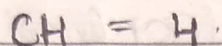


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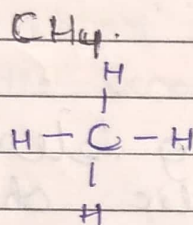


CARBON AND ITS COMPOUNDS

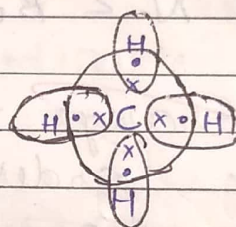
★ Hydrocarbons

1. Alkanes ($C_n H_{2n+2}$) (ane)

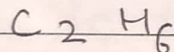
1. Methane, $n=1$



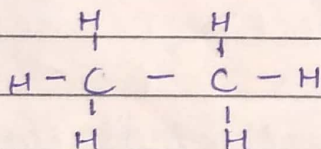
electron-dot-structure



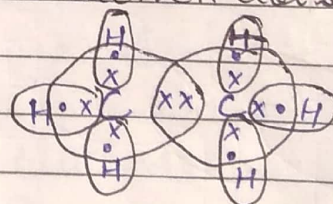
2. Ethane, $n=2$



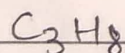
Simple structure



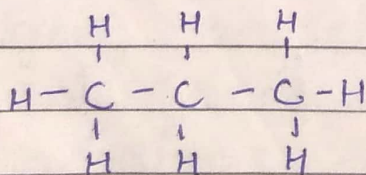
electron dot structure



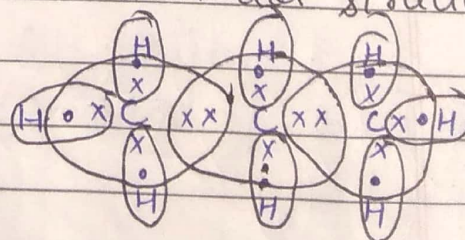
3. Propane, $n=3$



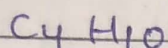
Simple structure



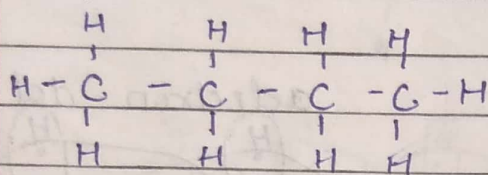
electron dot structure



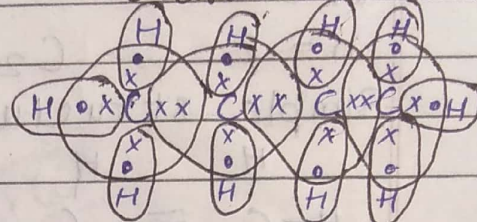
4. Butane, $n = 4$.



Simple structure



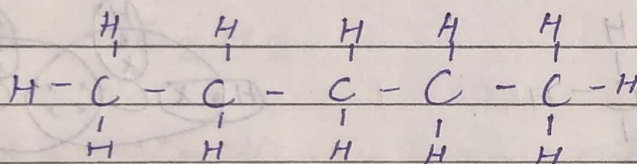
electron dot structure



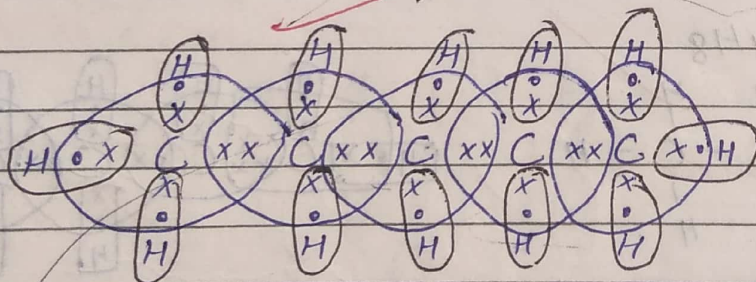
5. Pentane, $n = 5$.

formula: C_5H_{12}

Simple structure

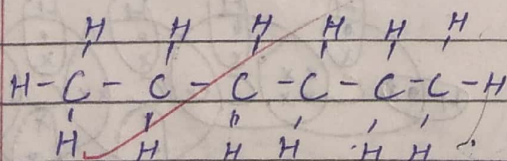


electron dot structure

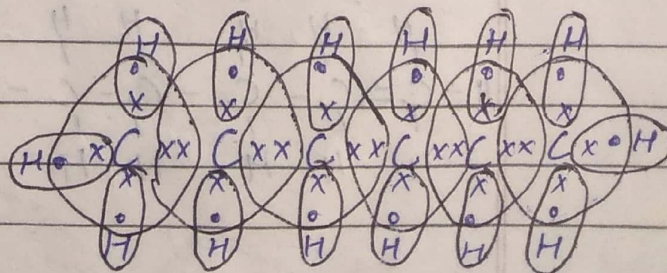


6. Hexane: C_6H_{14}

Simple structure



electron dot structure

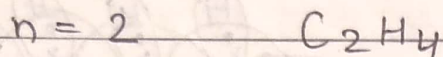


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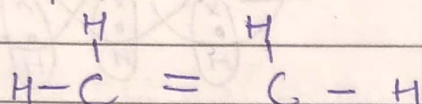
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☆ Alkene (C_nH_{2n}) (ene)

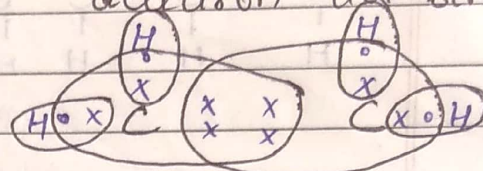
1. Ethene



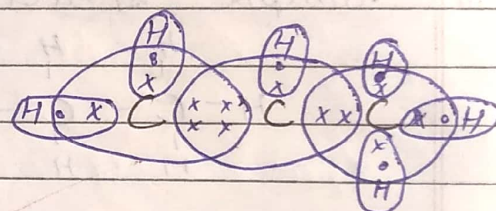
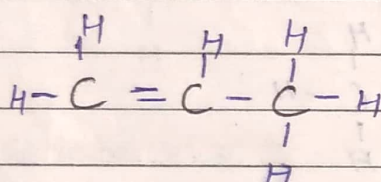
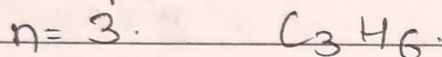
Simple structure



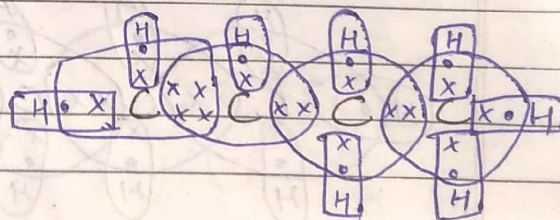
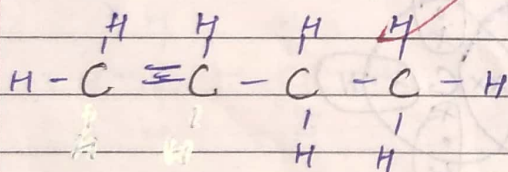
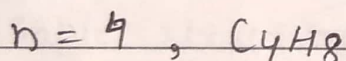
electron-dot structure



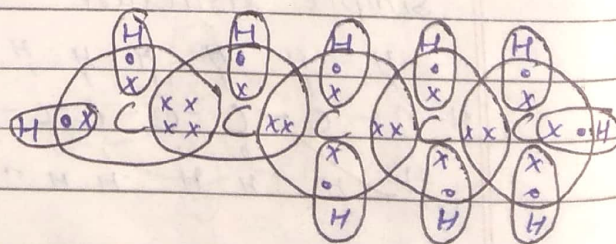
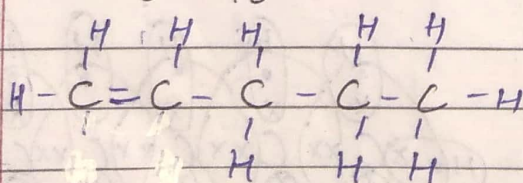
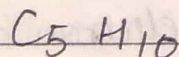
2. Propene

