

Practice Challenge - Objective

Subject: Chemistry

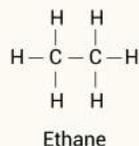
Topic : Carbon and its Compounds_Revision

Class: X

1. Ethane, with the molecular formula C_2H_6 , has ____ covalent bonds.

- A. six
- B. seven
- C. eight
- D. nine

A covalent bond involves the sharing of electron pairs between two elements. Given below is the structure of ethane, having molecular formula C_2H_6 :



Ethane has seven covalent bonds, i.e., six C-H bonds and one C-C bond.

Practice Challenge - Objective

2. Choose the correct option based on the statements given:

Statement 1: Carbon shares electrons to form covalent bond with other elements.

Statement 2: C^{4+} and C^{4-} ions are highly unstable.

- A. Both statements are correct but statement 2 is not the correct explanation for statement 1.
- B. Both statements are correct and statement 2 is the correct explanation for statement 1.
- C. Statement 1 is wrong but statement 2 is correct.
- D. Statement 1 is correct but statement 2 is wrong.

Carbon does not donate or accept electrons to obtain noble gas configuration as C^{4-} and C^{4+} are unstable in nature.

C^{4-} is unstable because it would be difficult for the nucleus with six protons to hold on to ten electrons.

C^{4+} is unstable because it would require an excessively large amount of energy to remove four electrons.

Since both C^{4-} and C^{4+} ions are unstable in nature, carbon overcomes this problem by sharing its valence electrons with other atoms to obtain the nearest noble gas electronic configuration.

Hence, the given statements are correct and statement 2 is correctly explaining statement 1.

Practice Challenge - Objective

3. Silicon is tetravalent. But why can't it form long chain compounds like carbon?

- A. Silicon is a metalloid and cannot bond with other atoms.
- B. Silicon is larger in size than carbon, and cannot hold the shared electron pair(s) strongly.
- C. Silicon is smaller in size than carbon, and cannot hold the shared electron pair(s) strongly.
- D. Silicon compounds are unreactive.

The compounds formed by carbon atoms with others are highly stable as the bonds formed by carbon atoms are strong. This is due to the small size of the carbon atom. This allows the nucleus of carbon to hold the shared pair of electrons more firmly.

Silicon atom is large and hence can't form long chain compounds like a carbon atom.

Practice Challenge - Objective

4. Select the option that will complete the homologous series given below.

C_2H_4 , C_3H_6 , _____, C_5H_{10} , C_6H_{12}

A. C_4H_6

B. C_4H_{10}

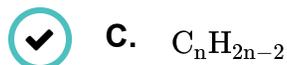
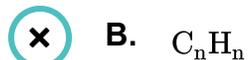
C. C_4H_4

D. C_4H_8

- The homologous series is a series of compounds with same functional group that differs by a $-CH_2$ unit.
- Given here is the alkene series. So, the successive member after C_3H_6 in the given alkene homologous series is C_4H_8 .

Practice Challenge - Objective

5. The general formula for alkynes is:



• Alkynes are hydrocarbons having atleast one triple bond between its carbon atoms. The general formula for alkynes is C_nH_{2n-2} .

• Alkanes are hydrocarbons having only single bonds between its carbon atoms. The general formula for alkanes is C_nH_{2n+2} .

• Alkenes are hydrocarbons having atleast one double bond between its carbon atoms. The general formula for alkenes is C_nH_{2n} .

Practice Challenge - Objective

6. Which amongst the following is not an allotrope of carbon?

- A. Carbon dioxide
- B. Fullerene
- C. Diamond
- D. Graphite

Allotropes are the different forms in which an element can exist. For example, diamond, graphite and fullerene are allotropes of carbon.

However, carbon dioxide (CO_2) is not an allotrope of carbon but instead a compound of carbon. It contains oxygen atoms bonded to the carbon atom.

