

Chemistry of Carbon Compounds

Important points to keep remember:

1. Valency of carbon is four. Carbon exhibits allotropy. Allotropic forms of carbon are Diamond, graphic and C_{60} .
2. In diamond carbon atoms are arranged in tetrahedral structure.
3. In graphite carbon atoms are arranged in hexagonal structure.
4. C_{60} having a football like structure contains 12 pentagons and 20 hexagon rings.
5. Solid CO_2 is known as dry ice.
6. Carbon exhibits catenation and Isomerism.
7. Dry distillation of coal given many important carbon compounds.
8. The compounds of carbon and hydrogen are called as Hydrocarbons.
 - a) Alkanes are saturated hydrocarbons. They under go substitution reactions.
 - b) Alkenes, Alkynes and Benzenes are unsaturated hydrocarbons.
 - c) Some unsaturated hydrocarbons undergo polymerisation.
9. A group of atoms in carbon compounds showing characteristic properties is called functional group.
10. Alcohols ($-OH$), aldehydes ($-CHO$), Ketones ($>C=O$) acids ($-COOH$), esters ($-COOR$) and ($-NH_2$) are some important esters ($-COOR$) and amines ($-NH_2$) are some important functional groups.
11. Aldehydes are detected with Tollen's test.
12. A piece of sodium metal reacts with alcohol immediately and liberates Hydrogen. This is due to $C-OH$ group.

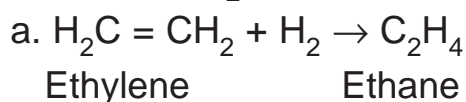
4 Marks Questions

1. Write the addition of alkenes

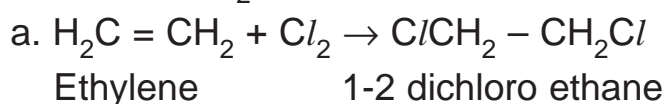
(June 01)

A- Double bond is present in alkenes. Hence, they undergo addition reactions giving rise to saturated compounds.

Addition of H_2



Addition of Cl_2



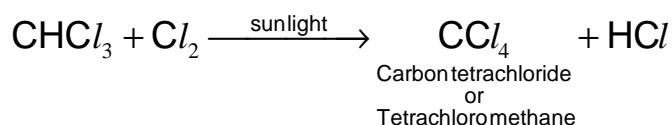
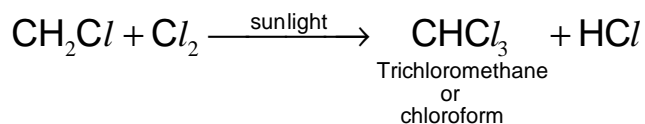
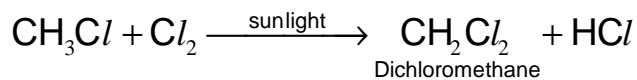
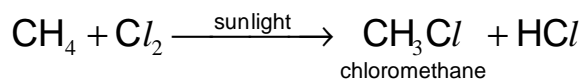
2. Write a short notes on substitution reaction of Alkanes

(or)

Give reaction of CH_4 (Methane) with Cl_2 (Chlorine) in the presence of sunlight in four stages with balanced equations. (March 2001, June 2005)

A-. Alkanes are saturated hydrocarbons. Hence they are highly un reactive. However they undergo substitution reactions. methane reacts with halogens such as chlorine and bromine in the presence of sunlight or on heating. In these reactions hydrogens atoms

are replaced by halogen atoms.
Substitution reactions of methane with chlorine.



Bromine also react in the similar way but the reaction is slow.