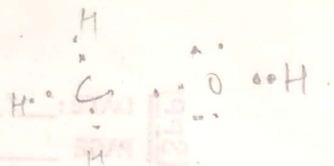


3. Butene

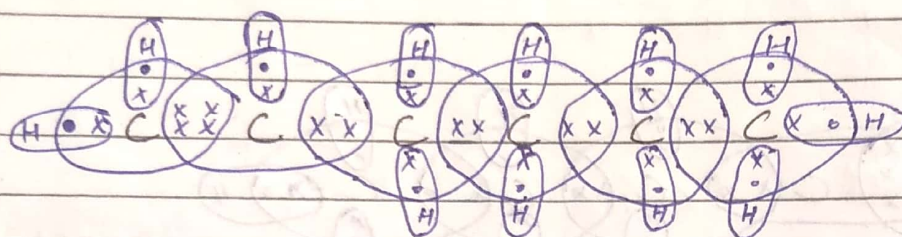
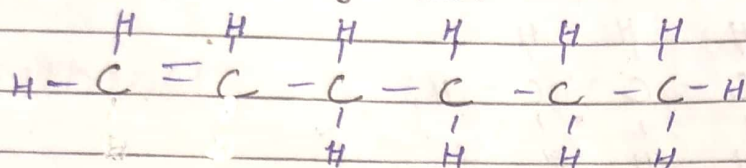


4. Pentene



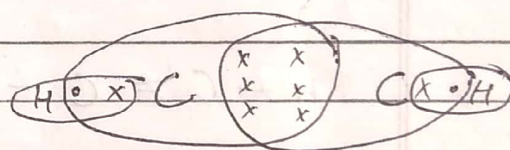
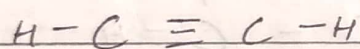


5. Hexene C_6H_{12}

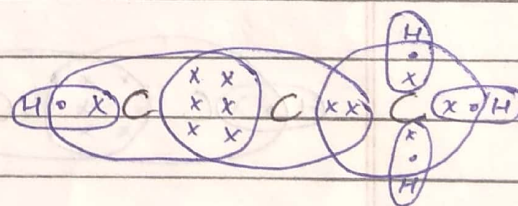
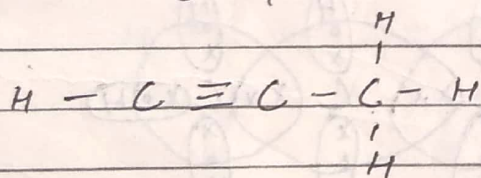


★ Alkyne $\rightarrow \text{C}_n\text{H}_{2n-2}$ (yne)

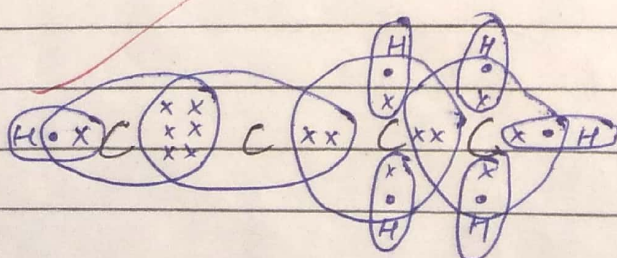
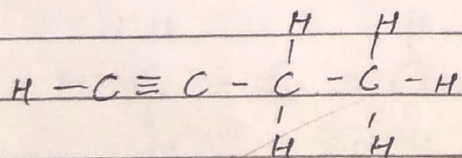
1. Ethyne C_2H_2



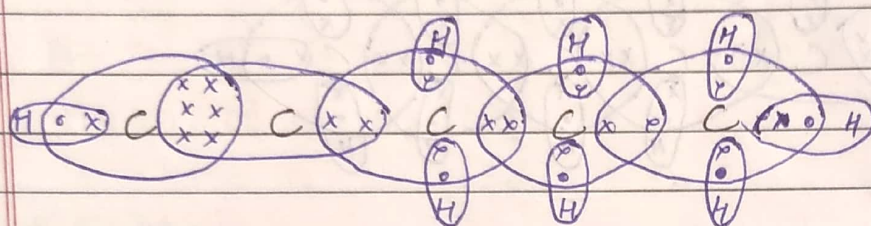
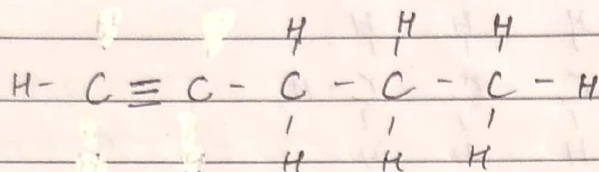
2. Propyne C_3H_4



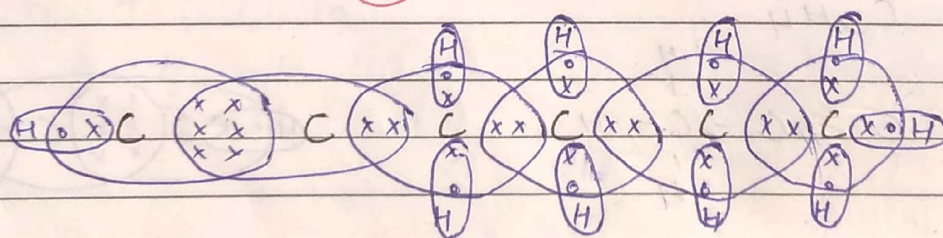
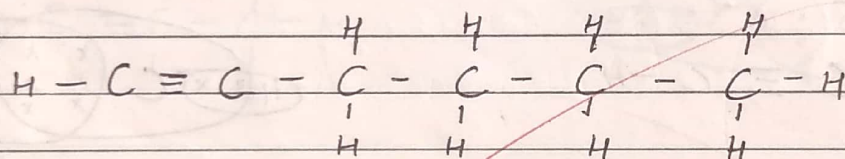
3. Butyne C_4H_6



4. Pentyne C_5H_8



5. Hexyne C_6H_{10}

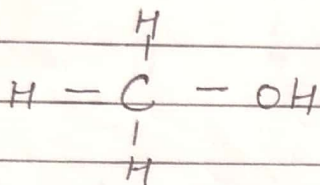


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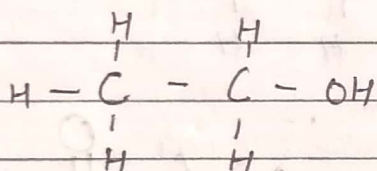
☆ Alcohols $\rightarrow C_n H_{2n+1} OH$ (-ol)

