Carbon and Its Compound

OBJECTIVE TYPE QUESTIONS

1. **Which of the following is not the use of graphite?**
   (a) It is used as lubricant
   (b) It is used in manufacturing of lead-pencils
   (c) It is used in manufacturing of artificial diamond
   (d) It is used for making insulated plates

Ans: (d) It is used for making insulated plates
Graphite cannot be used for making insulated plates, as it is a good conductor of electricity.

2. **Methane, ethane and propane are said to form a homologous series because all are-**
   (a) Hydrocarbons
   (b) saturated compounds
   (c) aliphatic compounds
   (d) differ from each other by a CH_2 group

Ans: (d) differ from each other by a CH_2 group

3. **Why does carbon form compounds mainly by covalent bonding?**
   (a) There are four electrons in the outermost shell of carbon.
   (b) It requires large amount of energy to form C^{4+} or C^{4-}
   (c) It shares its valence electrons to complete its octet.
   (d) All the above.

Ans: (d) All the above

4. **Which of the following belongs to homologous series of alkynes?**

C_6H_6, C_2H_6, C_2H_4, C_3H_4

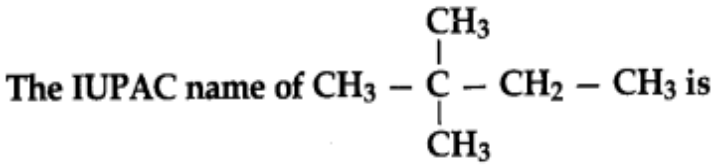
   (a) C_6H_6
   (b) C_2H_4
   (C) C_2H_6
   (d) C_3H_4

Ans: C_3H_4

5. **In diamond, each carbon atom is bonded to four other carbon atoms to form**
   (a) a hexagonal array
   (b) a rigid three-dimensional tetrahedral structure
   (c) a structure in the shape of a football
   (d) a structure of a ring

Ans: (b) a rigid three-dimensional tetrahedral structure.

6.

The IUPAC name of  **is**

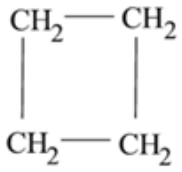
(a) 2-ethyl-2-methyl propane
(b) 2, 2-demethyl butane
(c) 1,1,1-trimethyl propane
(d) 2, 2-methyl butane

Ans: (b) 2, 2-demethyl butane

7. Which of the following is the molecular formula of cyclobutane?

a) C_4H_{10}
b) C_4H_6
c) C_4H_8
d) C_4H_4

Ans**:** (c) C_4H_8
Explanation: Cyclobutane is a cyclic hydrocarbon consisting of four carbon atoms where each carbon atom is attached to the two other carbon atoms and two hydrogen atoms, as shown below:



. Choose the correct statement:

8. (a) The ethene molecule is made up of 2 carbon atoms and 4 hydrogen atoms.

(b) Each carbon atom shares three electrons with three hydrogen atoms to form three carbon-hydrogen single covalent bonds.

(c) In ethane, the two carbon atoms share one pair of electrons among themselves to form one carbon-carbon single covalent bond.

(d) All the above.

Ans: (d) All the above

9. Which of the following is not a characteristic of fullerenes?

(a) Of all the fullerene, C_{60} allotrope is the most stable.

(b) Its shape is similar to that of a soccer ball.

(c) It contains only fused six-membered carbon-carbon rings.

(d) Its hardness is lower than that of diamond.

Ans: (c) It contains only fused six-membered carbon-carbon rings.

10. Which of the following statements about carbon is incorrect?

(a) It has four electrons in the valence shell.

(b) The four valencies of carbon do not lie in plane.

(c) The angle between any two adjacent valencies is 109.5^0.

(d) Three valencies of carbon are inclined to one another at an angle of 120^0 while fourth is perpendicular to the plane containing the remaining three valencies.

Ans: (d) Three valencies of carbon are inclined to one another at an angle of 120^0 while fourth is perpendicular to the plane containing the remaining three valencies.

ASSERTION AND REASON

DIRECTION: 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.

1. Assertion: Cyclopropane is heterocyclic compound.

Reason: Cyclopropane comes into category of those compounds in which complete ring is formed by carbon atoms only.

Ans: (d) Assertion (A) is false but reason (R) is true.

2. Assertion: Branched-chain alkanes have lower boiling points.

Reason: As molecular size decreases, boiling point increases.

Ans: (c) Assertion (A) is true but reason (R) is false.

Boiling point increases with increase in molecular mass and surface area of the compound. With the increase of branching surface area decreases and hence the boiling point.

3. Assertion: Olefins have the general formula C_nH_{2n}

   Reason: There is one triple bond between two carbon atoms in their molecules.

Ans: (c) Assertion (A) is true but reason (R) is false.

4. Assertion: Ionic compounds are solid in nature.

   Reason: Ions are closely packed in 3-D crystal lattice structure.

Ans: (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

5. Assertion: Carbon shows maximum catenation property in the periodic table.

   Reason: Carbon has small size and thus, forms strong C - C bond.

Ans: (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

VERY SHORT ANSWER TYPE QUSTIONS (1 MARK)

1. **Name the product formed when a mixture of ammonium chloride and potassium cyanate is heated? Is the product, an ionic or a covalent compound?**

Ans: Urea. It is a covalent compound.