3. Compare the structure of Diamond and Graphite?

(June - 03)

| Diamond | Graphite |
|--|---|
| 1. Crystalline Solid | 1. Grayish black soft crystalline solid |
| 2. Precious gem due to its brilliance and hardness | 2. Used as a lubricant due to its metallic luster and soapy touch |
| 3. Bad conductor of heat and electricity | 3. Good Conductor of heat and electricity |
| 4. Carbon atoms are arranged in tetrahedral | 4. Carbon atoms are arranged as hexagonal rings |
| 5. Its density is 3.51 gm/cc | 5. It has a density of 2.25 g/cc |
| 6. C-C bond length is 1.54 Å | 6. Bond length of C-C is 1.42 Å |
| 7. Bond angle is 109°28' | 7. Bond angle is 120° |

2 Marks Questions

1. Write the differences between Alkanes and Alkenes

(June 01)

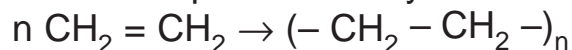
| Alkanes | Alkenes |
|---|---|
| 1. Saturated hydro carbons | 1. Unsaturated hydrocarbons |
| 2. Undergo substitution reactions | 2. Undergo addition reactions |
| 3. General Formula is C_nH_{2n+2} | 3. General formula is $C_n H_{2n}$ |
| 4. Do not participate in polymerization reactions | 4. Participate in Polymerization reactions. |

2. What is polymerisation?

(March 04, June 06)

A- The process in which a large number of smaller molecules combine to form a giant molecule (polymers) is called polymerisation.

For example when ethylene undergoes polymerisation it gives polythene (polymer)

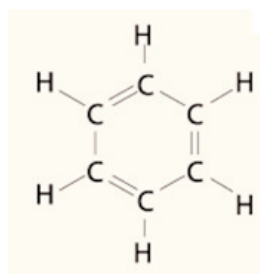


Ethylene

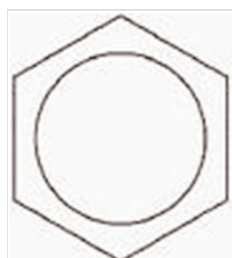
Polythene

3. Draw the diagram showing the structure of Benzene molecule?

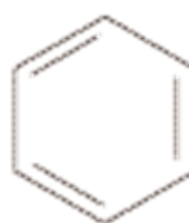
(March 2000)



(or)



(or)



4. Why does diamond act as a bad conductor of electricity?

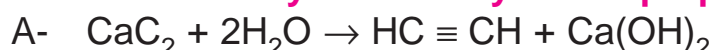
A- In diamond carbon atoms are in tetrahedral arrangement. Each carbon atom is attached to four other carbon atoms by covalent single bonds. As four valencies of carbons in diamond are satisfied, diamond acts as a bad conductor of electricity.

5. What is catenation?

(March 03, June 2000)

A- Catenation is a phenomenon in which atoms of same element join together to form long chains. Carbon exhibits maximum catenation because of strong carbon-carbon bonds and tetravalence.

6. State how ethyne or Acetylene is prepared by the hydrolysis of calcium carbide?

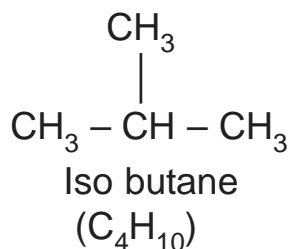
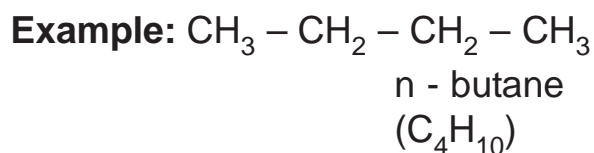


calcium carbide

Acetylene

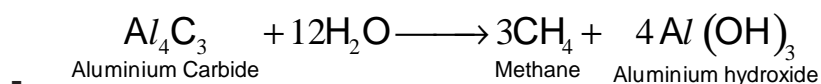
7. What is Isomerism?

A- Compounds having same molecular formula but different structures are called isomers and the phenomenon is called isomerism.



1 Marks Questions

1. Show the hydrolysis of Aluminium carbide in the form chemical equation.



2. What is polymerisation?

(June 2006, March 2004)

A- The process in which a large number of smaller molecules combine to form a giant molecule (polymers) is called polymerisation.