1. Methanol $C_1 H_3 OH$

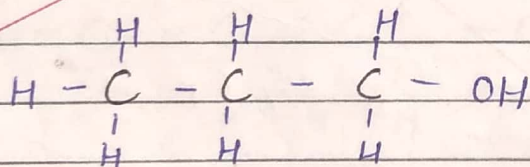


2. Ethanol

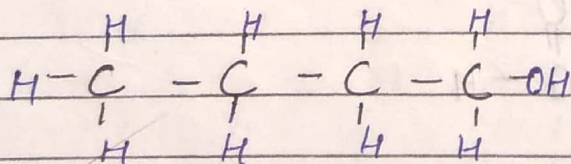
$C_2 H_5 OH$



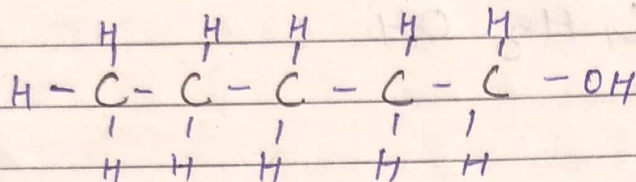
3. Propanol $\rightarrow C_3 H_7 OH$



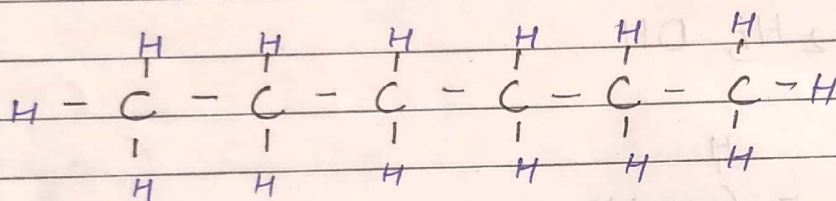
4. Butanol $C_4 H_9 OH$



5. Pentanol. $C_5H_{11}OH$

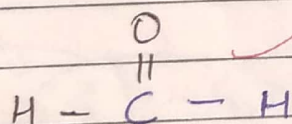


6. Hexanol - $C_6H_{13}OH$

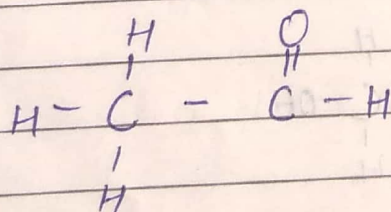


★ Aldehyde - $C_nH_{2n+1}(-ol)$ $\left(\begin{array}{c} O \\ || \\ -C-OH \end{array} \right)$

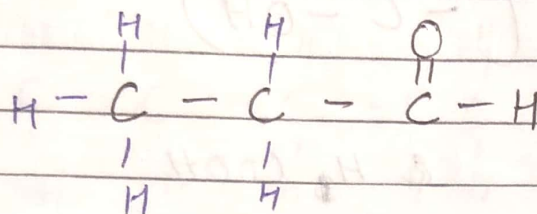
① Methanol, $n=0$ CH_3CHO



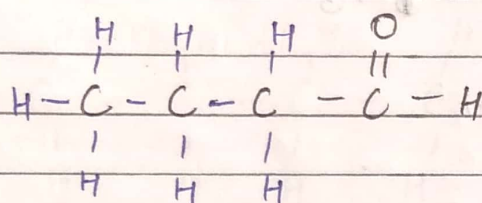
② Ethanol, $n=1$ CH_3CHO



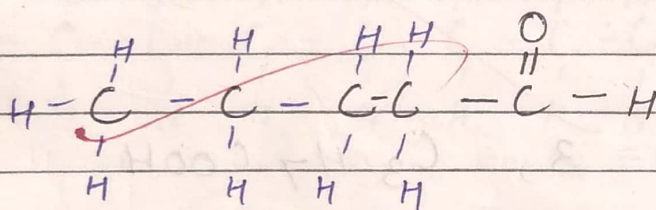
3. Propanal $n = 2$ C_2H_5CHO



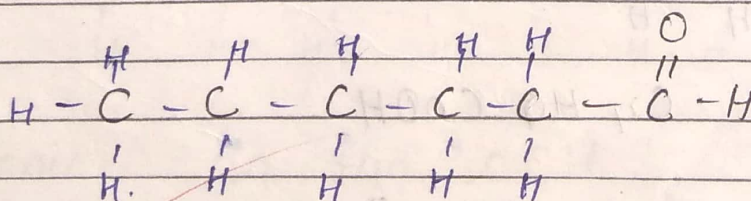
4. Butanal $n = 3$ C_3H_7CHO



5. Pentanal $n = 4$ C_4H_9CHO



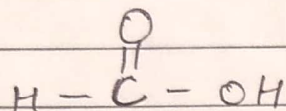
6. Hexanal $n = 5$ $C_5H_{11}CHO$



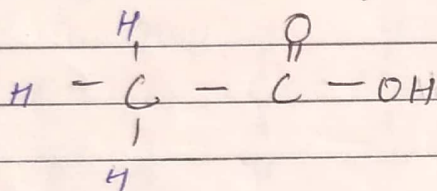
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★ Carboxylic acid, (oic), COOH ,
 $\text{C}_n\text{H}_{2n+1} \left(-\overset{\text{O}}{\parallel} \text{C} - \text{OH} \right)$

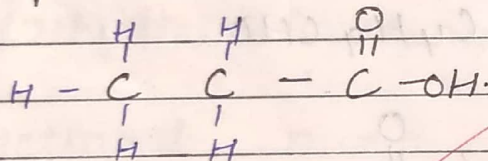
1. Methoic $n=0$ & H_1COOH



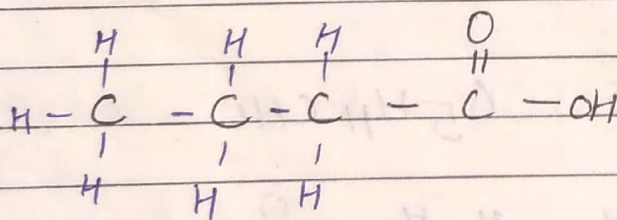
2. Ethoic $n=1$, $\text{C}_2\text{H}_3\text{COOH}$



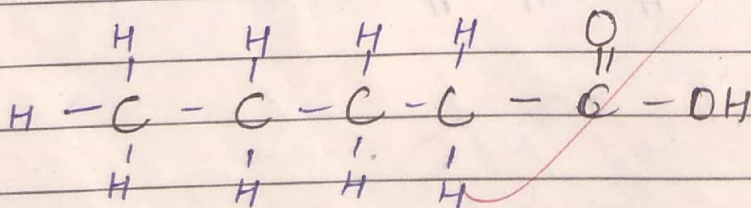
3. Propanoic $n=2$ $\text{C}_2\text{H}_5\text{COOH}$



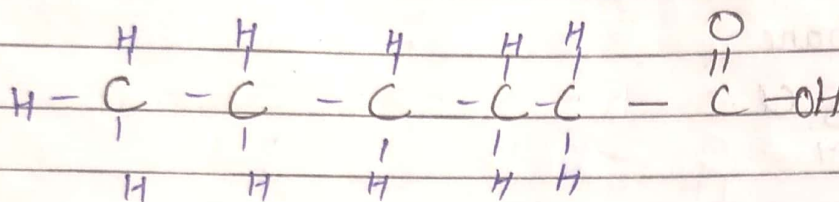
4. Butoic, $n=3$, $\text{C}_3\text{H}_7\text{COOH}$



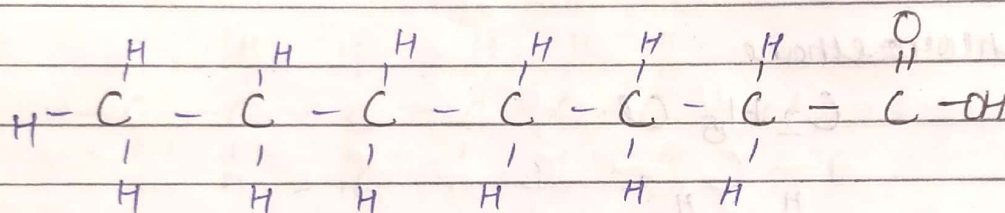
5. Pentoic $\text{C}_4\text{H}_9\text{COOH}$



