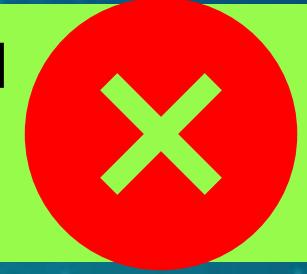
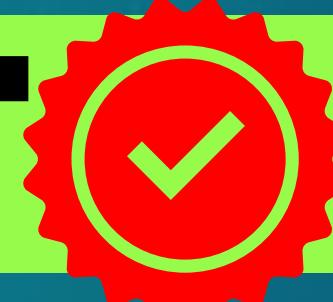


Carbon & Its Compounds

ONE SHOT 

GUN SHOT 

100% Paper yahi se bnega

Sab Samajh Me aaega !!

Covalent Compounds

A compound formed by sharing of electrons between two atoms.

Formation of Cl₂



e- dot structure

2, 8, 8, —

Single Covalent Bond

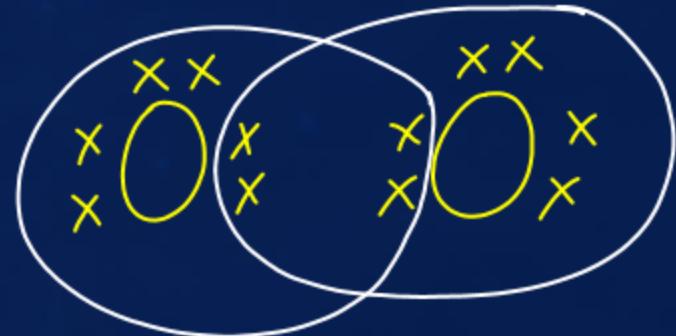
Cl → Cl

Formation of O₂

$$O(8) \rightarrow 2, \underline{6}$$

e- dot structure

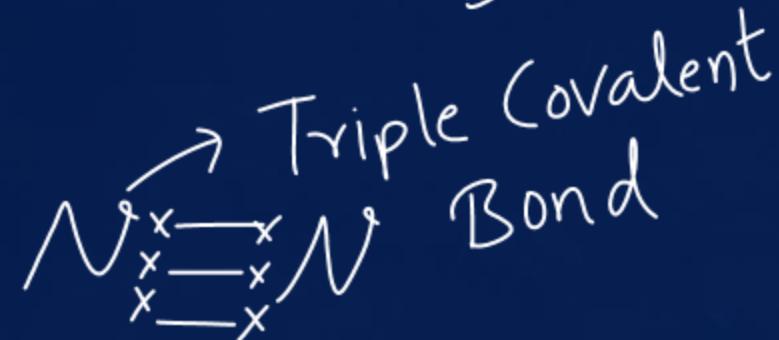
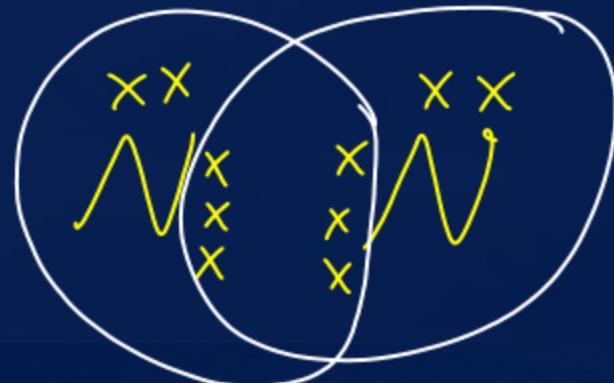
To attain stability O needs 8e- in last/valence shell.
Complete Octet.



Formation of N₂

$$N(7) \rightarrow 2, 5$$

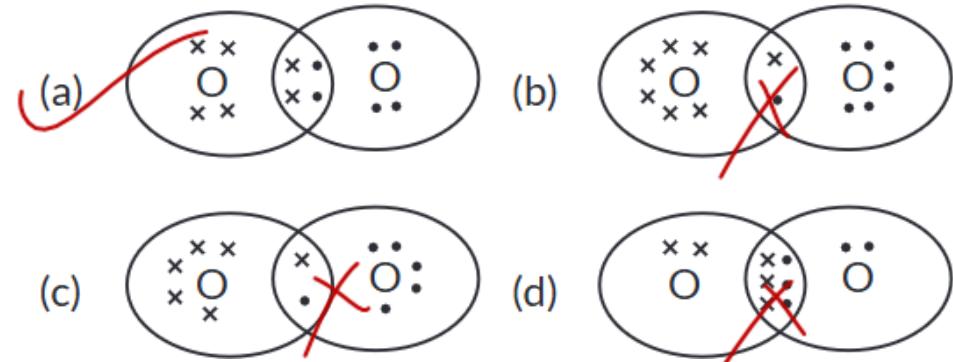
e- dot structure



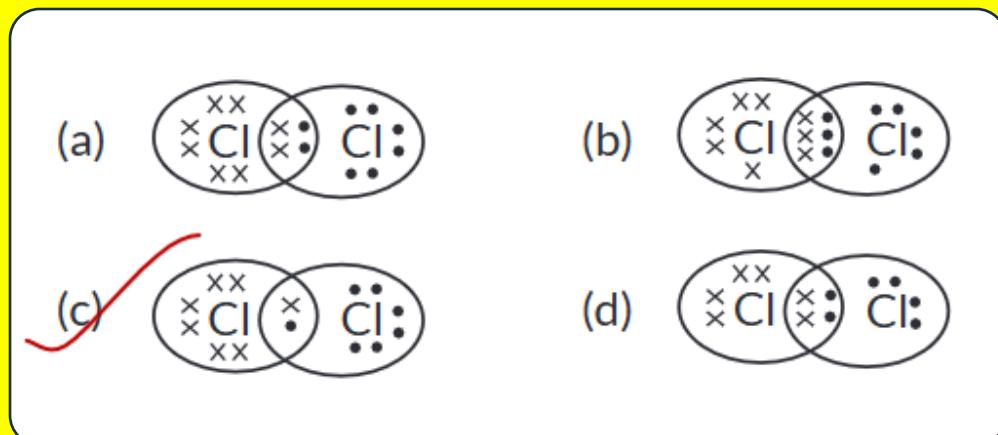
Q. The correct representation of covalent bonding in an oxygen molecule is

Q1

(CBSE 2023)



Q. The electron dot structure of chlorine molecule is



(CBSE 2023)

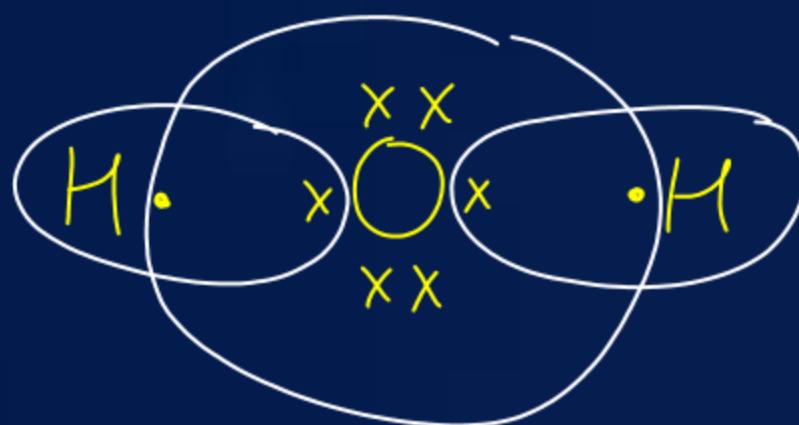
Covalent compound is formed between a
non-metal + non-metal
(C, S, N, O, H, Cl, F, Br)

Eg: H₂, O₂, N₂, Cl₂

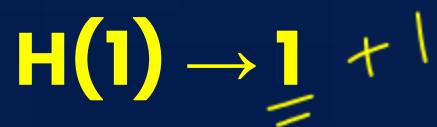
H₂O, NH₃, CH₄

(Water) (Ammonia) (Methane)

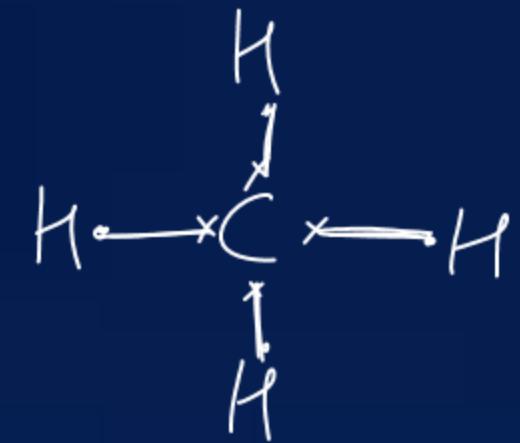
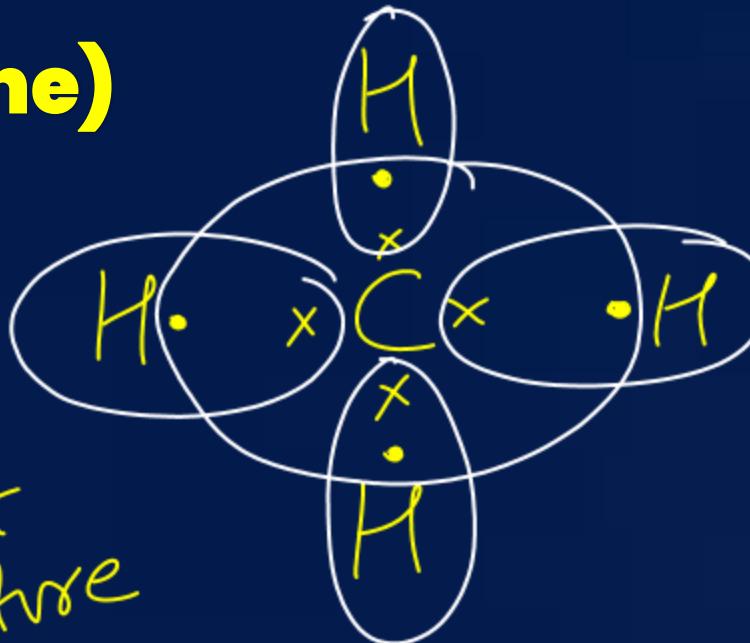
Formation of H₂O (Water)



Formation of CH₄ (Methane)



e⁻ dot
structure



H.W.

Formation of NH₃ (Ammonia) → comment Single ? Double ?



Carbon : C

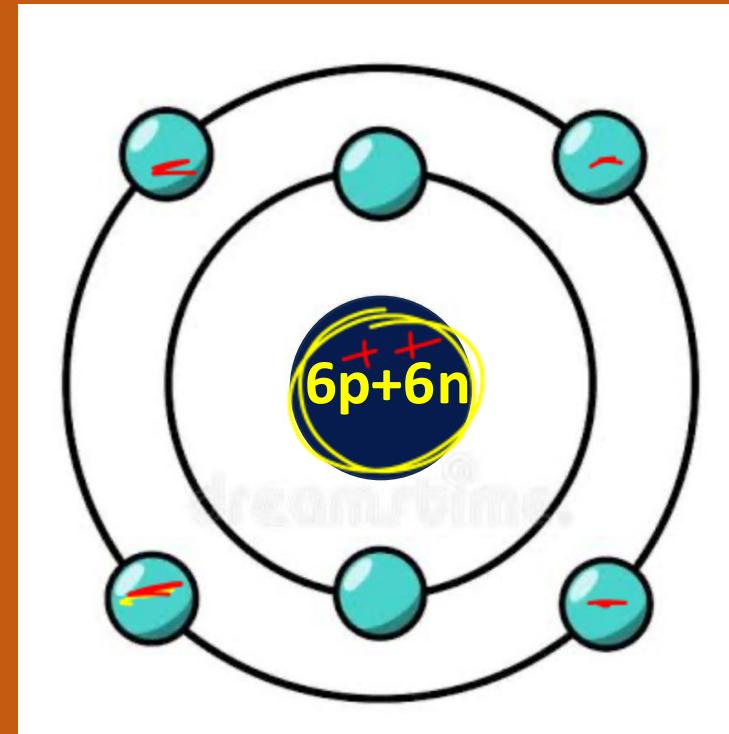
Atomic No. → 6

C(6) → 2, 4

To attain Noble gas configuration
→ Octet $8e^-$



So Carbon shares $4e^-$ & always form covalent bonds & covalent compounds.



Q. Assertion (A) : Carbon has a strong tendency to either lose or gain electrons to attain noble gas configuration.



Reason (R) : Carbon has four electrons in its outermost shell and has the tendency to share electrons with carbon or other elements.

Q2

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

(CBSE 2020)



(b) Both (A) and (R) are true, but (R) is not the correct explanation of the assertion (A).

