# CHAPTER : 4 CARBON & ITS COMPOUND

Date

Mark's = 1+1+1+4 = 7

* **CARBON (C) :-** One of the most common element found in living organism.
  - Atomic No. = 6
  - e⁻ Configuration = $1s^2\ 2p^4$
  - Discovered by = A. Lavoisier
  - Non-Metallic Element
  - Bond form = Covalent Bond
  - valency = 4 (Tetravalent)
  - Long chain (Carbon Containing)

* **Hydrocarbon :-** Composed of Carbon and Hydrogen

Hydrocarbon

- Aliphatic / Acyclic Compound
  - Saturated
    - Alkane (C-C)
      - $C_nH_{2n+2}$
      - ex. Methane ($CH_4$)
  - Unsaturated
    - Alkene (C=C)
      - $C_nH_{2n}$
      - ex. Ethene ($C_2H_4$)
    - Alkyne (C≡C)
      - $C_nH_{2n-2}$
      - ex. Ethyne ($C_2H_2$)
- Cyclic Compound
  - Alicyclic (Aliphatic + cyclic)
    - Saturated
      - ex. cycloalkane
      - - cyclopropane (Δ)
    - Unsaturated
      - ex. cycloalkene
      - cycloalkyne
      - - cyclobutyne
      - - cyclopentene
  - Aromatic
    - Benzene ($C_6H_6$)

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* IUPAC (The International Union for Pure and Applied Chemistry) - 1919
  • Zurich (Switzerland) - 1999

## Nomenclature of Carbon Compounds :-

① No. + Substitution grp + ② Cyclo + ③ Alk (No. of C) + ④ ene/ane/yne + ⑤ Functional grp

① Substitution grp
- F = Fluoro
- Cl = Chloro
- Br = Bromo
- I = Iodo
- -R (alkyl) = less 1-H From Alk

ex.
- $-CH_3$ = Methyl
- $-C_2H_5$ = Ethyl

② Cyclo
For Cyclic str. like-
△ □ ⬠ ⬡

③ Alk (No. of C)
- $C_1$ = Meth
- $C_2$ = Eth
- $C_3$ = Prop
- $C_4$ = But
- $C_5$ = Pent
- $C_6$ = Hex
- $C_7$ = Hept
- $C_8$ = Oct
- $C_9$ = Non
- $C_{10}$ = Dec

④ ene/ane/yne
- C-C = ane
- C=C = ene
- C≡C = yne

⑤ Functional grp
(i) Carboxylic acid
$-\overset{O}{\overset{\|}{C}}-OH$ (COOH) = Oic acid

(ii) Ketone
$-\overset{O}{\overset{\|}{C}}-$ = one

(iii) Aldehyde
$-\overset{O}{\overset{\|}{C}}-H$ (-CHO) - al

(iv) Alcohol
-OH = ol



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* Rule :-

① parent chain selection - Functional gp / Multiple Bond होनी जरूरी

② Numbering - (i) Func. grp side से No.

(ii) $-COOH$, $-CHO$ के carbon को 1-No.

exception - Ketone ($-\overset{\overset{O}{\|}}{C}-$) के carbon से No. start नहीं.

(iii) Priority Order -

Functional grp > Multiple bond ($=/\equiv$)

if Same No. (Alphabate) ⇐ Substitute grp.

③ Nomenclature 1 to 5 follow

Subs. + Cyclo + Alk + $-/=/\equiv$ + Fn grp.

④ ene / yne / ane के बाद Fn grp ; vowels (a, e, i, o, u) से start हो तो ane/ene/yne का last "e" हटा देंगे।

Que. Write IUPAC Name of following compound -

① $CH_3-C\equiv CH$ (2024)

② $CH_3-CH_2-CH_2-Br$ (Sup. 2024)

③ $C_nH_{2n}$ if $n=2$ (Sup. 2024)



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④ $CH_3-\underset{\underset{Cl}{|}}{CH}-\underset{\underset{F}{|}}{CH}-CH_3$ (2020)

⑤ $CH_3-CH=CH_2$ (2020)

⑥ $CH_3-\underset{\underset{Cl}{|}}{CH}-CH_2-CH=CH_2$ (2019)

⑦ $CH_3-\underset{\underset{CH_3}{|}}{C}=CH_2$ (2018)

⑧ $CH_3-CH=CH-CH_3$ (2018)

⑨ $CH_3-\underset{\underset{Cl}{|}}{CH}-CH_2-CH_3$ (2018)



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(9) $CH_3 - CH_2 - OH$ (Model 2025)

(10) $CH_3CH_2CH_2CH_2 - Cl$ (Model 2025)

(11) $CH_3CH_2CH_2CHO$ (Model 2025)

(12) $H-\overset{\overset{H}{|}}{C}=O$

(13) $CH_3-\overset{\overset{O}{||}}{C}-CH_2-CH_3$

(14) $CH_3-\underset{\underset{O}{||}}{C}-CH=CH_2$

(15) $CH_3-CH_2-\underset{\underset{Br}{|}}{CH}-\overset{\overset{Cl}{|}}{C}=CH_2$

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Q. Select alkane, alkene and alkyne from the following compound -

or

Select Saturated and unsaturated compound.