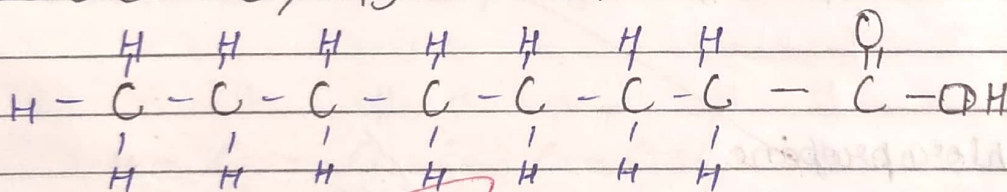
6. Hexoic $C_5H_{11}COOH$



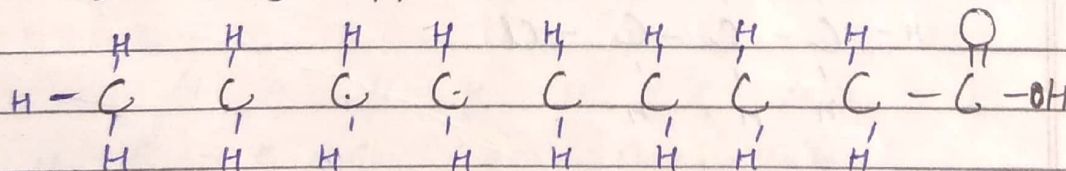
7. Heptanoic $C_7H_{13}COOH$



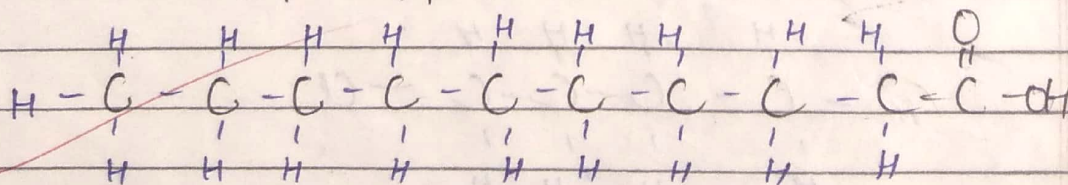
8. Octoic $C_7H_{15}COOH$



9 ~~Nonoic~~ C₈ C₁₇ COOH



10. Decoic $C_{19}H_{19}COOH$

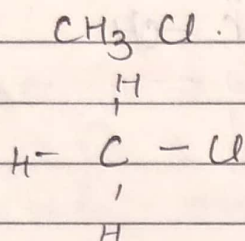


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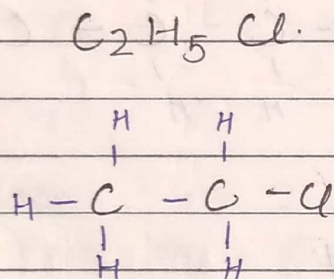
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★ Halvaukanu $C_n H_{2n+1} (x = F/Cl/Br/I)$

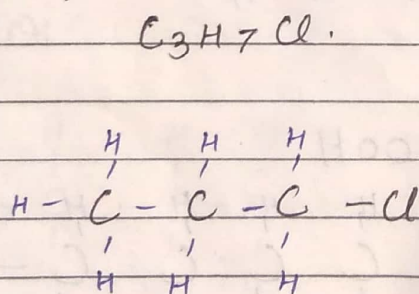
1. Chloromethane



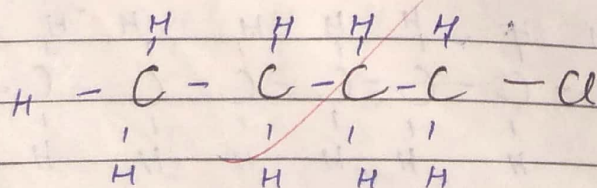
2. Chloroethane



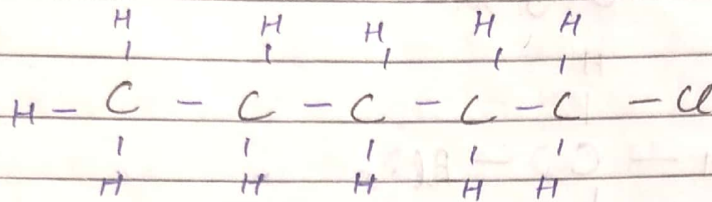
3. Chloropropane



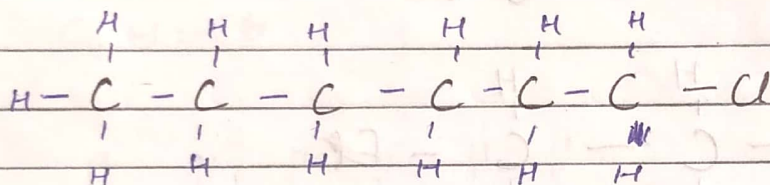
4. Chlorobutane $C_4 H_9 Cl$



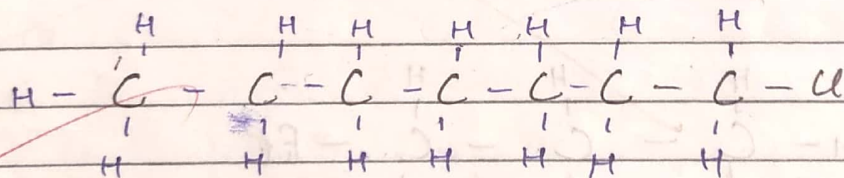
5. Chloropentane $C_5H_{11}Cl$



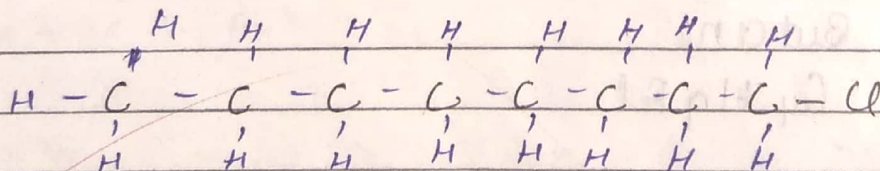
6. Chlorohexane $C_6H_{13}Cl$



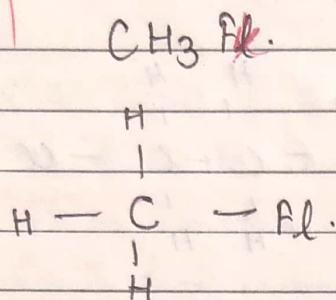
7. Chloroheptane $C_7H_{15}Cl$



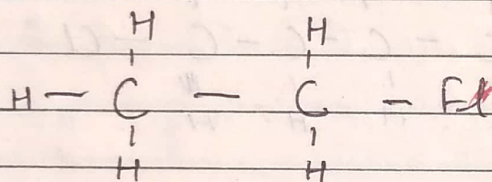
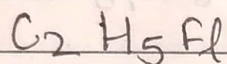
8. Chlorooctane $C_8H_{17}Cl$



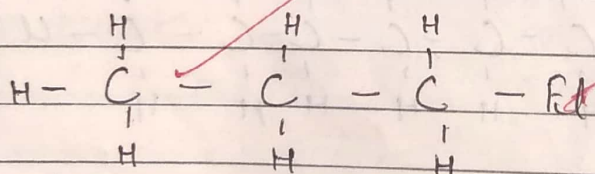
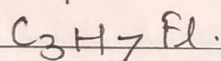
☆ 1. ~~Flormetane~~



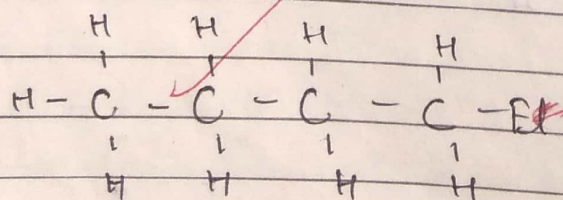
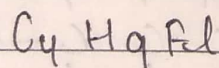
2. ~~Floro ethane~~