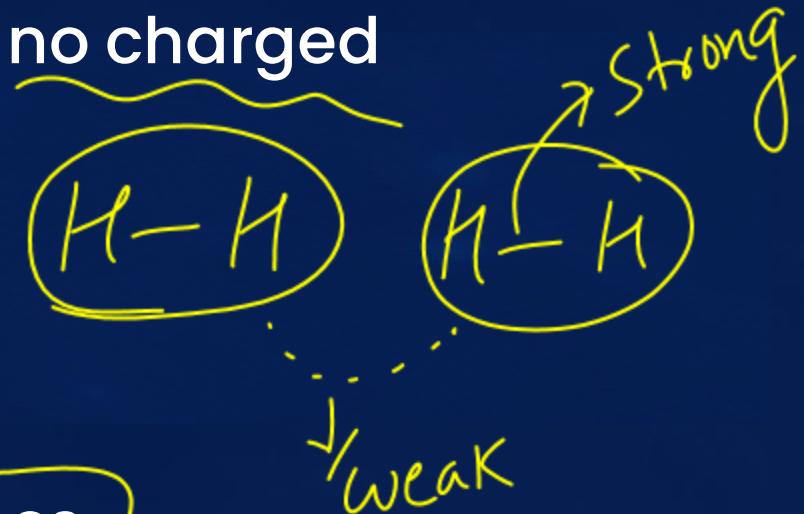
(c) (A) is true, but (R) is false.

(d) ~~(A)~~ is false, but (R) is true.

Properties of Covalent Compounds

1. Generally Poor Conductor of Electricity

- because e^- are shared between atoms and no charged particles are formed
- absence of ions



2. Generally Low Melting & Boiling Points

- because they have weak *intermolecular forces*

NOTE: Covalent Bond is strong

intermolecular forces are weak



Q. Carbon compounds

(CBSE 2024)

(i) are good conductors of electricity



(ii) are bad conductors of electricity



(iii) have strong forces of attraction between their molecules



(iv) have weak forces of attraction between their molecules.



The correct statements are

(a) (i)and (ii) (b) (ii)and (iii)

(c) ~~(ii)~~ and (iv) (d) (i) and (iii)

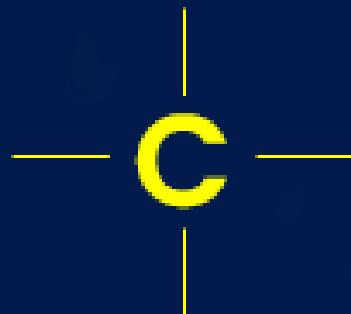
Q3



Nomenclature - IUPAC

1. C → 4 valency

6 → 2, 4 —



Learn

1C → Meth

2C → Eth

3C → Prop

4C → But

5C → Pent

2. Carbon ke sath kuch laga hai to theek, varna H laga Ke valency khatam karo. 'C' or 'H' bhai bhai.



6C → Hex - -

7C → Hept

8C → Oct

9C → Non

10C → Dec

Carbon Carbon single bond – ane



Methane



Ethane



Propane

Alkanes

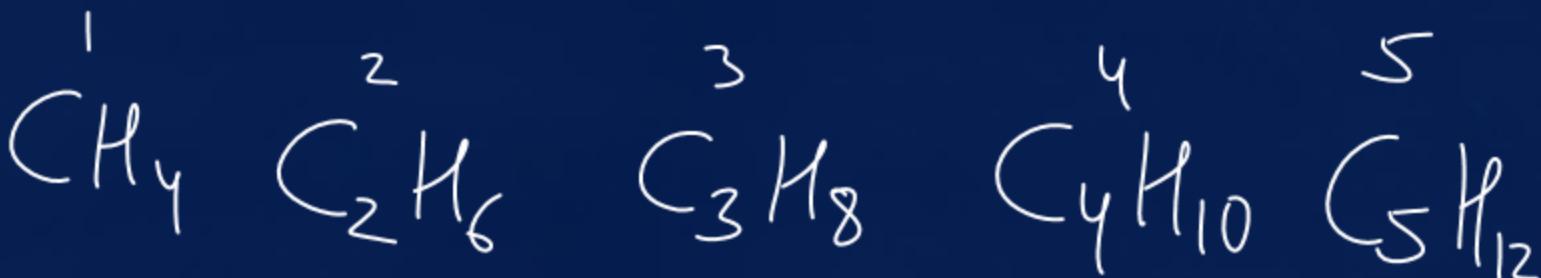


Butane



Pentane

Homologous Series: (HS)



Formula $\text{C}_n\text{H}_{2n+2}$

Q. Write the molecular formula of the following carbon compounds :

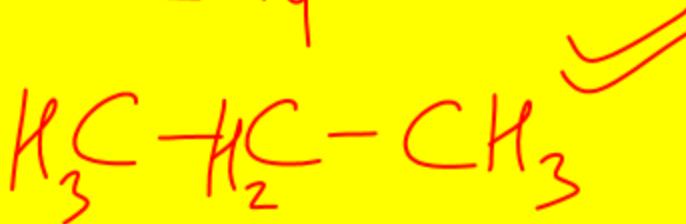
(i) Methane



(CBSE term II 2021-2022)

Q4

(i) Propane



Carbon Carbon double bond =ene



Ethene

~~Methylene~~



Propene



Butene

Homologous Series: (HS)



Carbon Carbon triple bond \equiv yne



Ethyne



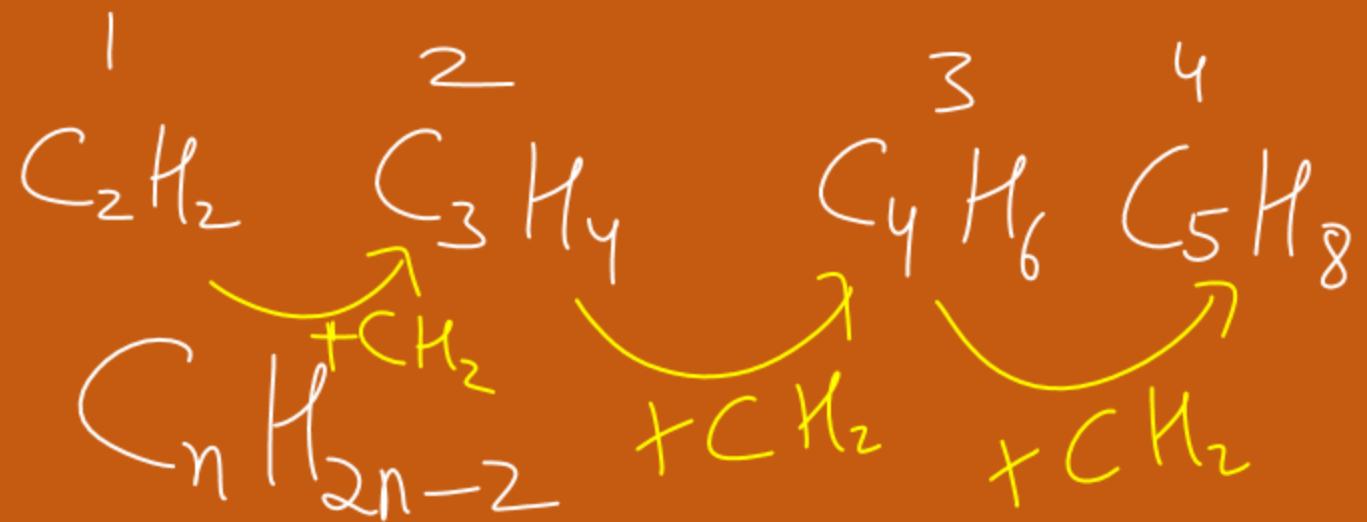
Propyne



Butyne

Homologous Series: (HS)

Formula:



Q. Write the formula of first member of the homologous series to which the carbon compound C_4H_6 belongs.

yne

(CBSE term II 2021-2022)



Q5

Q. The molecular formulae of two alkynes, A and B are C_xH_2 and C_3H_y respectively.

(CBSE term II 2021-2022)

- (a) Find the values of x and y.
- (b) Write the names of A and B.

Q6 H.W.
 x, y
Comment

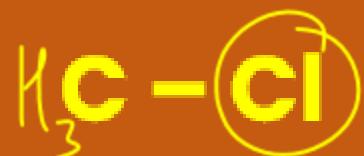
Functional groups → gives chemical properties to a compound

1. Cl, Br →

Chloro

Bromo

'Prefix' {pehle lagao}



Chloromethane



Chloro Ethane



ChloroPropane

Homologous Series (HS): Same functional group increasing CH₂.

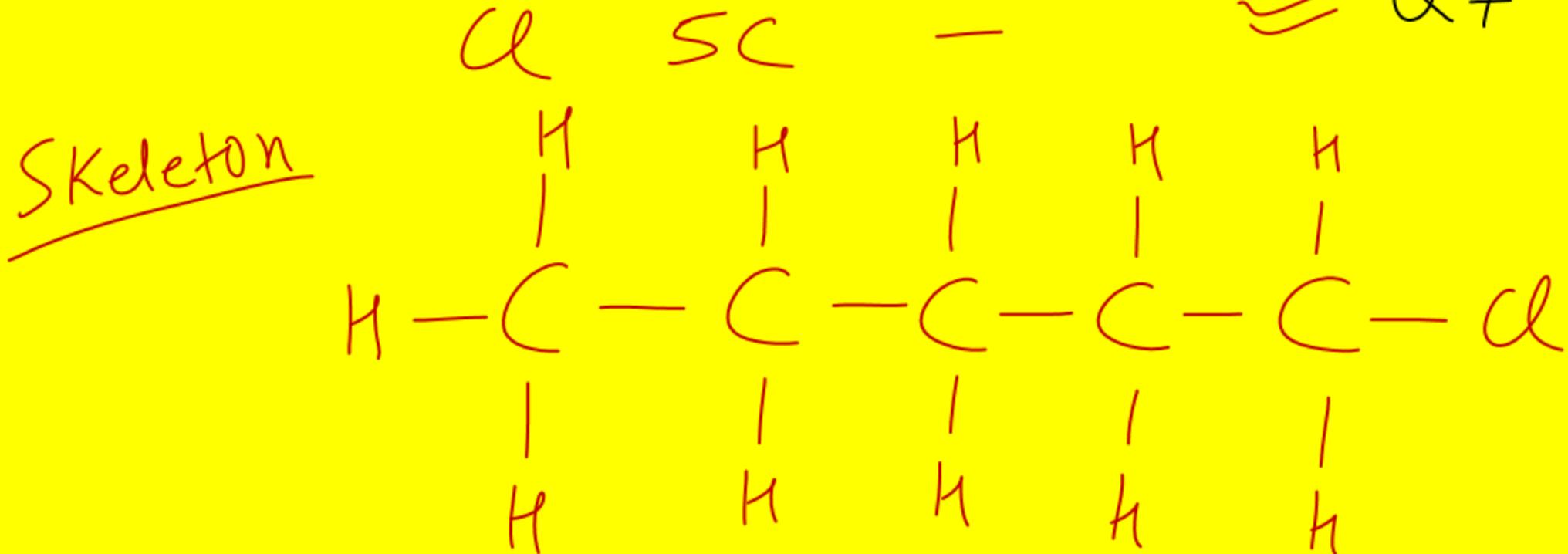
Formula X



Q. Draw the structure of Chloropentane

(CBSE 2023)

Q7



-OH → **Alcohol**



Suffix {Baad में lagao}



Methanol
Methanol



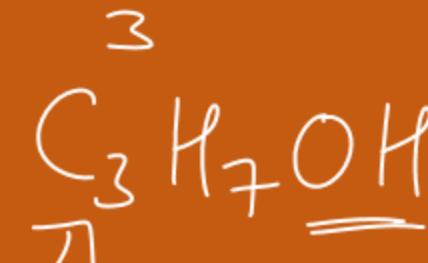
Ethanol
Ethanol {C₂H₅OH}



Propanol
Propanol

Homologous Series (HS): Same functional group increasing CH₂.

Formula X



Q. Assertion (A) : Following are the members of a homologous series :

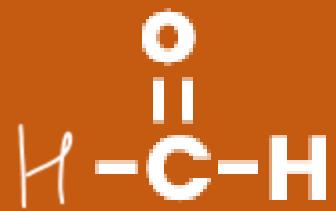


Q. Reason (R) : A series of compounds with same functional group but differing by $-\text{CH}_2$ unit is called homologous series

- (a) Both (A) and (R) are true and (R) is the correct explanation of the assertion (A).
- (b) Both (A) and (R) are true, but (R) is not the correct explanation of the assertion (A).
- (c) (A) is true, but (R) is false.
- (d) (A) is false, but (R) is true.

(CBSE 2023)

Q8



Methan~~al~~al

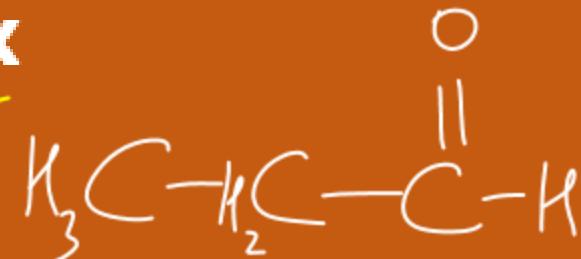
Methanal



Ethan~~al~~al



Propan~~al~~al



Homologous Series (HS): Same functional group increasing CH_2 .

