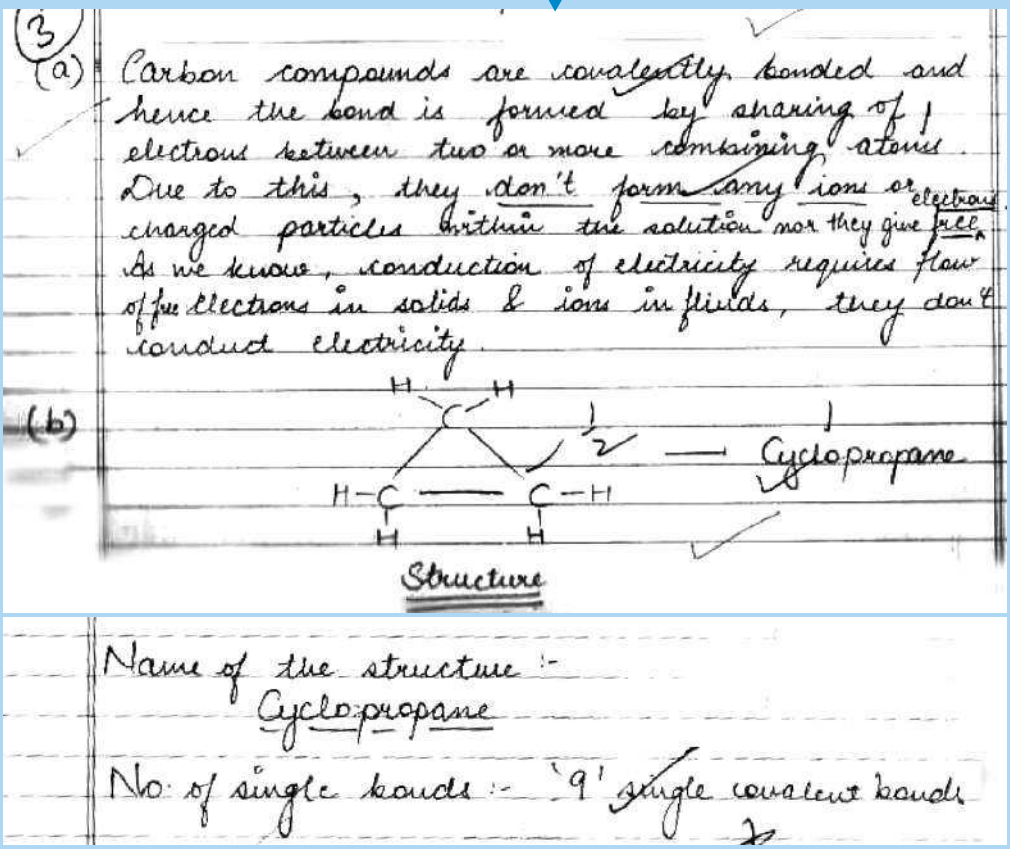


Total no. of single bonds = 18
(OR any other cycloalkane with corresponding number of bonds)

[CBSE Marking Scheme, 2018] **1 + 1 +1**

OR

Topper Answer, 2018



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.

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

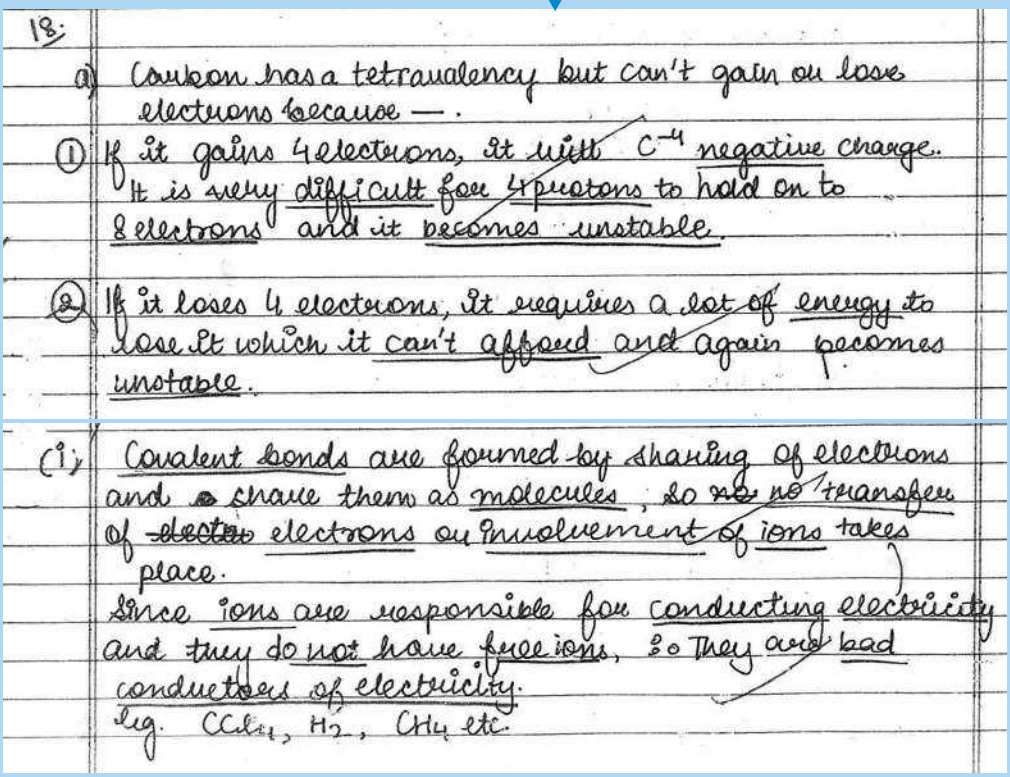
A [CBSE OD Comptt., 2017]