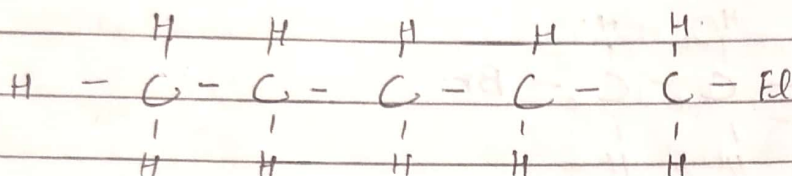
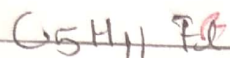
3. ~~Floropropane~~



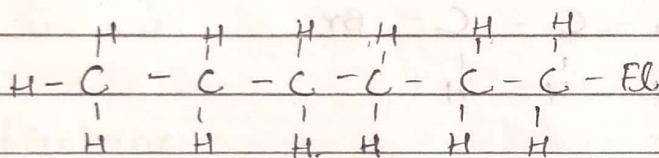
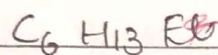
4. ~~Floro Butane~~



5. Fluoropentane.



6. Fluorohexane

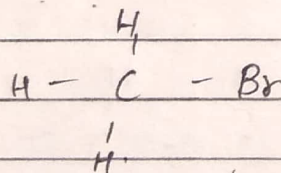
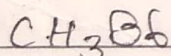


★ ~~Bromium~~

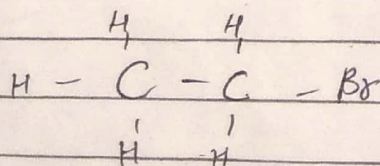
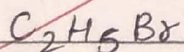
★ ~~Bromine~~

~~C~~

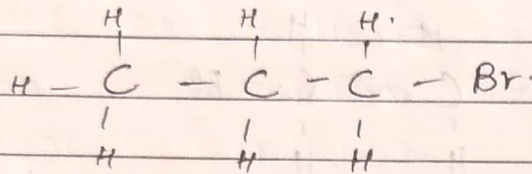
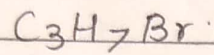
1. Bromomethane



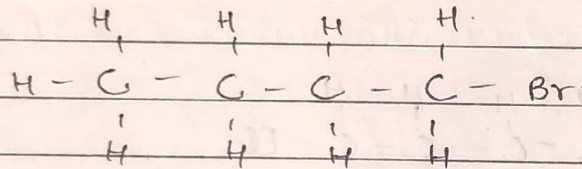
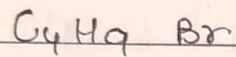
2. Bromoethane



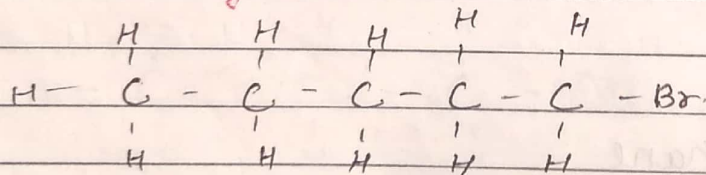
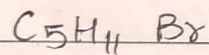
3. Bromopropane



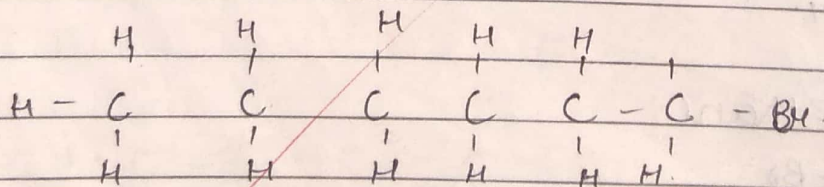
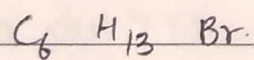
4. Bromobutane. Butane.



5. Bromopentane

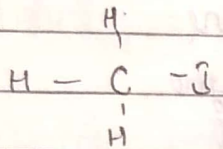
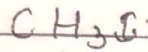


6. Bromohexane

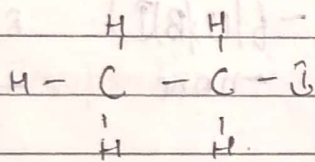
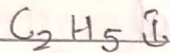


★ Iodine

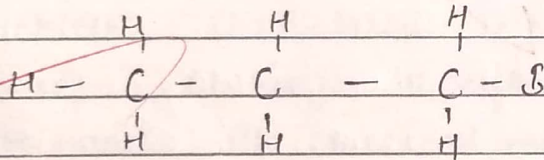
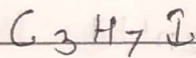
1. Iodomethane



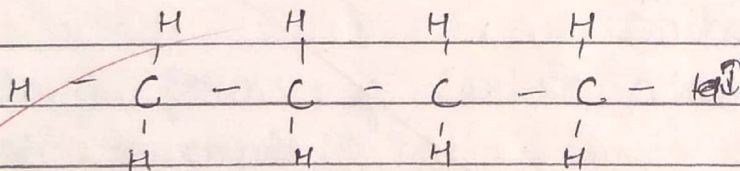
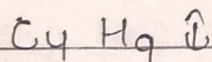
2. Iodethane



3. Iodopropane



4. Iodobutane



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Table.



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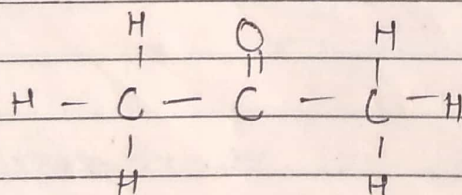
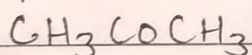
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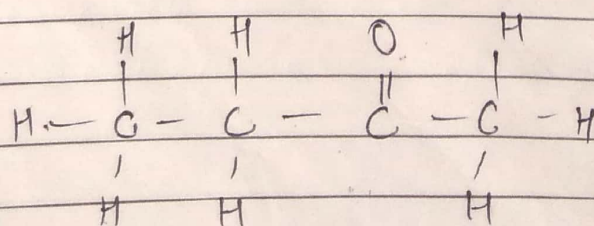
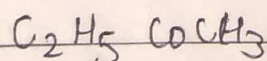
Name	General formula	Suffix	function.
Alkane	$C_n H_{2n+2}$	-ane	-
Alkene	$C_n H_{2n}$	-ene	=
Alkyne	$C_n H_{2n-2}$	-yne	≡
Alcohol	$C_n H_{2n+1} OH$	-ol	OH.
Carboxylic acid	$C_n H_{2n+1} COOH$	-oic	COOH
Aldehyde	$C_n H_{2n+1} CHO$	-al	CHO
Haloalkanes	$C_n H_{2n+1} X (F/Br/I/Cl)$	-fluoro/bromo/iodo/chloro	F/Br/I/Cl
Ketone	$C_n H_{2n+1} CO C_{n'} H_{2n'+1}$	-one	-C(=O)-

Ketone.Formula - $C_n H_{2n+1} CO C_{n'} H_{2n'+1}$

1. Propanone



2. Butanone



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CH-4

CARBON AND ITS COMPOUNDS

Carbon :-

Carbon is an element which is a non-metal.

Atomic no. of carbon = 6.

Electronic configuration of carbon = $K=2, L=4$.

Valency = 4.

Properties of carbon.

1. Tetra valent :-

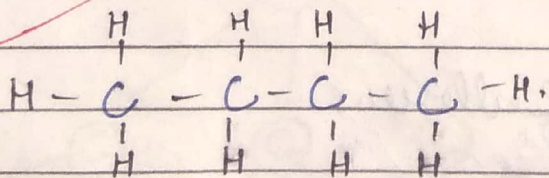
A carbon atom has 4 electrons in its outermost shell so it requires 4 more electrons to achieve the stable electron arrangement which gets by sharing therefore valency of carbon is four and it combined with other four different element like nitrogen, hydrogen, oxygen, chlorine etc.