Formula





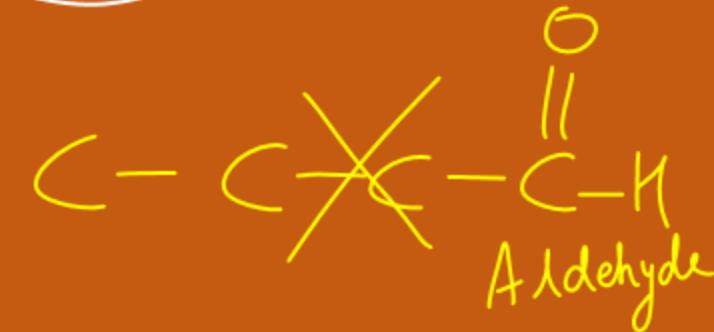
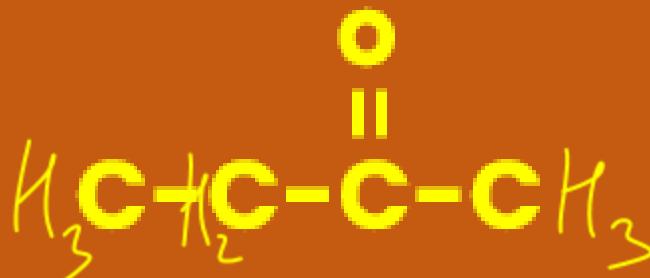
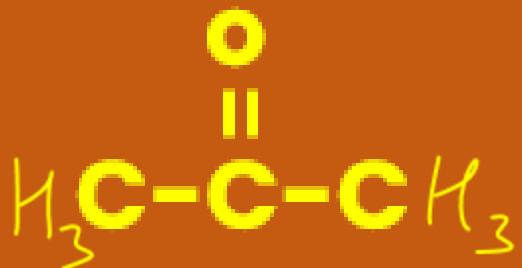
Ketone

'One' suffix

Dono Taraf Carbon Chahie

ye hamesha beech में hogा

at least 3C chahie



Propanone

Butanone

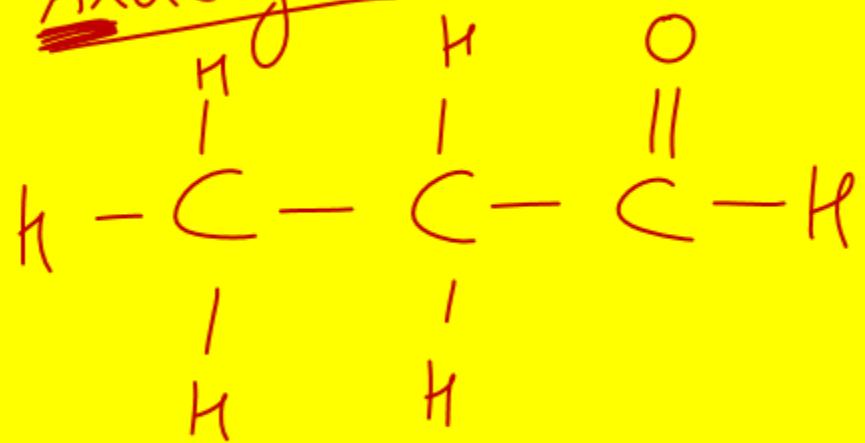
Homologous Series (HS): Same functional group increasing CH_2 .



Q. Write the name and structures of (i) aldehyde and (ii) ketone with molecular form C_3H_6O .

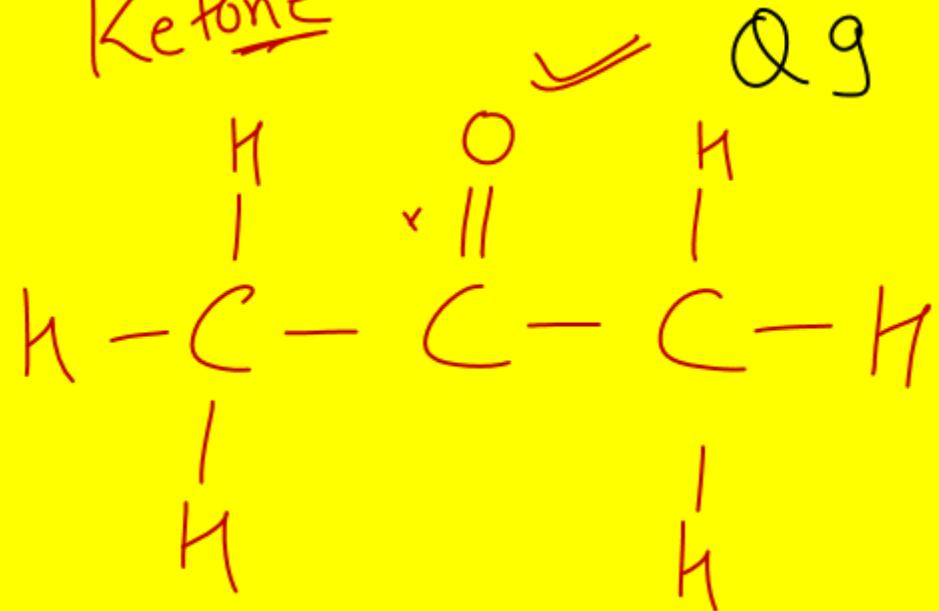
(CBSE 2024)

Aldehyde



Propanal

Ketone



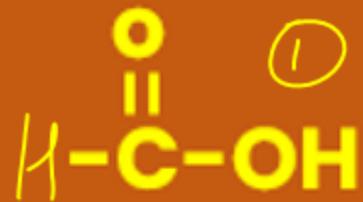
Propanone



-C-OH

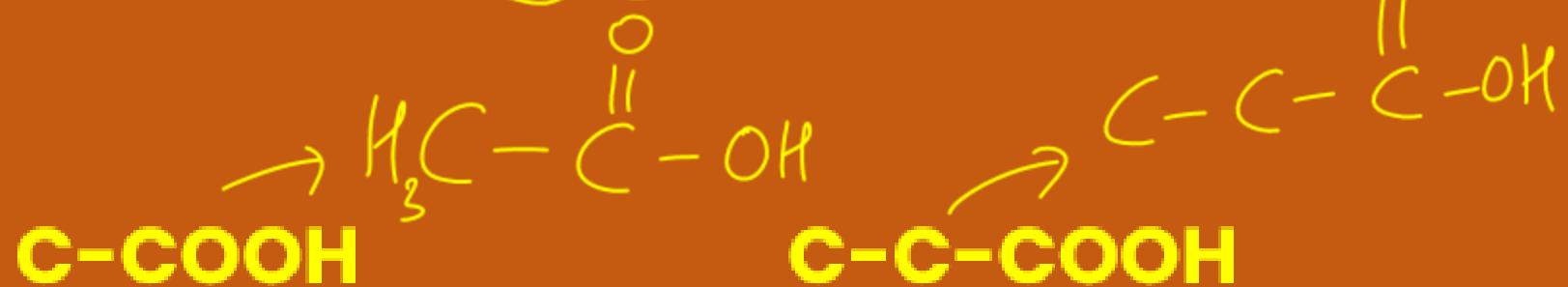
Or -COOH

Carboxylic acid 'Oic acid' suffix



Methan~~o~~ oic acid

methanoic acid

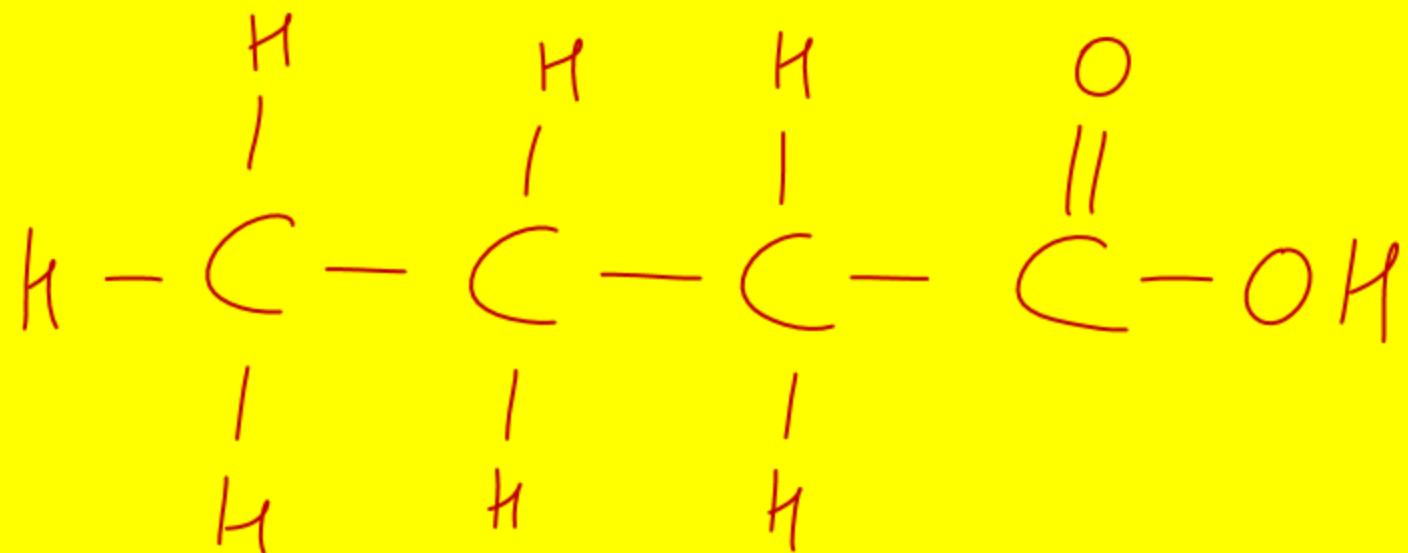
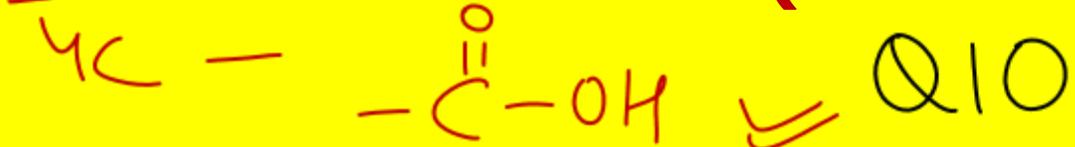


Ethan~~o~~oic acid
(CH₃COOH)

Formula X

Q. Draw the structure of Butanoic acid:

(CBSE 2023)



NAME	IUPAC	Structure	Formula
AlKane	ane	$C-C$	C_nH_{2n+2}
AlKene	ene	$C=C$	C_nH_{2n}
AlKyne	yne	$C\equiv C$	C_nH_{2n-2}
Chloro Bromo	Pchloro Bromo	$C-Cl$	X
Alcohol	ol	$C-OH$	X
Aldehyde	al	Side $\text{---} \overset{\text{O}}{\underset{\text{II}}{\text{C}}} \text{---} \text{H}$	$C_nH_{2n}O$
Ketone	one	Beech $\text{---} \overset{\text{O}}{\underset{\text{II}}{\text{C}}} \text{---}$	$C_nH_{2n}O$
Carboxylic Acid	OIC acid	$\text{---} \overset{\text{O}}{\underset{\text{II}}{\text{C}}} \text{---} OH$	X

CH₄ C₂H₆
 1st member 2C
 Learn

C---C---C---H
 O
 ||
 C---C---C
 O
 ||
 1st member
 3C

(i) Draw the structures of propanol and propanone.

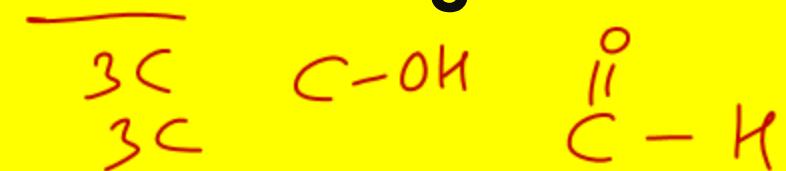


(CBSE 2023)

(ii) Name the third homologue of:

(a) alcohols

(b) aldehydes



**Q11
H.W.**

Comment!

**Check &
Comment**



I did It!

Homologous Series (HS)

A series of compound with same functional group, same general formula & similar chemical properties where each consecutive member differs by $-\text{CH}_2$.

E.g:



1. Molecular Mass increase moving up homologous series



2. Melting and boiling point increase up the series

Reason: They increase with Molecular Mass Gradation in other physical properties like solubility.

3. Chemical properties are same for a homologous series

Reason: Chemical properties are because of functional groups which remains same in HS.

Q. Write the formula and the molecular mass of the third homologue of alcohols. State how the boiling point of an alcohol changes as one moves from lower to higher homologues.

(CBSE 2024)

-OH 3C

→ increases

✓ Q12



$$3 \times 12 + 7 \times 1 + 16 + 1$$

$$36 + 8 + 16 + 1$$

Q. (i) Define a homologous series of carbon compounds.



(i) Why is the melting and boiling points of C_4H_8 higher than that of C_3H_6 or C_2H_4 ?