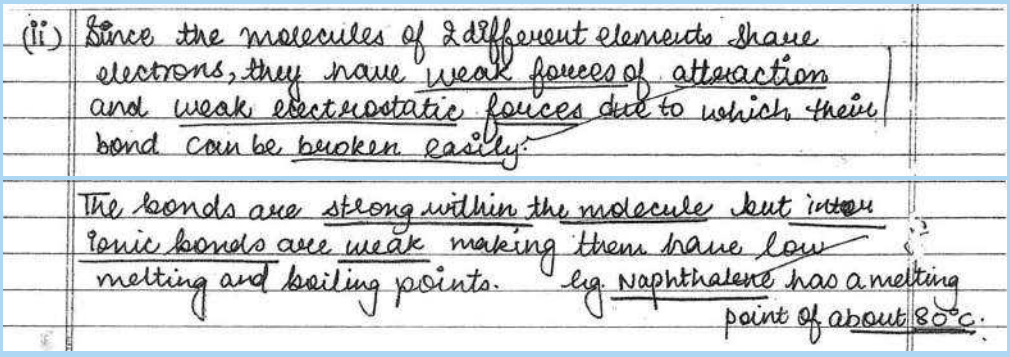
Ans. The compounds that are formed due to sharing of electrons between two atoms/compounds having covalent bonds. **1**
Ionic compounds are formed due to transfer of electrons from one atom to another/compounds having ionic bonds/compounds having attraction between oppositely charged ions **1**
(i) They are poor conductors of electricity ½
(ii) They have low melting and boiling point. ½
[CBSE Marking Scheme, 2017] **(or any other)**

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 **[CBSE 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]

Topper Answer, 2017

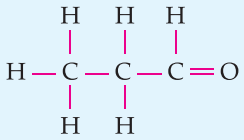

18:
a) Carbon has a tetravalency but can't gain or lose electrons because —.
(1) If it gains 4 electrons, it will C^{-4} negative charge. It is very difficult for 4 protons to hold on to 8 electrons and it becomes unstable.
(2) If it loses 4 electrons, it requires a lot of energy to lose it which it can't afford and again becomes unstable.
(i) Covalent bonds are formed by sharing of electrons and share them as molecules, so no transfer of electrons or involvement of ions takes place.
Since ions are responsible for conducting electricity and they do not have free ions, so they are bad conductors of electricity.
Eg. CCl_4, H_2, CH_4 etc.


(ii) Since the molecules of 2 different elements share electrons, they have weak forces of attraction and weak electrostatic forces due to which their bond can be broken easily.
The bonds are strong within the molecule but inter ionic bonds are weak making them have low melting and boiling points. Eg. Naphthalene has a melting point of about 80°C.

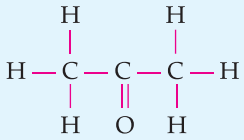
6. An aldehyde as well as a ketone can be represented by the same molecular formula, say C_3H_6O. Write their structures and name them. State the scientific relation between the two.

A [CBSE OD. Set-I, 2016]

Ans. (i) Propanal (aldehyde); ½ + ½



(ii) Propanone (Ketone); ½ + ½



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

[CBSE Marking Scheme, 2016]

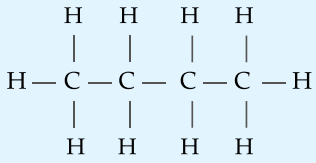
7. What is meant by isomers ? Draw the structure of two isomers of butane, C_4H_{10}. Explain why we cannot have isomers of first three members of alkane series.