2. Catenation (Self combination):

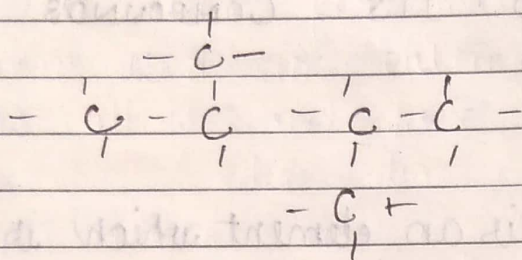
The self linking of carbon atoms to form long forms of carbon atom.

For example:-

(i) linear chain



(ii) Branched chain



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Occurrence of Carbon

1. In free state:- Carbon occurs in nature mainly in two forms diamond and Graphite and another naturally occurring form of carbon is called Buckminster fullerene has been discovered recently.

2. In Combine State:- Carbon occurrence nature in form of Compounds such as Carbon dioxide gas in nature, fossil fuels, Carbonates.

* Allotrops of Carbon:-

The various physical forms of in which an element can exist are called the allotrops of element. There are three element of allotrops.

1. Diamond
2. Graphite
3. Buckminster fullerene

Diamond :-

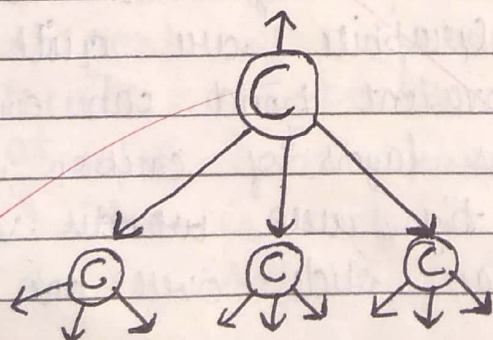
Diamond is a colourless transparent substance having extraordinary brilliance and hardest natural substance.

Physical Properties of Carbon-Diamond.

1. It does not conduct electricity.
2. It burns on strong heating to form Carbon dioxide.
3. It is very hard substance.
4. Melting point of diamond is 3500°C .
- 5.

Structure of Diamond :-

Each carbon atom in diamond crystal is linked to four other carbon atoms by strong covalent bond. The four surrounding carbon atoms are at the four vertices of regular tetrahedron. The diamond crystal is the re-fer. which are bonded to another by network of covalent bond. and its structure is rigid. its rigid is 3 dimensional arrangement of carbon atoms gives it a high density.



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Uses of Diamond :-

1. It is used for making jewellery.
2. It is used in cutting instruments like glass cutters and ~~the~~ drill equipments.
3. The sharp edge diamonds are used by eye surgeons as a tool to remove cataract from eye.

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Graphite

It is greenish black opaque substance. It is lighter than diamond it is soft and slippery to touch.

Physical properties

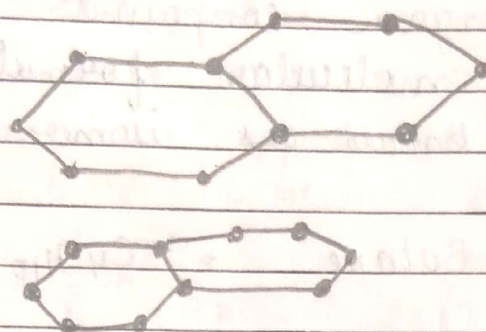
1. It conducts electricity.
2. The melting point of Graphite is 3700°C .
3. The density of Graphite is 2250 kg. m^{-3} .
4. It burns on strong heating to form Carbon dioxide.

Structure:

A Graphite crystal consists of layers of Carbon atoms. Each layer forms a sheet of Carbon atoms. Each Carbon atom in a graphite layer is joined to 3 other Carbon atoms by strong covalent bonds to form hexagonal rings. The various layers of Carbon atoms in Graphite are quite far apart so that no covalent bond can exist between them. The various layers of Carbon in Graphite are held together by weak ~~weak~~ van der Waals force. So they can slide over one another.

Uses.

10



Uses.

1. It can be used for lubricating those machine parts which operate at very high temperature.
2. It is used for making electrodes in dry cells.
3. It is used for making ~~core~~ core of our pencil called pencil leads.

e

3. Buckminster fullerene : Buckminsterfullerene is an allotrope of carbon containing clusters of 60 carbon atoms joined together to form spherical molecules. It is a football shaped spherical molecules in which 60 carbon atoms are arranged in hexagonal & pentagonal rings of carbon atoms.

There are twenty hexagons and twelve in pentagons of carbon atoms in one molecule of buckminsterfullerene. This allotrope was named buckminsterfullerene bcz, its structure resembled the plane work of dome shaped balls designed by fuller.

X

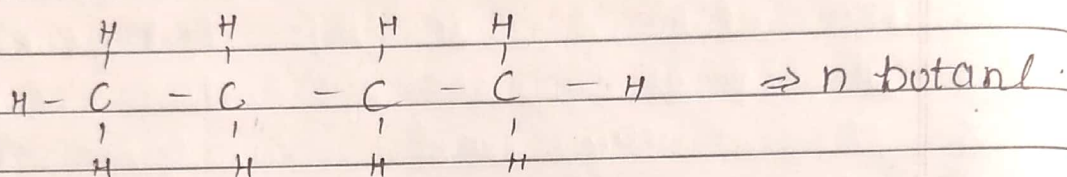


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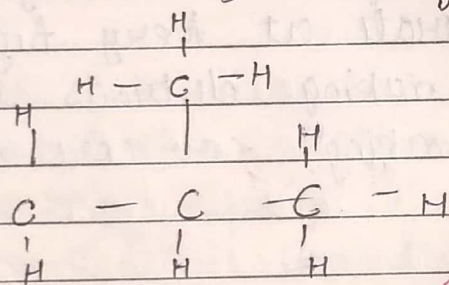
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- **Isomers**:- The organic compounds having the same molecular formula but different structure are known as isomers.

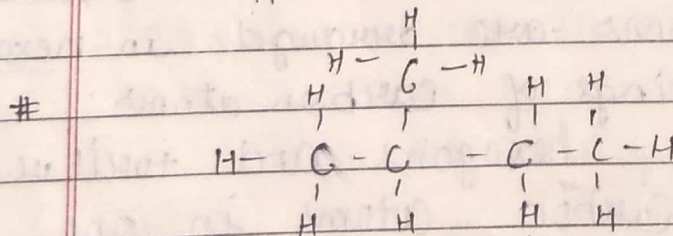
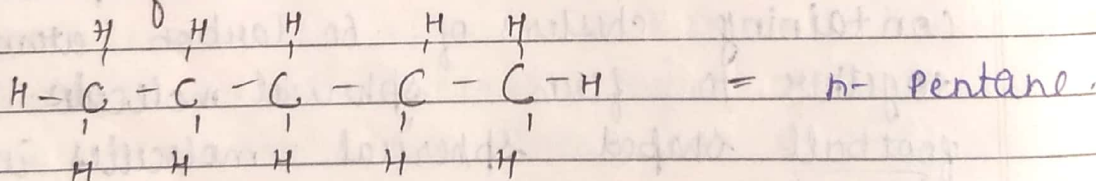
1. Isomers of Butane = C_4H_{10}



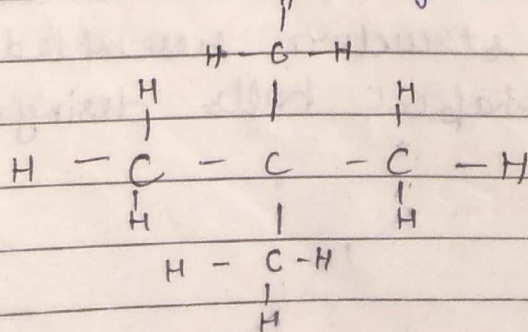
(ii) Isomers of butane, Methyl propane.