C_3H_6 C_2H_4

ene



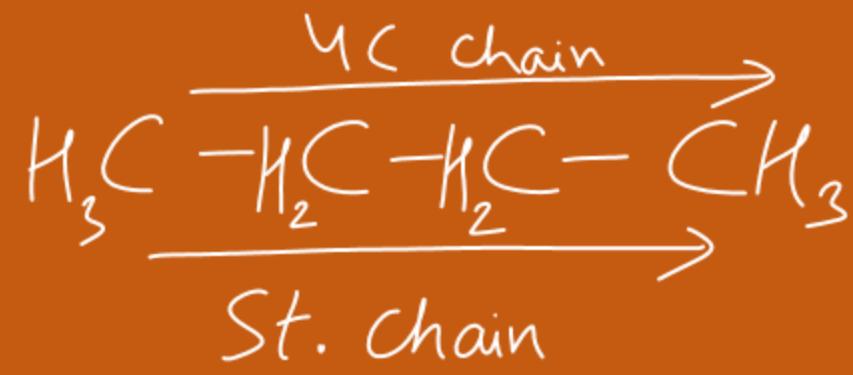
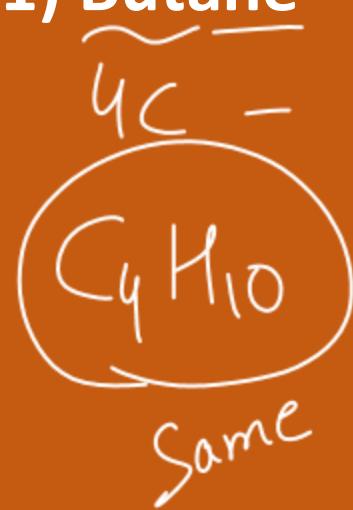
(iii) Why do we not see any gradation in chemical of a homologous series compounds?

PROP.

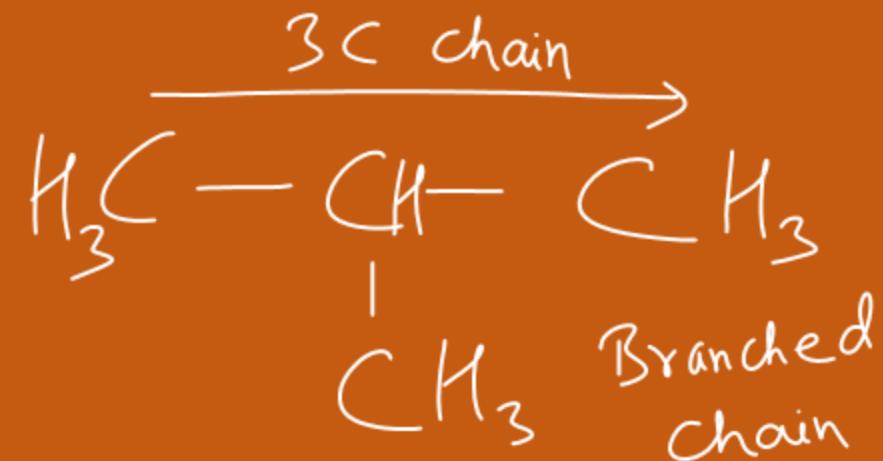
Same functional group **(CBSE 2024)** Q13

Isomers

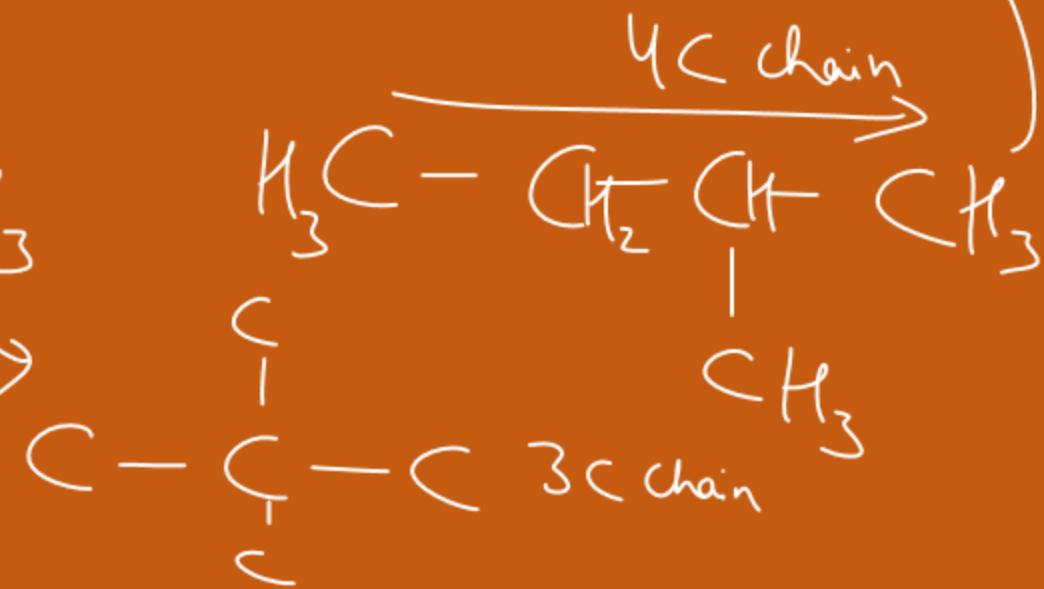
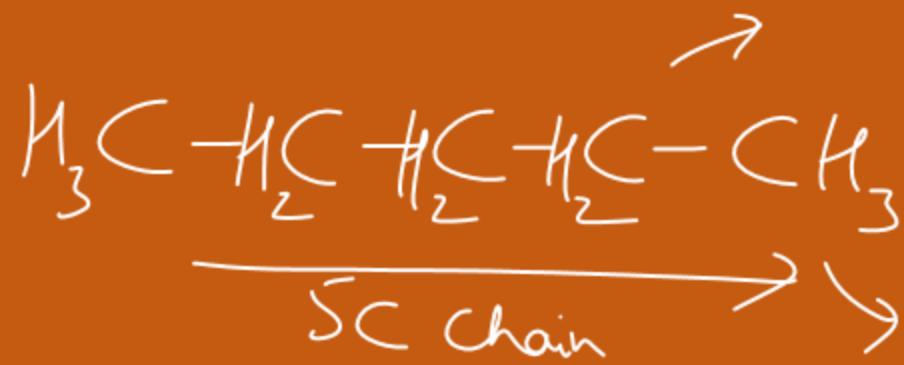
1) Butane

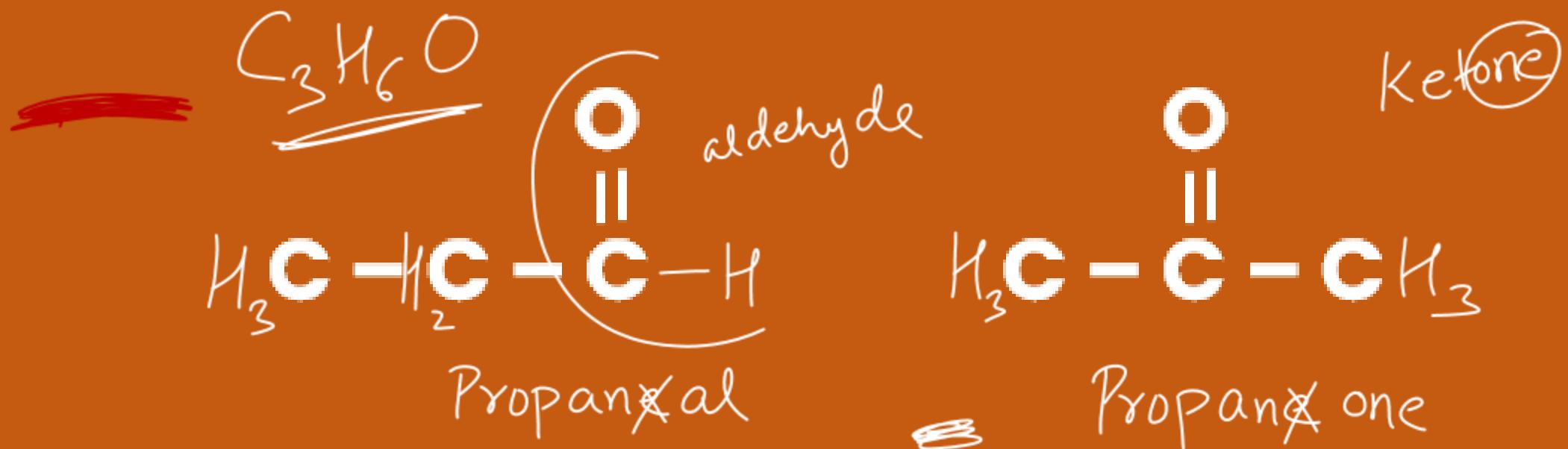


Propane X



2) Pentane





Isomers: Compounds with same molecular formula but different structures, and this phenomenon is called isomerism.

Q. Draw two structural isomers of butane.

(CBSE 2023)

K.W.



Q14

*structural
isomers*

Q. What are structural isomers? Write the structures of two isomers of butane (C_4H_{10}).

Q15
(CBSE 2024)

Saturated Compounds

Which has Carbon-Carbon single bonds only.



AlKane

Unsaturated Compounds

Which has Carbon-Carbon Double or triple bond

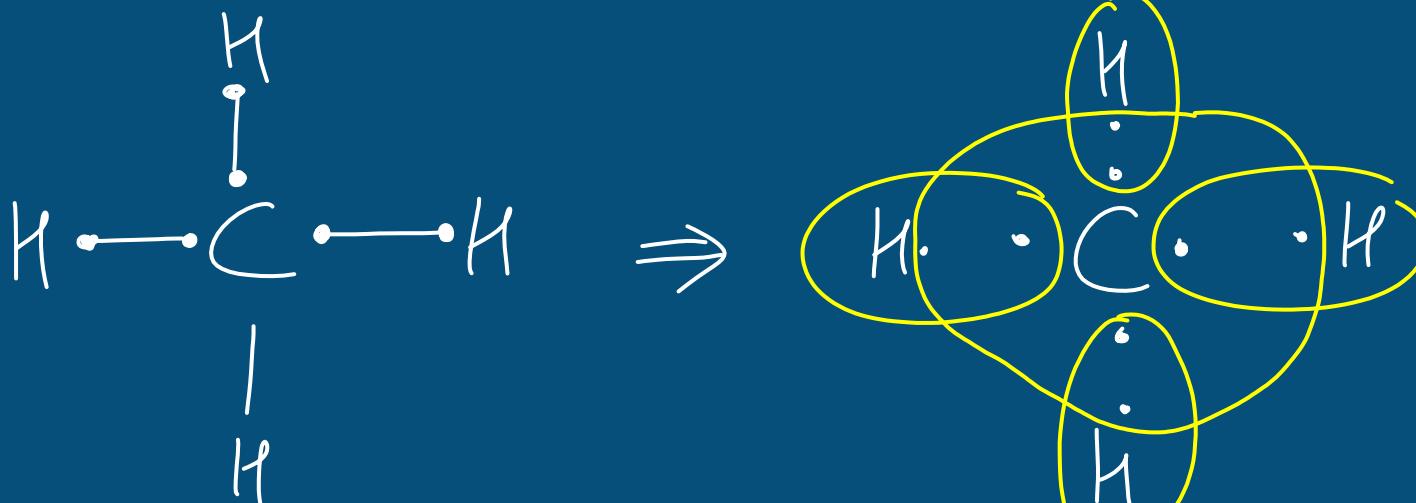


Q. Differentiate between saturated and unsaturated carbon compounds on the basis of their general formula.

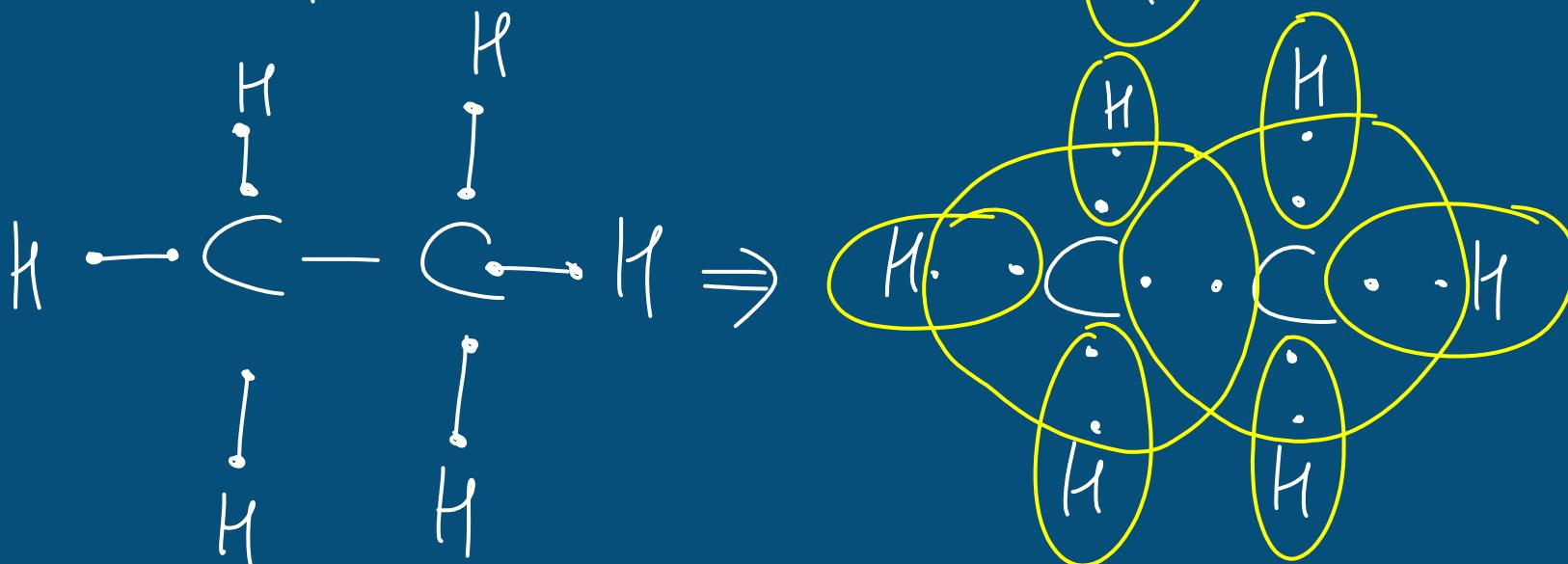
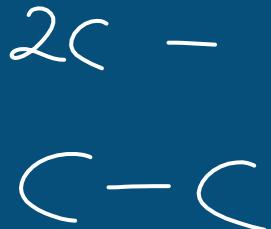
(CBSE 2023)