AE [CBSE Board Term II, Delhi Set-I, 2015]

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

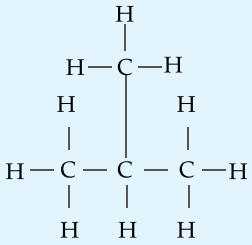
Isomers of Butane:

(i)



n-butane

(ii)



iso-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 carbon atom of the structure. **1+1+1**

[CBSE Marking Scheme, 2015]

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

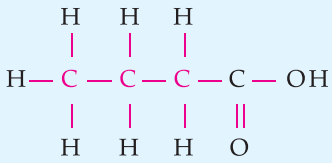
(i) Butanoic acid

(ii) Bromopropane

(iii) Butyne

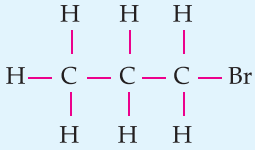
AE [CBSE Board Term-II, 2015]

Ans. (i)



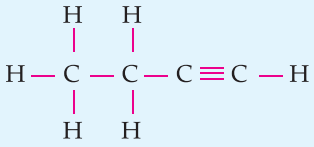
Carboxylic group – COOH

(ii)



Halogen atom – Br

(iii)



Triple bond – C ≡ C –

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

COMMONLY MADE ERROR

- Students mostly commit errors in writing structural formulae.

ANSWERING TIP

- Sufficient practice must be taken to write the structural formulae of organic compounds with correct functional groups.

AI **9. Write the molecular formula of the following compounds and draw their electron-dot structures:**

(i) Ethane

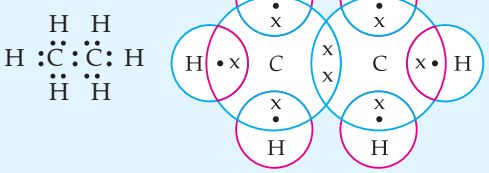
(ii) Ethene

(iii) Ethyne

C [Foreign Set-I, 2015]

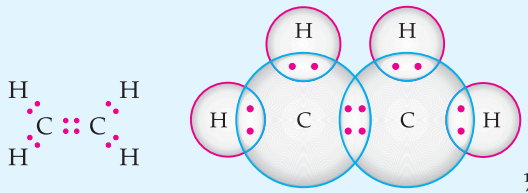
Ans.

(i) Ethane: C_2H_6



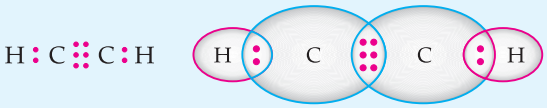
½ + ½

(ii) Ethene: C_2H_4



½ + ½

(iii) Ethyne: C_2H_2



[CBSE Marking Scheme, 2015] ½ + ½

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.

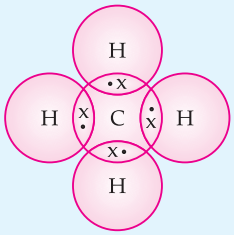
Long Answer Type Questions

(5 Marks Each)

AI **1. 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 Delhi Set-I, 2019]**

Ans. • CH_4/Simplest hydrocarbon



- Covalent bonds

(i) No ions or charged particles are formed

(ii) Due to weak covalent bonds

- Carbon dioxide and water are produced/

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$$

½ + 1 + ½ + 1+1+1

[CBSE Marking Scheme, 2019]

Detailed Answer:

Methane is a colourless and highly flammable gas produced on decomposition of vegetation naturally in marshlands. It is the simplest hydrocarbon (CH_4).

Electron dot structure:

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

(i) 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.

(ii) 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.

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

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + \text{heat and light}$$

1+1+1+1+1

2. 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 **[CBSE OD Set-I, 2017]**

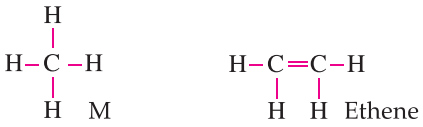
Ans. The hydrocarbons are the compounds that consist of carbon and hydrogen.

The alkanes are known as the saturated hydrocarbons as they have compounds of carbon that are single bonded and has the general formula C_nH_{2n+2}

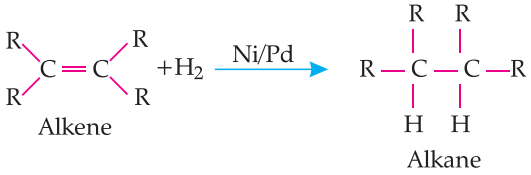
Alkenes are unsaturated hydrocarbons and are made up of compounds of carbon that are double bonded and has the general formula C_nH_{2n}.

Alkynes are also unsaturated hydrocarbons that are made up of compounds of carbon that are triple bonded and have a general formula C_nH_{2n-2}

The structure of the first members of each series are as follows:



The hydrogenation reaction is a reaction that helps in converting unsaturated hydrocarbons to the saturated hydrocarbons. The conversion of alkenes to alkane is an example of hydrogenation reaction.



Topper Answer, 2017