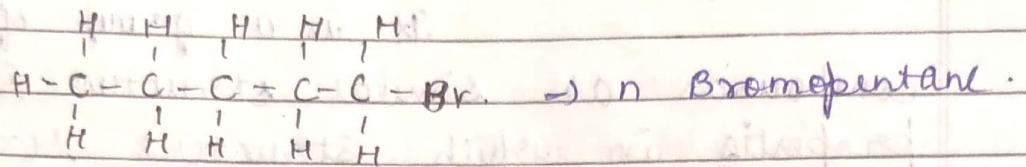
Isomers of Pentane = C_5H_{12}



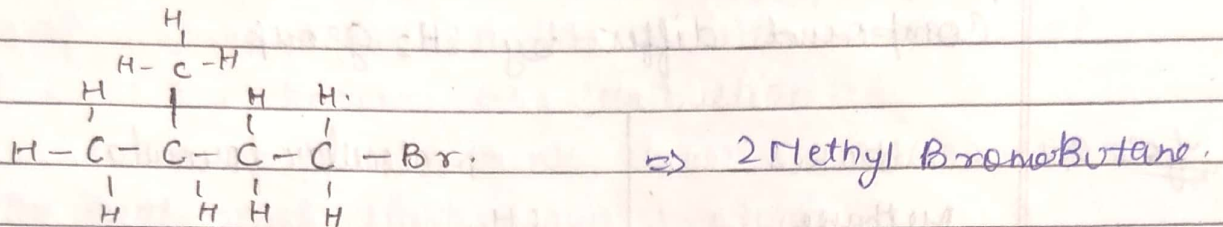
Pentane, Dimethyl propane



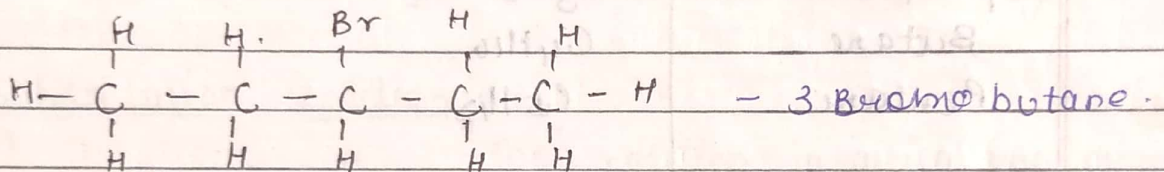
* 380 - Bromo pentane $\Rightarrow C_5H_{11}Br$.



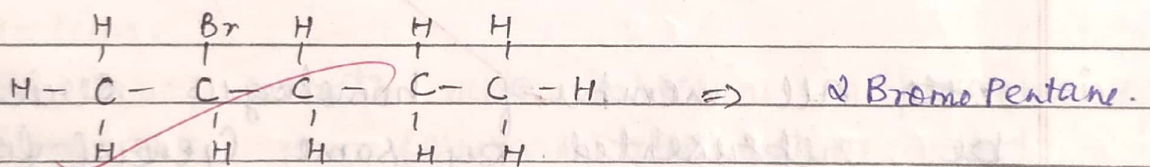
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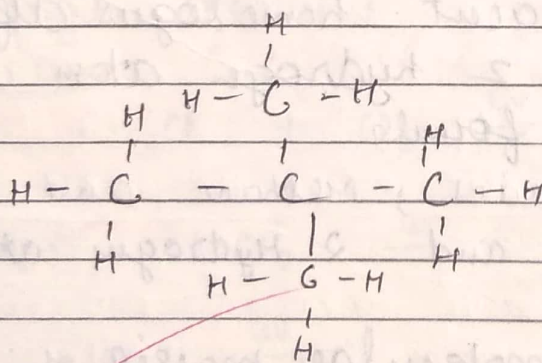
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2,2-Dimethyl Bromopropane.

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#

Homologous Series

It is a group of organic compounds as similar structure & similar properties in which successive compound differ by CH_2 group.

for ex.	Alkanes	Molecular formula.
	Methane	CH_4
	ethane	C_2H_6
	propane	C_3H_8
	Butane	C_4H_{10}
	Pentane	C_5H_{12}

Characteristics

- All members of homologous series can be represented by same General formula.
- Any 2 adjacent homologous differ by 1 Carbon and 2 hydrogen atom in their Molecular formula

Ex: In alkanes series, Methane and Ethane differ by 1 carbon and 2 Hydrogen atoms.

- The diff. in molecular masses of any two adjacent homologous is 14u .

Ex The diff in molecular mass of ethane (30u) and Propane (44u)

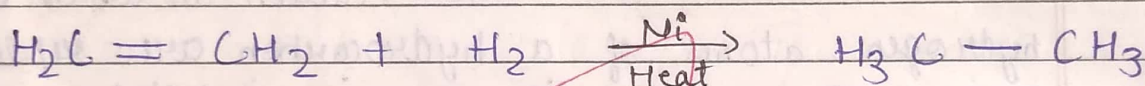
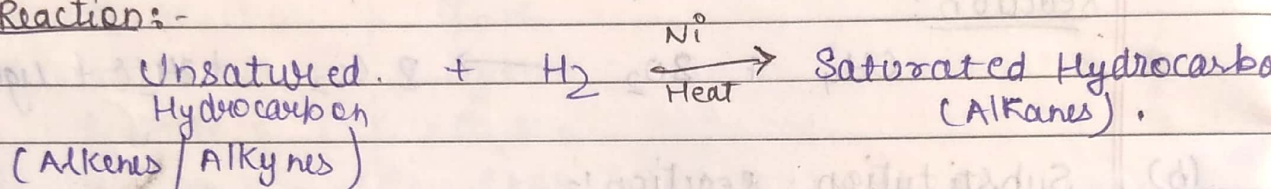
- All the compound of homologous series show similar chemical properties

(iii) $\text{CHCl}_3 + \text{Cl}_2 \xrightarrow{\text{uv}}$ $\text{CCl}_4 + \text{HCl}$.
tetrachloromethane.

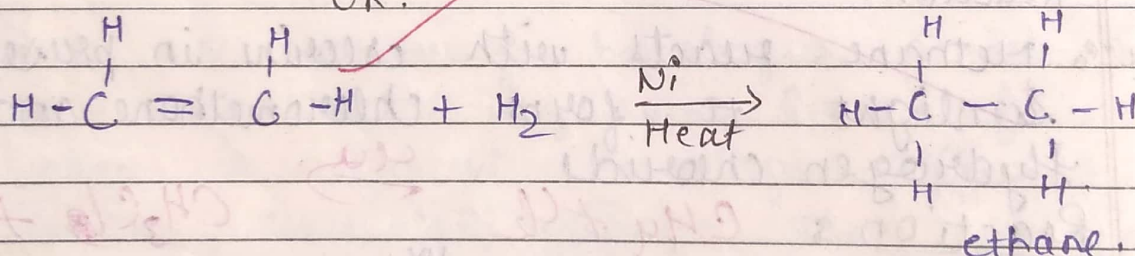
(c) ★ Addition Reaction (Hydrogenation):-

The addition of Hydrogen to an unsaturated Hydrocarbon to obtain a saturated Hydrocarbon is known as Hydrogenation. It takes place in presence of Nickel as catalyst.

for ex:- Ethene reacts with Hydrogen when heated in presence of Nickel catalyst to form ethane.
Reaction:-