Electron Dot Structure

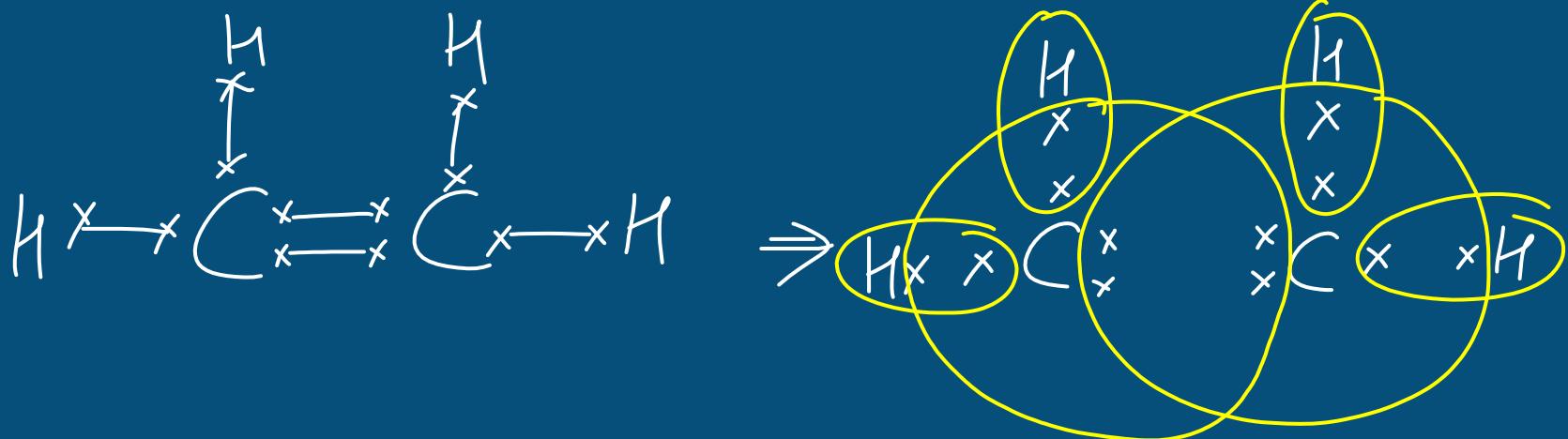
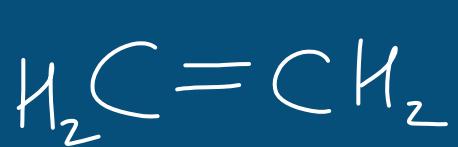
1. Methane



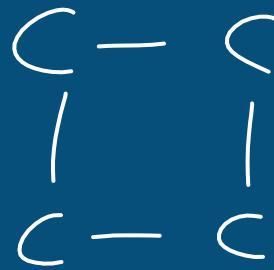
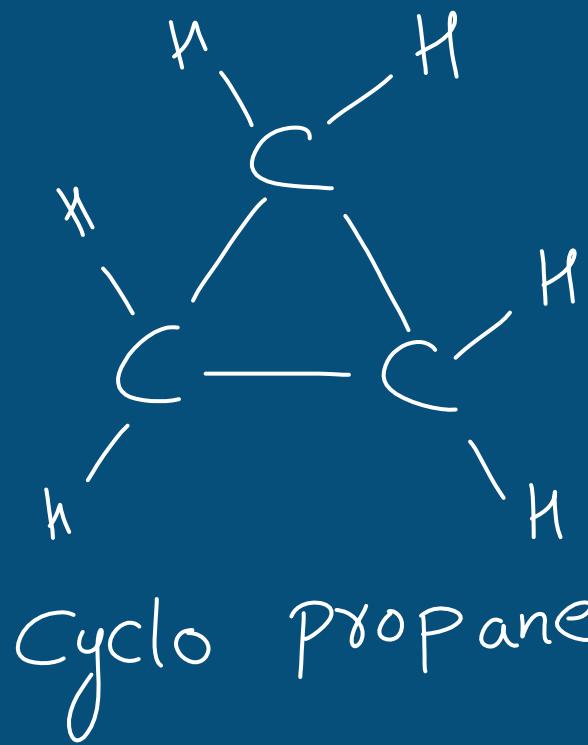
2. Ethane



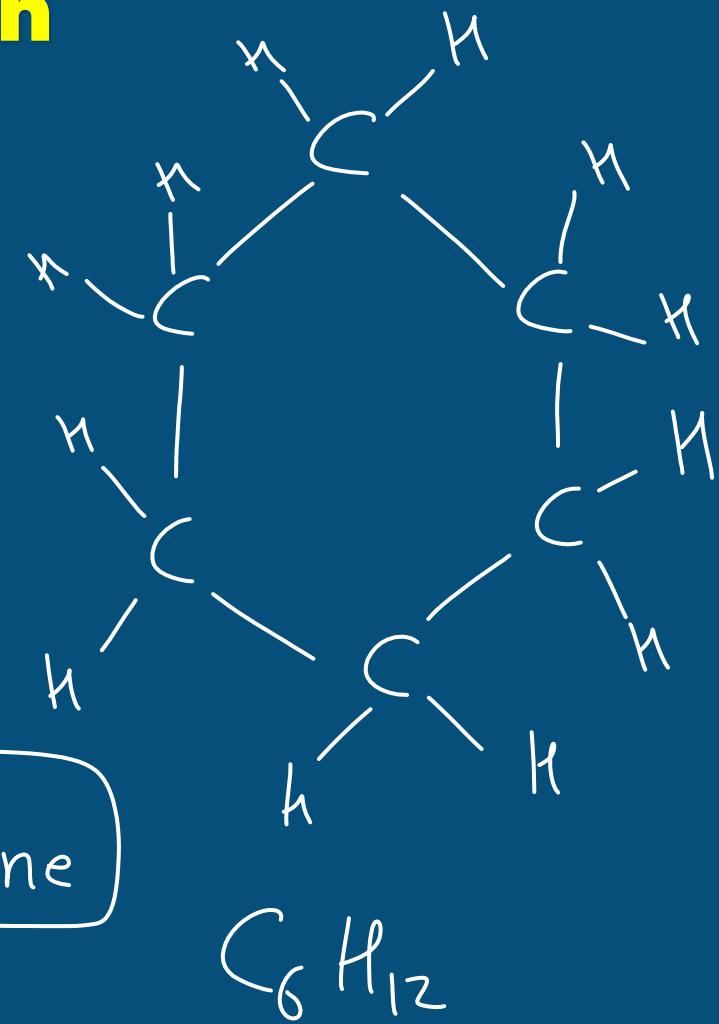
3. Ethene



Rings of Carbon

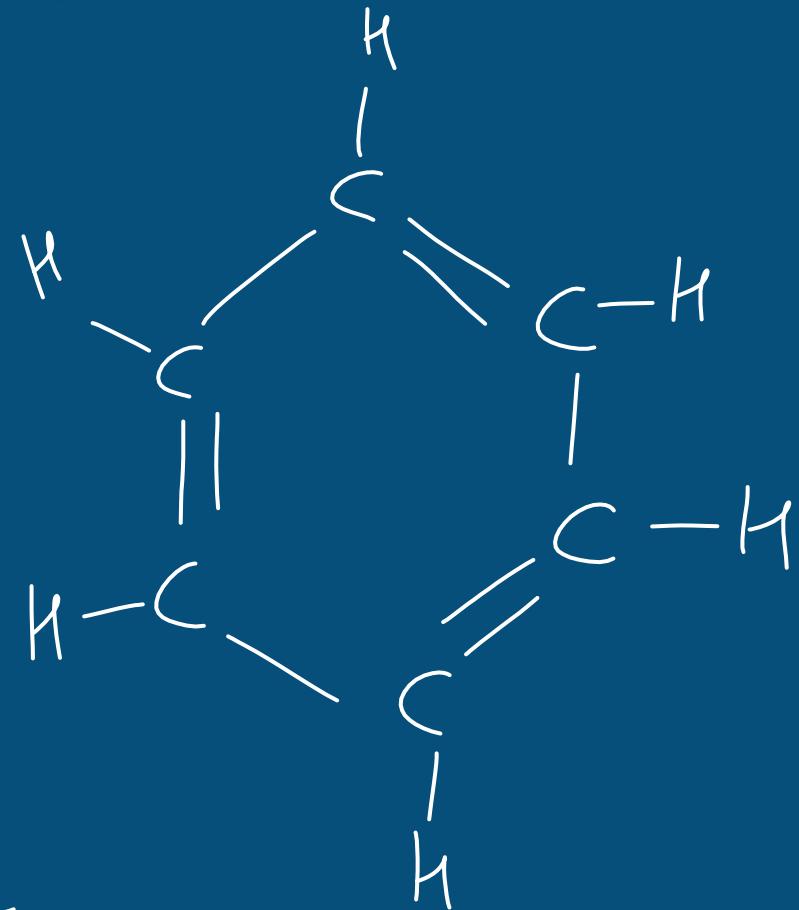
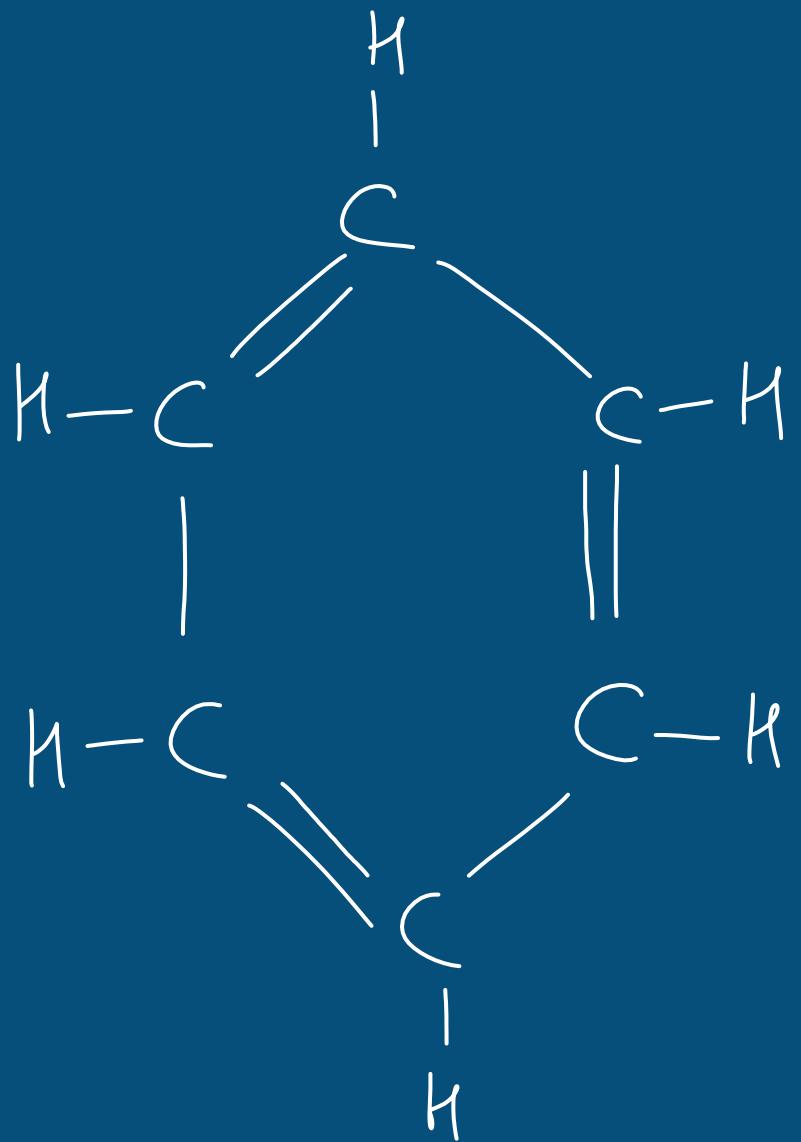


Cyclohexane



Saturated or Unsaturated?