$C_2H_2$, $C_2H_4$, $C_2H_6$, $C_3H_6$, $C_4H_6$, $CH_4$

Ans:- Alkane (Saturated) =

Alkene
Alkyne
} Unsaturated

* Covalent Bond :-

The Chemical bond formed by sharing of two valence electrons between the two atoms is called Covalent Bond.

- Covalent bond b/w two Non-metals.
- Covalent bonding don't conduct electricity due to the lack of free e-.
- Covalent bond insoluble in water.
- Covalent bond form by the equal sharing e-s, of participating atoms.
- Covalent Bond compounds have low M.P. and B.P. as compared to ionic compound.

Types - 1) Single Bond 2) Double Bond
3) Triple Bond

1) Single Bond ($\sigma$) :- C-H, H-H, C-X(F, Cl, Br, I)

2) Double Bond ($\sigma, \pi$) :- O=O, C=C, C=O

3) Triple Bond ($\sigma, 2\pi$) :- N≡N, C≡C



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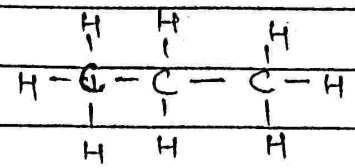
Q. Write the No. of Covalent Bond with σ and π Bond -

1) $C_3H_8$ (2024)



σ =

π =

C.B. =

2) $CH_4$ (2023)

3) $CH_3COOH$

4) Benzene ($C_6H_6$)

(5) $C_2H_2$

(6) Ethanal

Q. Electron Dot structure :- Obtained Octet Rule (Noble gase e- configuration) by sharing of e-s.

1) $H_2$ $H-H$

2) $O_2$ $O=O$

3) $N_2$ $N\equiv N$



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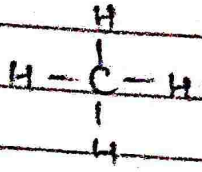
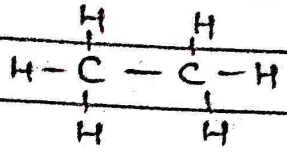
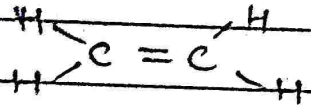
4) Methane ($CH_4$)



5) Ethane ($C_2H_6$)

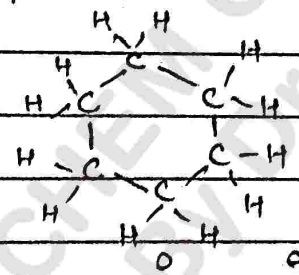


6) Ethene ($C_2H_4$)

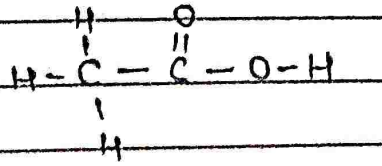


7) Ethyne ($C_2H_2$)

(8) Cyclohexane ($C_6H_{12}$)



9) Ethanoic acid ($CH_3COOH$)



10) $H_2S$



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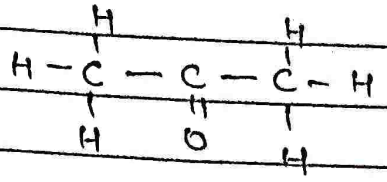
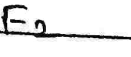
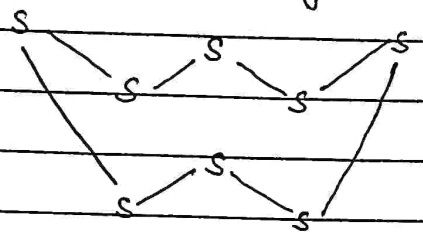
11) propanone ($CH_3COCH_3$)



12) $F_2$ (outer e⁻ config. = 7)



13) $S_8$ (outer e⁻ config. = 6)



* Homologous Series :- A series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called a Homologous series.

ex. - $C_3H_6$, $C_4H_8$, $C_5H_{10}$ ⇒ Alkene

$CH_3OH$, $C_2H_5OH$, $C_3H_7OH$, $C_4H_9OH$ ⇒ Alcohol



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