3. What is Catenation?

(March 2003, June 2000)

A- Catenation is a phenomenon in which atoms of same element join together to form long chains. Carbon exhibits catenation.

4. What is allotropy?

A- The Occurrence of same element in two or more different forms is known as allotropy.

Fill in the blanks

(1/2 Marks)

- Bond length in graphite is _____ (March 10, 09)
- Saturated hydrocarbons are called as _____ (June 10)
- Example for C – O – C functional group is _____ (June 10)
- The presence of alcoholic group is tested by addition of _____ metal (March 10, 06)
- $\text{Fe}_2\text{O}_3 + 3\text{CO} \xrightarrow{\Delta} \text{_____}$ (March 2003)
- Alkenes undergo _____ reactions. (March 2005, 2007)
- Alkanes undergo _____ reactions. (March 2000)
- $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{_____} + \text{_____}$ (March 1999)
- $\text{HC} \equiv \text{CH} + 2\text{Cl}_2 \rightarrow \text{_____}$ (March 99)
- General formula of Alkenes is _____ (March 08, 99)

11. General formula of Alkanes is _____
12. General formula of Alkynes is _____ **(March 08, 99)**
13. The functional group of aldehydes is _____
14. The functional group of carboxylic acid is _____
15. Solid CO_2 is called as _____ **(April 08, June 06, March 03, Oct 99)**
16. Balances equation between CaC_2 and H_2O is _____ **(March 2002)**
17. Alkenes undergo addition reaction because of _____ **(March 07)**
18. The refractive index of diamond is _____ **(April 08, June 04)**
19. The name of C_8H_{18} is _____ **(April 08, June 04)**
20. $-\text{COOR}$ is the functional group of _____ **(March 02, 04, 00, June 05)**
21. Among C_4H_{10} , C_4H_8 , C_4H_6 and C_6H_6 _____ is a Alkene. **(March 1999)**
22. Example for C - COOR functional group _____ **(June 2001)**
23. Among $-\text{OH}$, $-\text{CHO}$, $-\text{O}-$ and $>\text{C}=\text{O}$ _____ is the functional group of ketone. **(June 2002)**
24. $-\text{NH}_2$ is called as _____
25. Dilute acetic acid is called as _____

Answers

1. 1.42 A°
2. Paraffins
3. $\text{CH}_3 - \text{O} - \text{CH}_3$
4. Sodium
5. $2\text{Fe} + 3 \text{CO}_2$
6. Addition
7. Substitution
8. $\text{CO}_2 + 2\text{H}_2\text{O}$
9. $\text{Cl}_2\text{CH} - \text{CHCl}_2$
10. C_nH_{2n}
11. $\text{C}_n\text{H}_{2n+2}$
12. $\text{C}_n\text{H}_{2n-2}$
13. $-\text{CHO}$
14. $-\text{COOH}$
15. Dry ice
16. $\text{CaC}_2 + 2\text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_2 + \text{Ca}(\text{OH})_2$
17. Double bond or unsaturated
18. 2.41
19. Octane
20. Esters
21. C_4H_8
22. $\text{CH}_3\text{COOC}_2\text{H}_5$
23. $(>\text{C}=\text{O})$
24. Amine
25. Vinegar

Match the following

2 1/2 Marks

Generally this item is covered from this chapter only. Hence it is better to go through various match the following questions covered in previous exams. so carefully practice following matching to secure 2 1/2 marks.

- I. **Group A** **Group B** (March - 2008)
- | | | |
|-------------------|-----|---|
| 1) Dimethyl Ether | () | a) CH_3Cl |
| 2) Acetylene | () | b) C_6H_{10} |
| 3) Chloromethane | () | c) C_2H_2 |
| 4) Benzene | () | d) $\text{CH}_3 - \text{O} - \text{CH}_3$ |
| 5) Hexyne | () | e) C_6H_6 |

KEY: 1. d; 2. c; 3. a; 4. e; 5. b.