Benzene



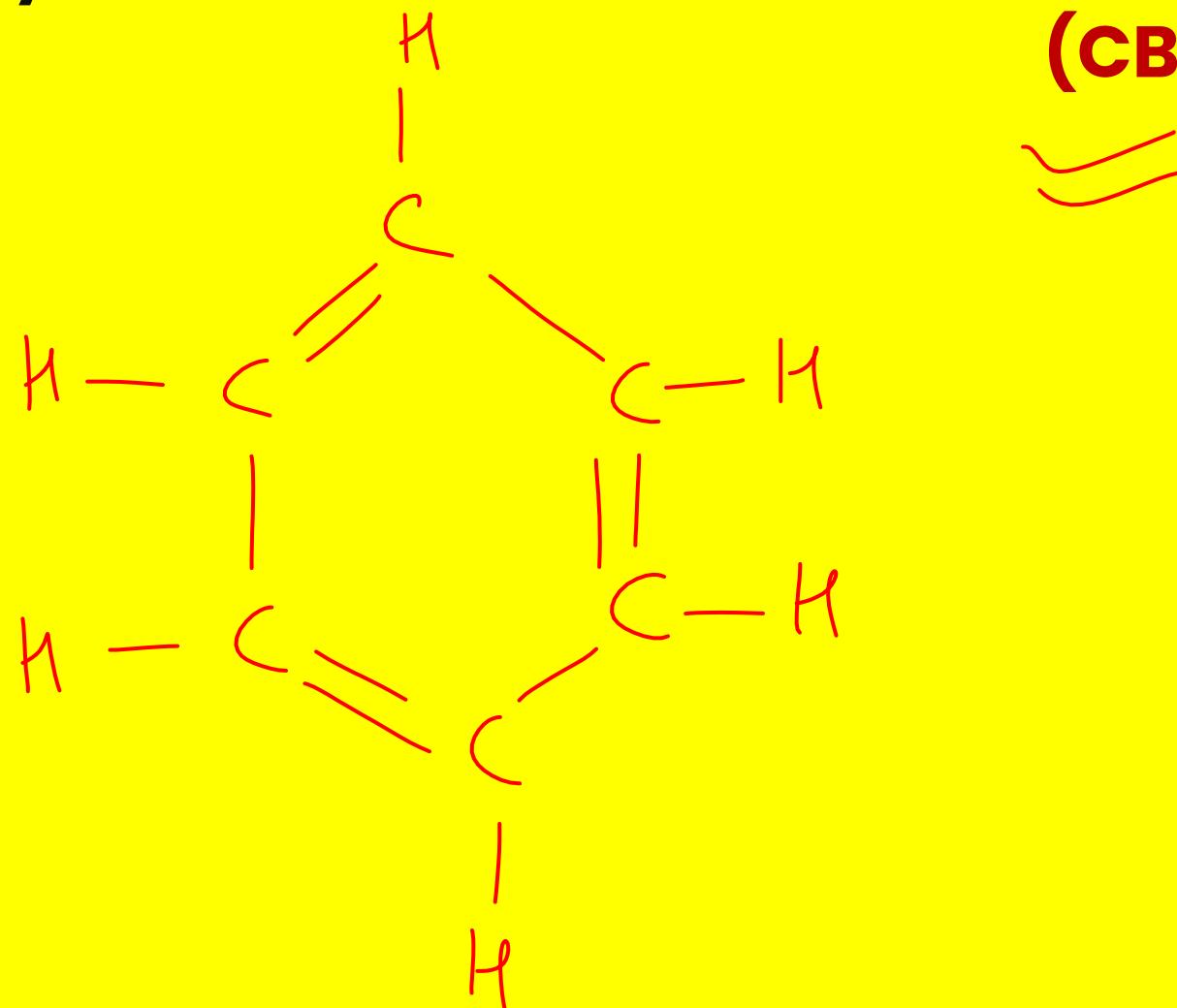
Saturated or Unsaturated?

Q. The number of single and double bonds present in a molecule of benzene (C_6H_6) respectively, are

- (a) 6 and 6 (b) 9 and 3
~~(c)~~ 3 and 9 (d) 3 and 3

(CBSE 2024)

3D GS



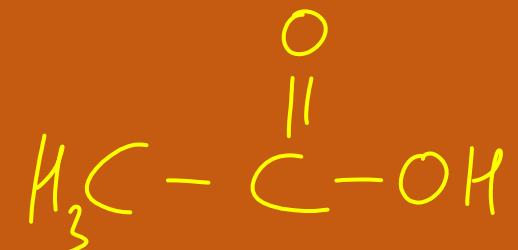
REACTIONS



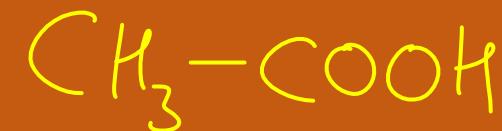
ETHANOL



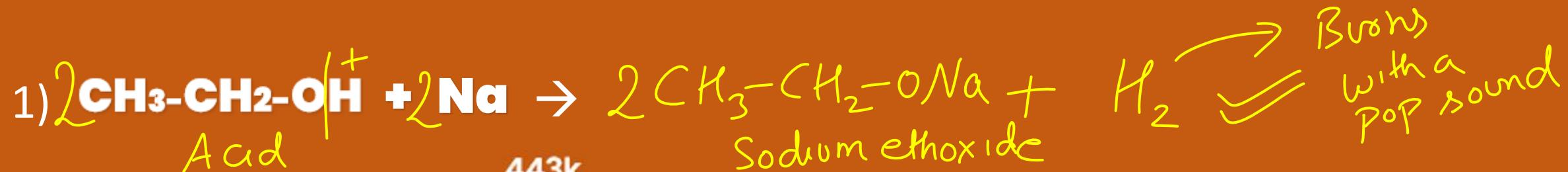
PAR USSEY PEHLE
YE DO COMPOUND YAAD KARO



ETHANOIC ACID

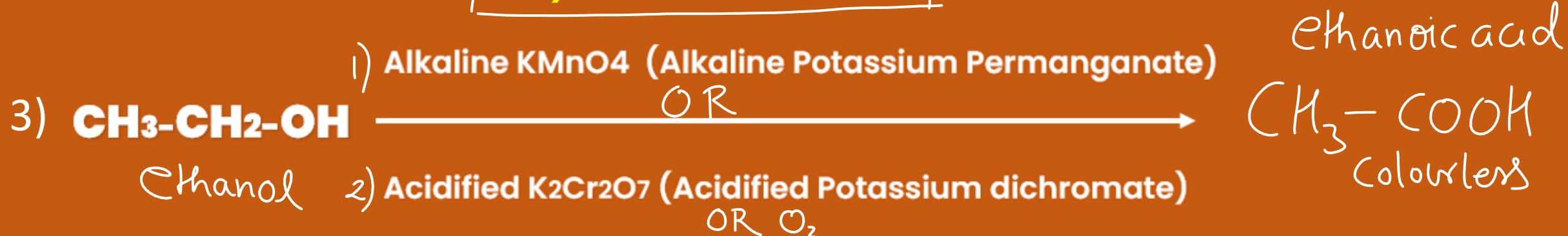


ETHANOL $\text{CH}_3\text{-CH}_2\text{-OH}$ Ke Reactions



Conc H₂SO₄ Dehydrating agent hai (pani nikalne wala).

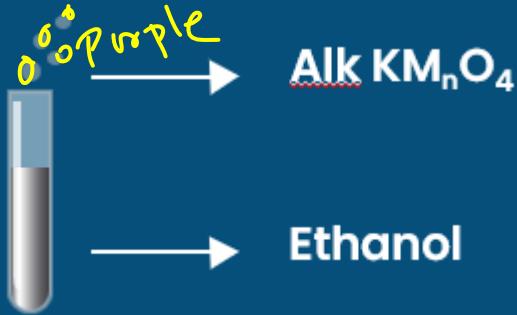
This Reaction is Called ***Dehydration of Ethanol***



1 & 2 are oxidizing agent. This is oxidation of Ethanol. Addition of oxygen to ethanol happens. Purple colour of Alkaline KMNO₄ Dissapears

Activity 4.5:

drop wise alkaline KMnO_4 (Potassium Permanganate)



Observation: Purple colour of Alkaline KMnO_4 Disappears
Reason: Ethanol reacts with Alkaline KMnO_4 to give ethanoic acid (colourless)



On adding excess of Alk KMnO_4

Now Purple colour doesn't disappear [o] as there is no ethanol left now

1. Liquid at room temperature

Ethanol

2. Commonly called alcohol

3. Used in alcohol drink in dilute form; pure ethanol (absolute alcohol) can cause death

4. Good solvent → Used in medicine → cough syrup many tonic



Q. Why is the conversion of ethanol to ethanoic acid an oxidation reaction? Name the oxidising agent used in this conversion. Write chemical equation for this oxidation reaction.

(CBSE 2024)

Addition
of O₂



\equiv Q17

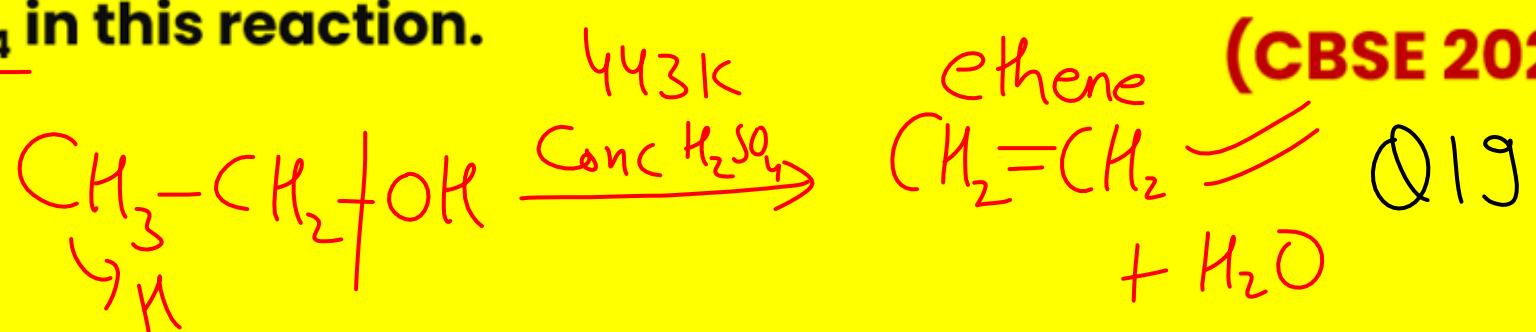
Q. What happens when a small piece of sodium is dropped in ethanol? Write the equation for this reaction.

(CBSE 2023)



Q. Name the compound formed when ethanol is heated at 443 K in the presence of conc. H₂SO₄ and draw its electron dot structure. State the role of conc. H₂SO₄ in this reaction.