2. **A boy sharpens a pencil at both the ends and connects them to the poles of the battery. Will the current flow through the circuit? Give reasons for your answer**.
3. **An organic compound burns with sooty flame. Is it saturated or unsaturated compound?**
4. **Draw the structure of 3,3-Dimethyl pentane.**
5. **What is the valency of carbon in CH_3-CH_3 and CH_2=CH_2?**

Ans: The valency of carbon in all its compounds whether saturated or unsaturated is 4.

SHORT ANSWER TYPE QUESTIONS (2 MARKS)

1. **An alkane has molecular weight 86. Write its molecular formula. What will be its physical state?**
2. **Compare the ability of catenation of carbon and silicon. Give reasons.**

Ans: Hints: Strength of C-C bond > Si-Si bond

3. **Explain the following:**

   (a) Diamond does not conduct electricity.

   (b) Diamond is used for making tools for cutting and drilling.

Ans: Hints: (a) No free electrons

(b) Diamond has the highest thermal conductivity of any known substance.

4. **(a) How can diamonds be made artificially? How do synthetic diamonds differ from natural ones?**

   (b) Give any two differences between the properties of diamond and graphite. What causes these differences?

Ans: (a) Diamonds can be made artificially by subjecting pure carbon to very high pressure and temperature. The synthetic diamonds are small whereas natural diamonds are big.

(b)(i) Diamond is hard whereas graphite is soft.

(ii) Diamond is a non-conductor of electricity whereas graphite is a good conductor of electricity. The difference in the physical properties of diamond and graphite arises because of the different arrangements of carbon atoms in them.

5. **NaCl conducts electricity in its molten as well as in aqueous state but not in its solid state. Why?**

<u>SHORT ANSWER TYPE QUESTIONS (3 MARKS)</u>

1. **(a) Write two points of difference in the structures of diamond and graphite.**

   (b) Explain why, graphite can be used as a lubricant but diamond cannot.

   (c) Explain why, diamond can be used in rock drilling equipment but graphite cannot.

2. **A solid element X has four electrons in the outermost shell of its atom. An allotrope Y of this element is used as a dry lubricant in machinery and also in making pencil leads.**

   (a) What is element X?

   (b) Name the allotrope Y.

   (c) State whether allotrope Y is a good conductor or non-conductor of electricity.

   (d) Name one use of allotrope Y (other than lubrication and pencil leads)

   (e) Name two other allotropes of element X.

3. **Two organic compounds A and B have the same molecular formula C_6H_{12}. Write the names and structural formulae:**

(a) If A is a cyclic compound

(b) If B is an open chain compound

(c) Which compound contains single bonds as well as a double bond?

(d) Which compound contains only single bonds?

4. **The solid element A exhibits the property of catenation. It is also present in the form of a gas B in the air which is utilised by plants in photosynthesis. An allotrope C of this element is used in glass cutters.**

   (a) What is element A?

   (b) What is the gas B?

   (c) Name the allotrope C.

   (d) State another use of allotrope C (other than in glass cutters).

   (e) Name another allotrope of element A which exists as spherical molecules.

   (f) Name a yet another allotrope of element A which conducts electricity.

5. **An element E exists in three allotropic forms A, B and C. In allotrope A, the atoms of element E are joined to form spherical molecules. In allotrope B, each atom of element E is surrounded by three other E atoms to form a sheet like structure. In allotrope C, each atom of element E is surrounded by four other E atoms to form a rigid structure.**

   (a) Name the element E.

   (b) What is allotrope A?

   (c) What is allotrope B?

   (d) What is allotrope C?

   (e) Which allotrope is used in making jewellery?

PARAGRAPH BASED MULTIPLE CHOICE QUESTIONS

Question numbers 1 to 4 are based on the following paragraph

Carbon is a versatile element. It has three important allotropic forms: diamond, graphite and Buckminster fullerene, which have quite different physical properties. Diamond is hard, graphite is soft while fullerene is neither very hard nor very soft.

Now answer the following questions choosing the correct option in each case:

1. Which of the following characteristics of diamond is correct?

   (a) It has three dimensional rigid structure.

(b) Its thermal conductivity is lower than that of copper.

(c) It is good conductor of electricity.

(d) It contains both carbon-carbon single and double bond.

2. Which one of the following statement is not correct about graphite?

(a) It has two-dimensional layered structure made up of fused benzene rings.

(b) It contains only carbon-carbon double bonds.

(c) It is good conductor of heat and electricity.

(d) It is used as a solid lubricant for heavy machinery.

3. Which of the following is not a characteristic of fullerenes?

(a) Of all the fullerene, C_{60} allotrope is the most stable.

(b) Its shape is similar to that of a soccer ball.

(c) It contains only fused six-membered carbon-carbon rings.

(d) Its hardness is lower than that of diamond.

4. Choose the incorrect statement about allotropes of carbon.

(a) Fullerenes are soluble in organic solvent.

(b) Lead in lead pencils is made up of graphite.

(c) The weight of diamond is expressed in carats.

(d) The complete oxidation product of diamond, graphite and fullerenes are different.