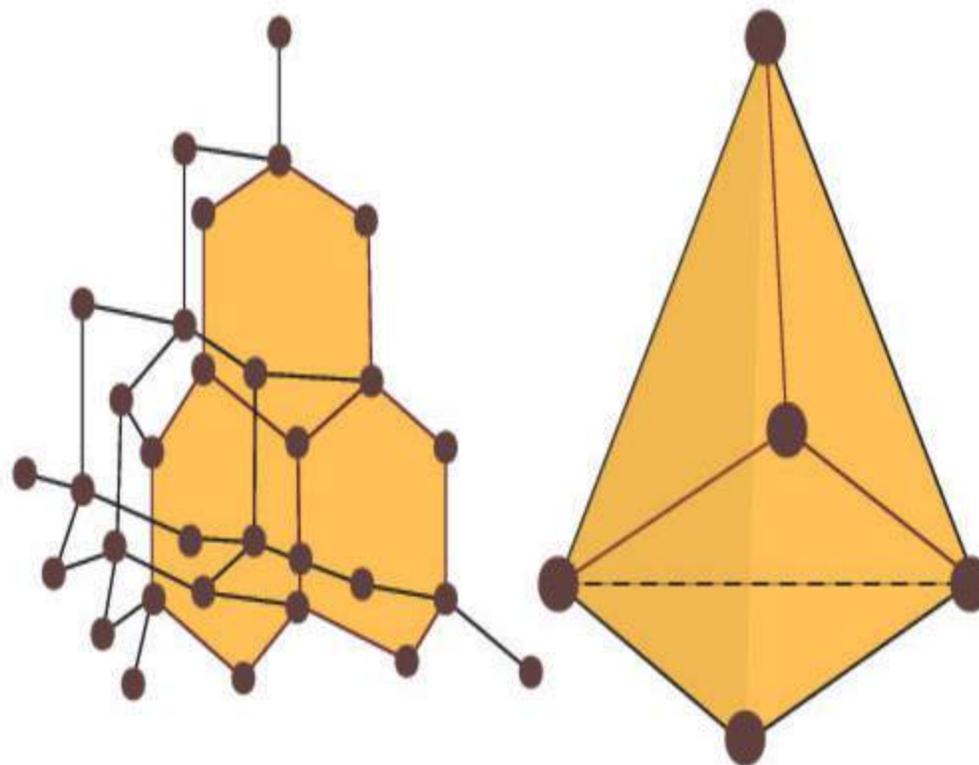
Practice Challenge - Objective

7. Diamond has a _____ structure while that of graphite is _____.

- A. hexagonal layered, octahedron
- B. tetrahedral, hexagonal layered
- C. tetrahedral, square pyramidal
- D. pentagonal, hexagonal layered

Diamond is a crystalline allotrope of carbon in which each carbon atom is covalently bonded to four other carbon atoms. It forms a rigid 3D tetrahedral structure as shown below.

Practice Challenge - Objective



- Carbon atom
- Covalent bond

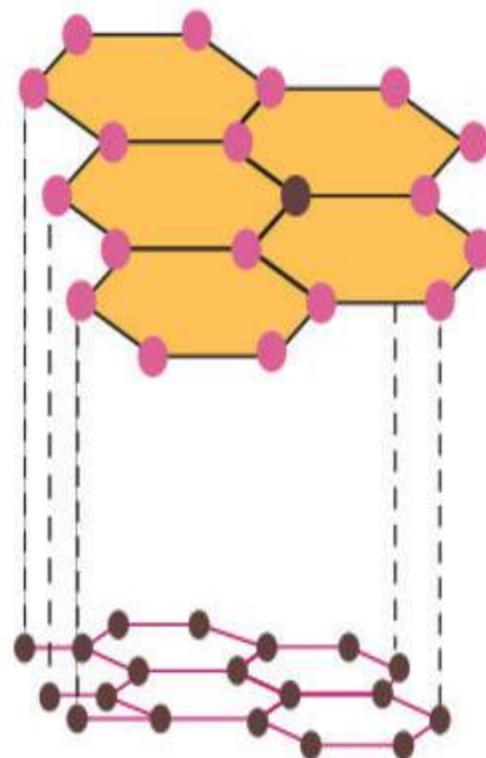
©byjus CarS2011_Carbon diamond structures (3)

Practice Challenge - Objective

Graphite is another crystalline allotrope of carbon. In graphite, each carbon atom is covalently bonded to three other carbon atoms, thus forming a hexagonal layered structure. Each of these layers are joined together by weak van der Waals force.

BYJU'S

Practice Challenge - Objective



----- Van der Waals forces

— Covalent bond

©byjus CarS2015_Carbon graphite structures

Practice Challenge - Objective

8. The maximum number of covalent bonds that can be formed between two carbon atoms is _____.

- A. two
- B. five
- C. three
- D. four

There can be a maximum of three bonds between two carbon atoms. A triple bond is formed when three pairs of electrons are shared between two atoms.

9. The ability of atoms of an element to combine among themselves to form long chains is called _____.

- A. catenation
- B. allotropy
- C. tetravalency
- D. isomerism

The ability of atoms of an element to combine among themselves to form long chains and rings is called catenation.

Carbon exhibits this property, so it has large number of compounds.

Practice Challenge - Objective

10. Which of the following pairs does not contain unsaturated hydrocarbons?

- A. C_4H_8, C_3H_4
- B. $C_{10}H_{22}, C_6H_{14}$
- C. C_2H_4, C_6H_{12}
- D. C_4H_6, C_6H_{10}

Unsaturated hydrocarbons are of two types, alkenes and alkynes. Alkenes have the general formula C_nH_{2n} , while alkynes have the general formula C_nH_{2n-2} , where $n = 2, 3, \dots$

The general formula of saturated hydrocarbons is C_nH_{2n+2} , where $n = 1, 2, \dots$

The compounds $C_{10}H_{22}$ and C_6H_{14} are saturated hydrocarbons because they correspond to the above general formula for values of n as 10 and 6 respectively.

Hence, the correct answer is option (b).