(CBSE 2023)



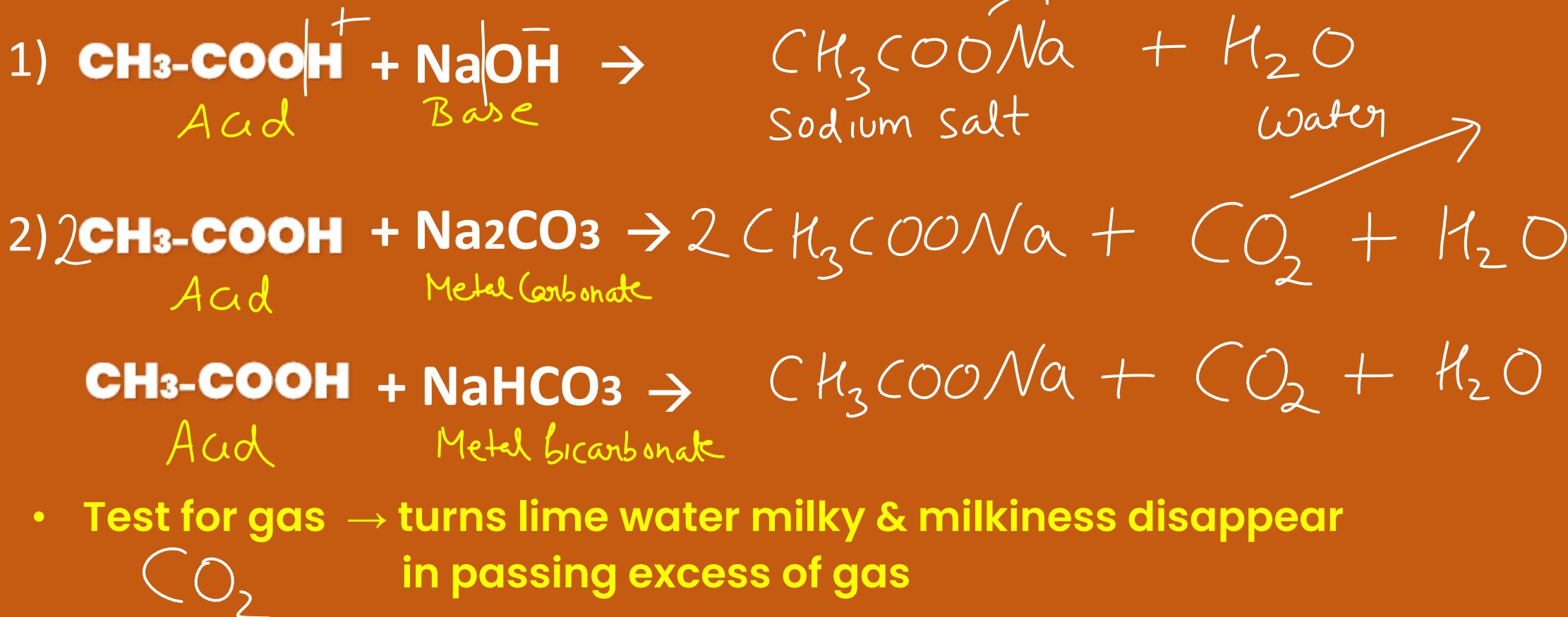
- (i) Write the name and structure of an organic compound 'X' having two carbon atoms in its molecule and its name is suffixed with '-ol.**
- (ii) What happens when 'X' is heated with excess concentrated sulphuric acid at 443 K? Write chemical equation for the reaction stating the conditions for the reaction. Also state the role played by concentrated sulphuric acid in the reaction.**
- (iii) Name and draw the electron dot structure of hydrocarbon produced in the above reaction.**

H.W. (CBSE 2024)

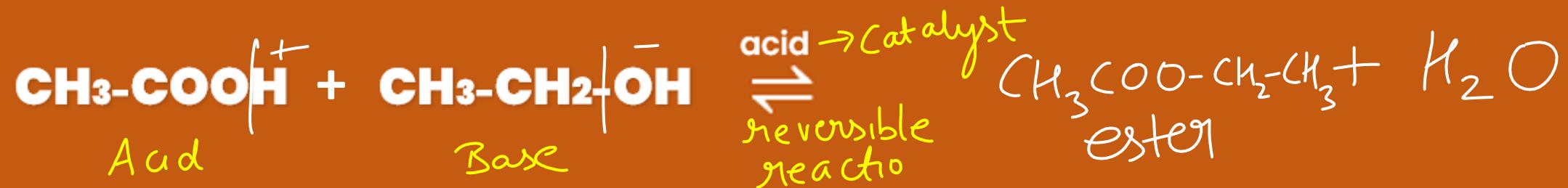
Q20

ETHANOIC ACID $\text{CH}_3\text{-COOH}$ Ke Reactions

Reactions of Acid \rightarrow H⁺ ions release

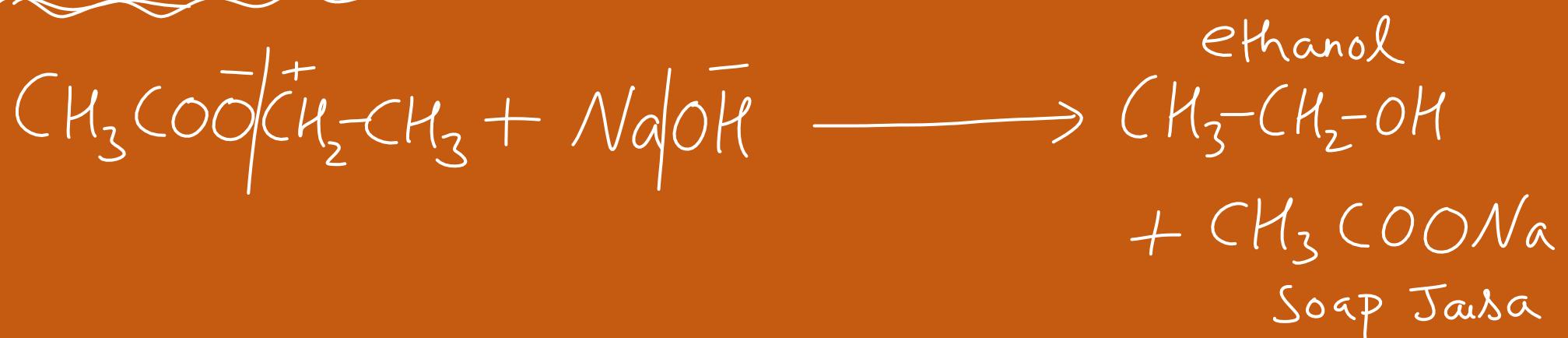


3) Esterification - Ethanoic acid + Ethanol



Ester are sweet smelling substances , used in making perfumes & flavouring agents

4) Saponification – Ester + NaOH



Q. Write the chemical equation for the following:

Esterification reaction

Saponification reaction



(CBSE 2023)

\checkmark Q21



Q. A spatula full of sodium carbonate is taken in a test tube and 2 mL of dilute ethanoic acid is added to it.

(CBSE 2024)

(a) Write a chemical equation for the reaction.

(b) Suggest a method of testing the gas liberated in the reaction.

\checkmark Q22

Ethanoic Acid



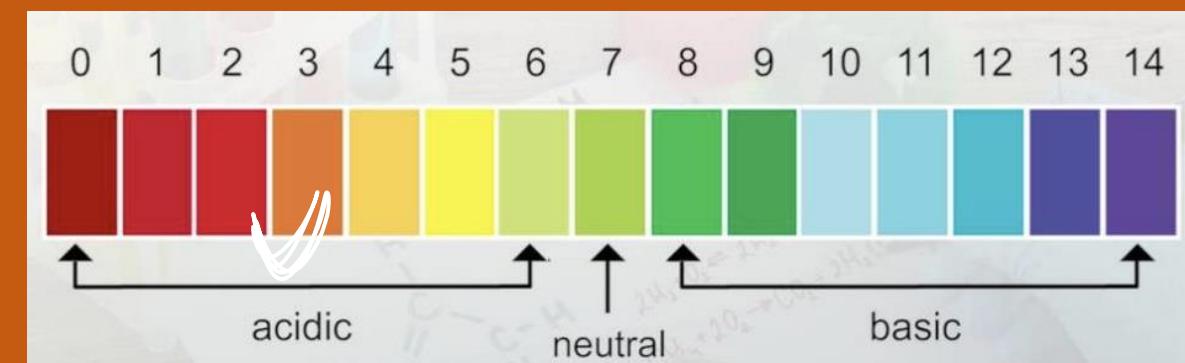
weak acid

1. commonly called **acetic acid**
2. 5–8% solution of acetic acid in water → **vinegar used as preservative in pickles**
3. Glacial **acetic acid** → Melting point of pure ethanoic acid is **290k** (**17°C**) hence it often freezes in winter in cold climates
4. Carboxylic acids are weak acids compared to HCl

pH = 2.4 acetic acid
Colour Red Yellow
Universal Indicator

pH = 1 HCl
Colour Red
Universal Indicator

pH ↑ and weak



Addition reaction

1) Unsaturated Compounds – Alkene , Alkyne



Hydrogenation – Addition Of Hydrogen to unsaturated Compounds to give saturated compound

**Reaction is used in Hydrogenation of
vegetable oil (long unsaturated carbon
chains)**

Learn

Substitution reaction

For Saturated Compounds – Alkane



Saturated Compounds are less reactive

Q. (i) Write the name and general formula of a chain of hydrocarbons in which an addition reaction with hydrogen can take place. Stating the essential condition required for an addition reaction to occur, write the chemical equation giving the name of the reactant and product of such a reaction. How is an addition reaction different from a substitution reaction?

ene
 C_nH_{2n}

(CBSE 2023)

\checkmark H.W. Q23

Combustion

1) Complete Combustion (in supply of air) $\rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{Heat}$



2) Saturated Hydrocarbons \rightarrow Clean blue flame

AlKane
ene
yne

Unsaturated Hydrocarbons \rightarrow Yellow flame with lot of black smoke

3) Camphor & Napthalene \rightarrow Yellow Flame ?? \rightarrow Unsaturated Hydrocarbon

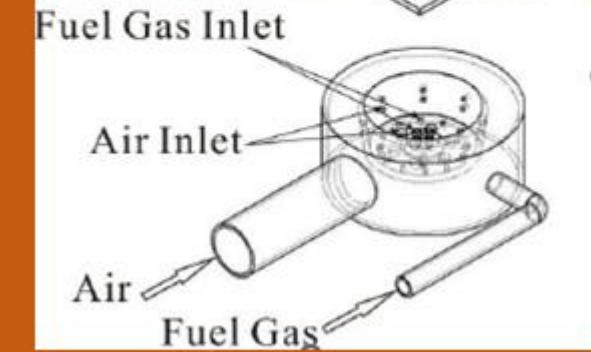
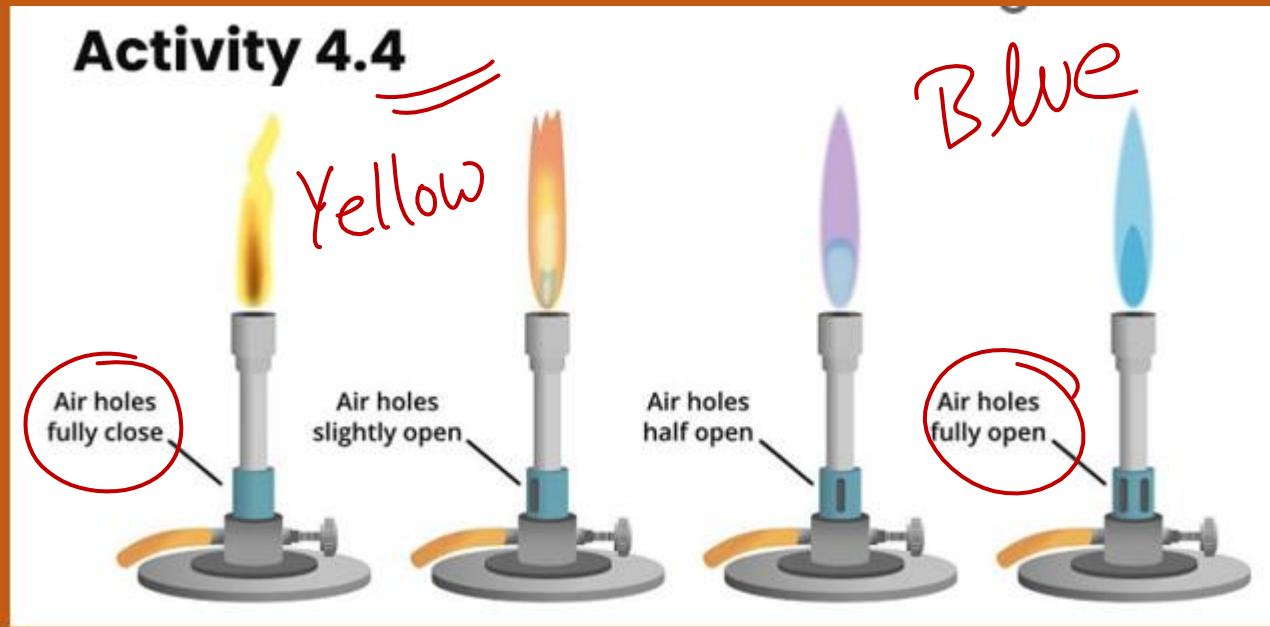
Incomplete Combustion \rightarrow Limited Supply of air \rightarrow Yellow flame
products are H_2O CO & C

4. Incomplete Combustion → Limited Supply of air → Yellow flame

products are H_2O CO

& C (black Carbon soot)

Learn



Gas Stove

Allotropy

- The phenomenon of existence of an element in two or more forms which have different physical properties but identical chemical properties.

Carbon exists in different forms in nature.

- Like Diamond & Graphite
- This phenomenon is called allotropy & these different forms are called allotropes.



Graphite is smooth & slippery.



Diamond is hardest substance

Catenation -



Property of carbon to self link and form long chains of Carbon atoms , branched chains of Carbon atoms or rings of carbon atoms !