- II. **Group A** **Group B** (June - 2008)
- | | | |
|--------------------------|-----|------------------------------|
| 1) Carbon tetra Chloride | () | a) CHCl_3 |
| 2) Butane | () | b) CH_4 |
| 3) Methane | () | c) C_6H_6 |
| 4) Chloroform | () | d) CCl_4 |
| 5) Benzene | () | e) C_4H_{10} |

KEY: 1. d; 2. e; 3. b; 4. a; 5. c.

- III. **Group A** **Group B** (June 2010, March 2007)
- | | | |
|--------------------|-----|-------------|
| 1) - OH | () | a) Aldehyde |
| 2) - CHO | () | b) Amine |
| 3) - COOH | () | c) Alcohol |
| 4) - NH_2 | () | d) Ester |
| 5) - COOR | () | e) Acid |
| | | f) Ether |

KEY: 1. c; 2. a; 3. e; 4. b; 5. d.

- IV. **Group A** **Group B** (March 2010)
- | | | |
|--------------|-----|---------------------------|
| 1) Methane | () | a) C_2H_6 |
| 2) Ethane | () | b) C_2H_2 |
| 3) Propane | () | c) C_2H_4 |
| 4) Ethylene | () | d) C_3H_8 |
| 5) Acetylene | () | e) CH_4 |

KEY: 1. e 2. a 3. d 4. c 5. b

V. Group A

- 1) Ester ()
- 2) Acid ()
- 3) Alcohol ()
- 4) Ketone ()
- 5) Ether ()

Group B

(June - 2009)

- a) CH_3COCH_3
- b) $\text{C}_2\text{H}_5\text{NH}_2$
- c) $\text{CH}_3\text{COOC}_2\text{H}_5$
- d) CH_3COOH
- e) CH_3OH
- g) CH_3CHO

KEY: 1. c; 2. e; 3. f; 4. a; 5. d.

VI. Group A

- 1) Acetylene ()
- 2) Acetic Acid ()
- 3) Glucose ()
- 4) Methyl Alcohol ()
- 5) Hexane ()

Group B

(June - 2007)

- a) C_6H_{14}
- b) CH_3OH
- c) Ester
- d) $\text{C}_6\text{H}_{12}\text{O}_6$
- e) C_2H_2
- f) Base
- g) CH_3COOH

KEY: 1. e; 2. g; 3. d; 4. b; 5. a.

VII. Group A

- 1) Alkane ()
- 2) Alkene ()
- 3) Alkyne ()
- 4) Acid ()
- 5) Benzene ()

Group B

(March - 2006)

- a) C_2H_4
- b) $\text{C}_2\text{H}_5\text{OH}$
- c) C_6H_6
- d) C_4H_{10}
- e) C_2H_2
- f) CH_3OCH_3
- g) CH_3COOH

KEY: 1. d; 2. a; 3. e; 4. g; 5.c.

VIII. Group A

- 1) Methyl Alcohol ()
- 2) Glucose ()
- 3) Butane ()
- 4) Benzene ()
- 5) Acetylene ()

Group B (June - 2005, April 08, March 05)

- a) C_2H_2
- b) C_6H_6
- c) CH_3OH
- d) $\text{C}_6\text{H}_{12}\text{O}_6$
- e) $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
- f) C_4H_{10}
- g) C_4H_8

KEY: 1. c; 2. d; 3. g; 4. b; 5.a.

IX. Group A

- 1) Propane ()
- 2) Butane ()
- 3) Pentane ()
- 4) Hexane ()
- 5) Ethylene ()

Group B

- a) C_2H_4
- b) C_6H_{14}
- c) C_5H_{10}
- d) C_6H_{12}
- e) C_5H_{12}
- f) C_4H_{10}
- g) C_3H_8

(June - 2000)

KEY: 1. g; 2. f; 3. c; 4. b; 5.a.