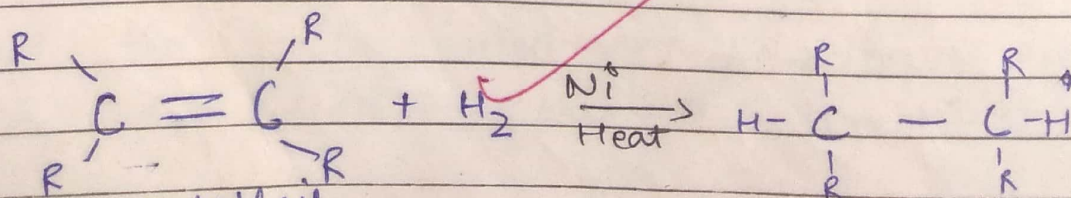
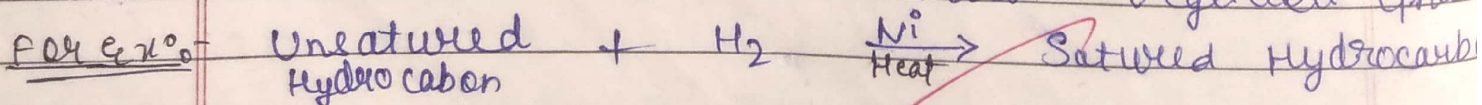


OR.



★ Industrial Application of Hydrogenation:-

Vegetable oils are unsaturated compounds containing double bonds. They undergo addition of Hydrogen in presence of Nickel catalyst to form saturated products called Vegetable Ghee.



(R = Alkyl) vegetable oil

vegetable ghee (solid)

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★ Ethanol. (C_2H_5OH) ethyl alcohol :-

Ethanol is second member of whole of series of alcohols the formula of ethanol is C_2H_5OH and its common name is ethyl alcohol.

Physical Properties of ethanol.

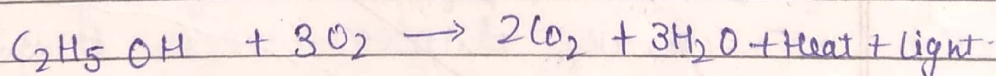
1. It is the colourless liquid having a pleasant smell and a burning taste. Its melting point is $78^\circ C$. It is lighter than water. It mix with water in any proportion. It is a neutral compound. It has no effect on any litmus solution.

Chemical properties of ethanol.

1. Combustion:-

Ethanol burns in air to form Carbon-dioxide and water vapours and releasing lot of heat and light.

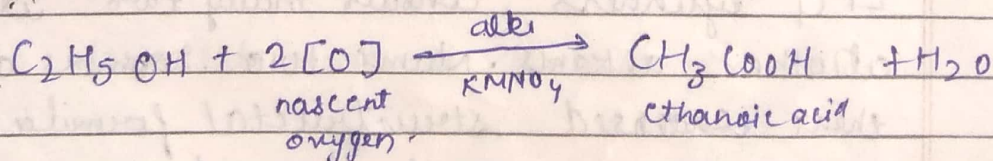
Reaction:-



2. Oxidation:-

When ethanol is heated with alkaline $KMnO_4$. It gets oxidised to ethanoic acid.

Reaction:-



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Assignment

Ques 1 Name the element whose one of allotropic forms the buckminsterfullerene.

Ans: Carbon.

Ques 2: what are the two properties of Carbon which lead to the formation of large number of carbon compounds?

Ans:- Catenation (Self linking of carbon atoms to form long chains) and Tetravalency.

Ques 3: State whether the following statements is true or false.

Diamond and graphite are the covalent compounds of carbon element (C).

Ans:- False

Ques 4: Name the scientist who discovered the 'vital force theory' for formation of organic compounds.

Ans: Friedrich Wohler

Ques 5: Name the element whose allotropic form is graphite.

Ans: Carbon

Ques 6: In addition to some propane and ethane, LPG cylinders contain mainly two isomers of another alkanes. Name two isomers and write their condensed structural formula.

Ans: n-butane and iso-butane.

Ques 7. Buckminsterfullerene is a spherical molecule in which 60 carbon atoms are arranged in interlocking hexagonal and Pentagonal rings of carbon atoms.

(a) How many hexagons of carbon atoms are present in one molecule of buckminsterfullerene?

Ans: 20 hexagons.

(b) How many Pentagons of carbon atoms are present in one molecule of buckminsterfullerene?

Ans: 12 Pentagons.

Ques 8. Name the black substance of pencil which the current flows through the electric circuit when we use the sharpened ends of pencil to complete the circuit?

Ans: Graphite : Yes.

Ques 9. How does graphite acts as lubricant?

Ans: Due to its softness, powdered graphite is used as lubricant for fast moving parts of machinery. Since graphite is non-volatile, it can be used for it can use for lubricating machine parts which operate at very high temperature. It is used as dry lubricant or mixed with petroleum jelly to form graphite grease. It is also mixed with lubricant oils.

Ques 10 Name the hardest natural substance known.

Ans: Diamond.

Ques 11. which of the following molecule is called buckminsterfullerene

A. C_{90} C_{60} C_{70} C_{120}

Ans. C_{60}

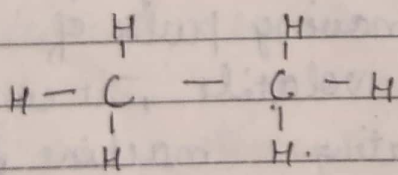
Ques 12. Give the name and structural formula of Alkyl group

Ans. # Propyl

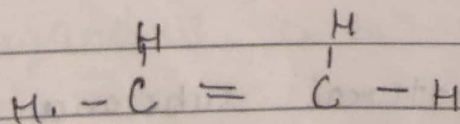
Ques 13. write the electron-dot structure for.

(i) ethane.

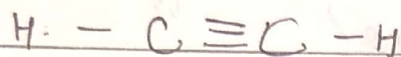
formula = C_2H_6



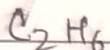
(ii) ethene, C_2H_4



(iii) ethyne C_2H_2 .



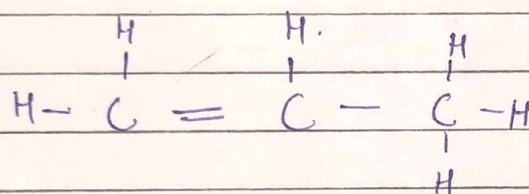
Ques 14. Give the IUPAC name of following compound.



Ans. Ethane

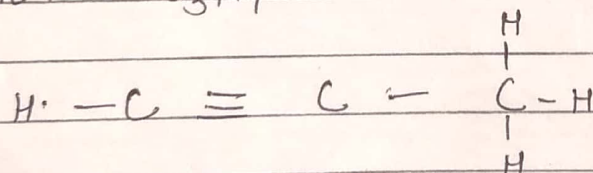
Ques 15. Write the structural formula of propene.

Ans. Propene = C_3H_6 .



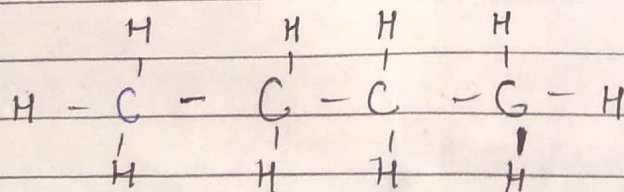
Ques 16. Write the structural formula of propyne.

Ans:- Propyne:- C_3H_4 .



Ques 17. Write the structural formula of butane.

Ans. butane:- C_4H_{10} .



Ques 18 what do you call the compounds having same molecular formula but different structural arrangements of atoms?

Ans Isomers

Ques 19 write the name of any two isomers represented by molecular formula C_5H_{12} .

SBG STUDY