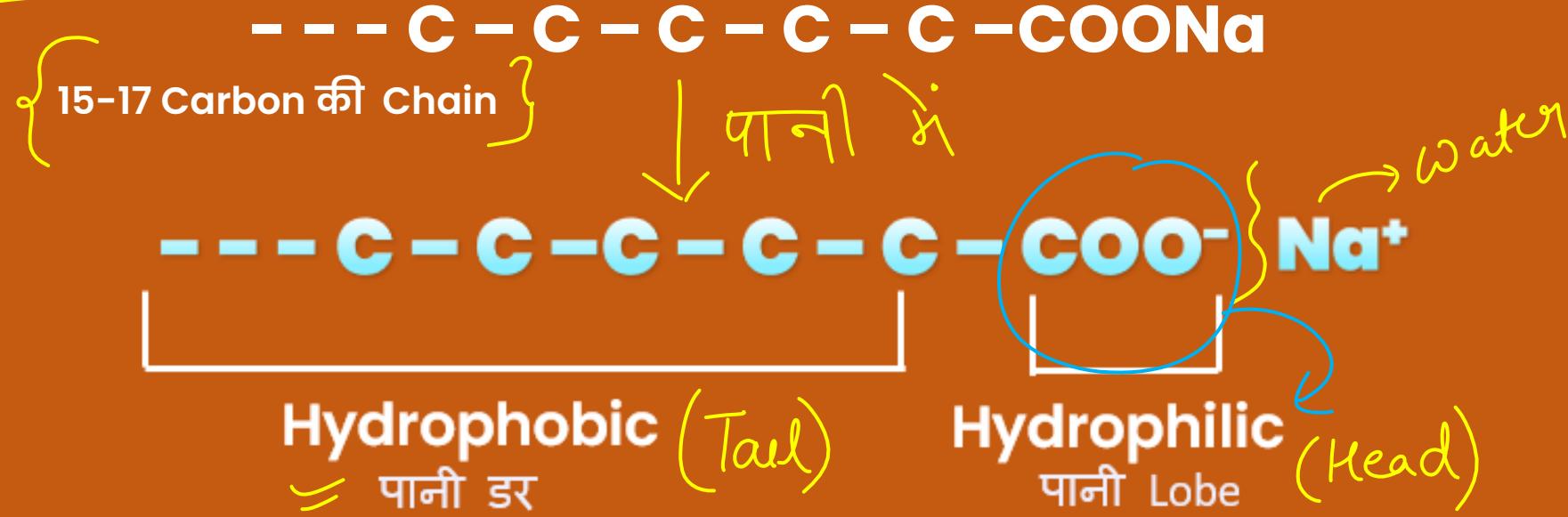
This is the biggest reason that carbon forms Millions of compounds. Food , paper , clothes , Human body all contains carbon compounds

Silicon also shows Catenation but to lower extent than Carbon.

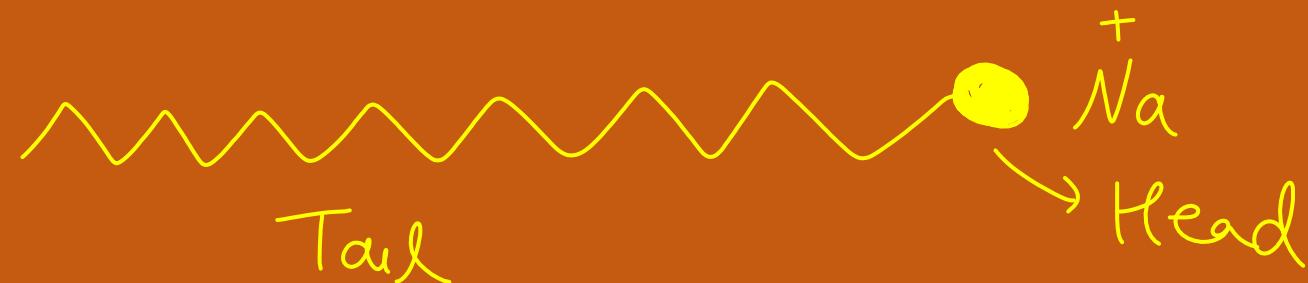


SOAPS

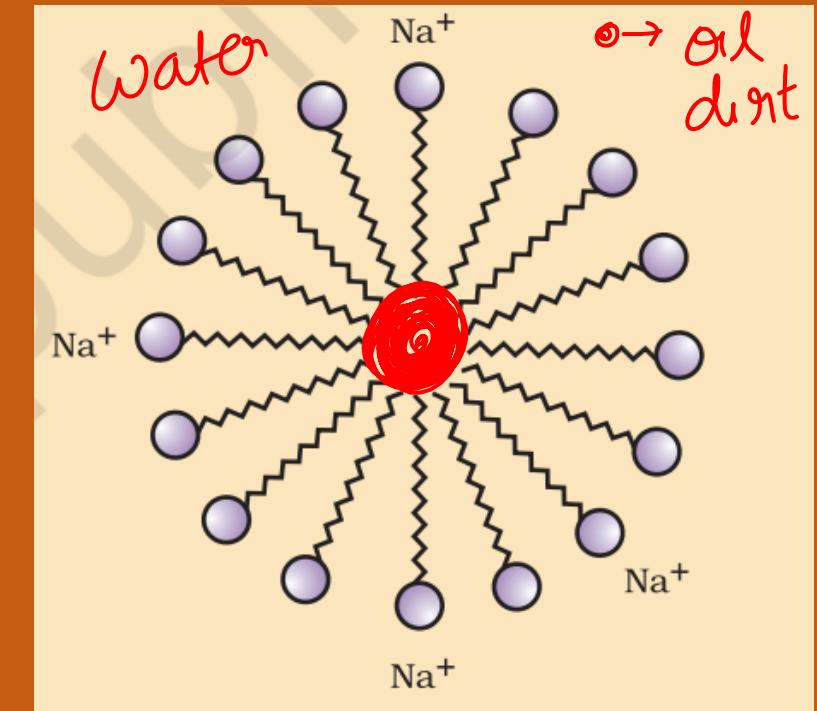
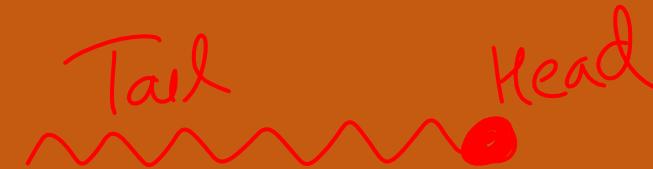
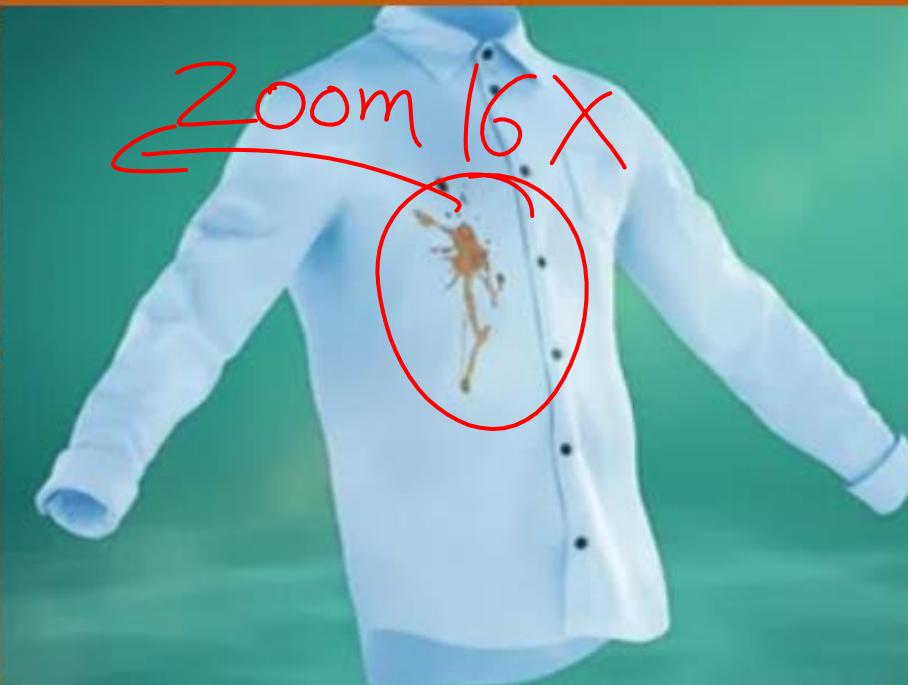
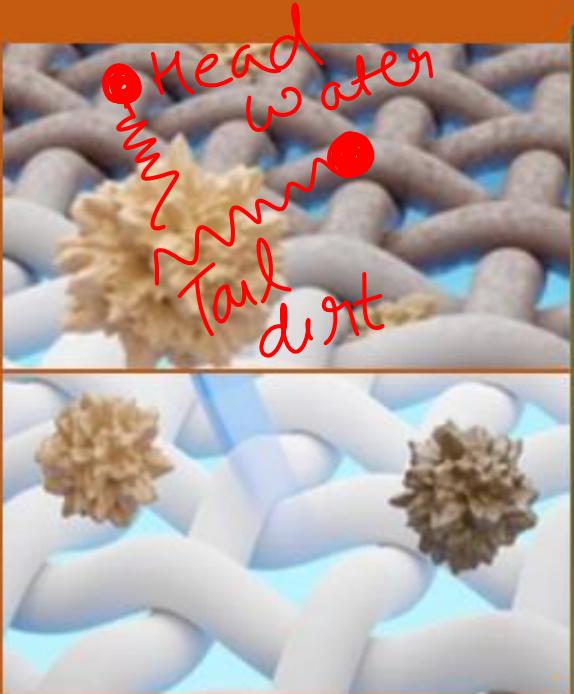
Molecules of soaps are sodium or potassium salts of long-chain carboxylic acids



Representation of Soap Molecule



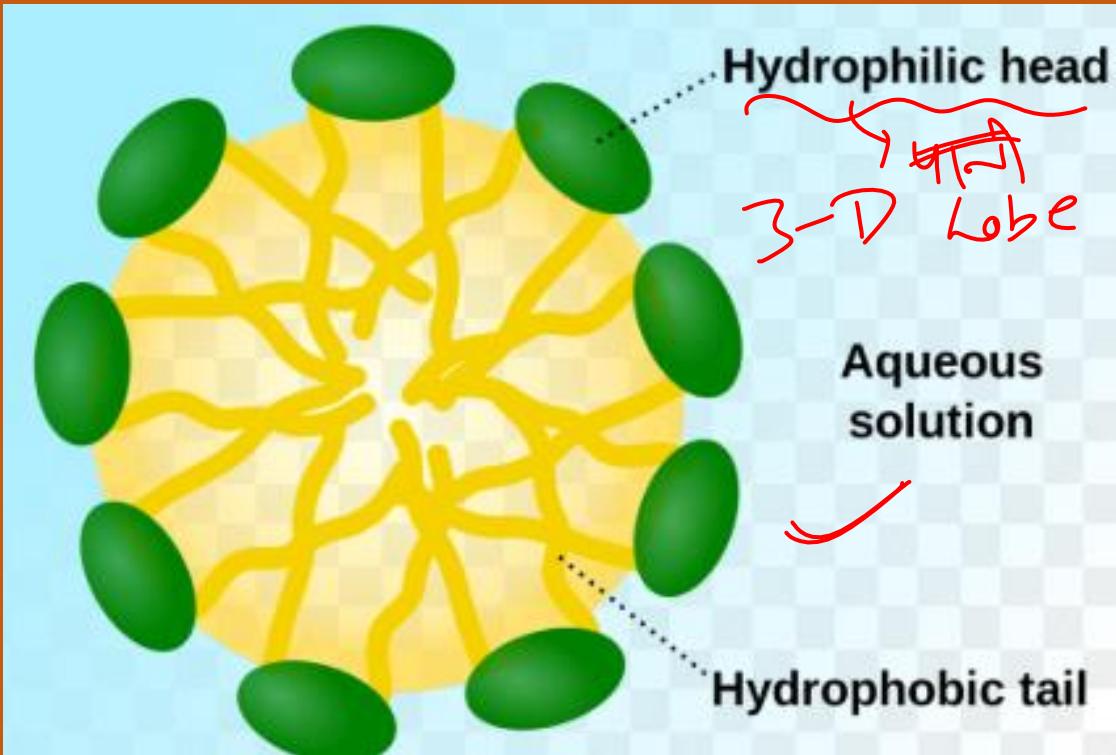
- Most of the dirt is oil
- Oil does not dissolve in water



Micelles
Pronounced → Maicell

Head – Towards Water

Tail – Towards Oil



- The oil dirt is trapped inside micelle
- Washed away with water rinsing



With the help of a diagram, show the formation of micelles, when soap is applied on oily dirt.

Q24 (CBSE 2023)

Hard Water

Water that contains salts of calcium and magnesium--
bicarbonates, chlorides, sulphates

Q. You want to test for hardness of water but hard water is not available in the laboratory. Which of the following compounds may be dissolved in pure water to make it hard?

1. Hydrogen carbonate of Sodium X
2. Sulphate of Magnesium ✓
3. Chloride of Calcium ✓
4. Carbonate of Sodium X

(CBSE 2023)

= Q25

- a) I and II
- b) II and III ✓
- c) III and IV
- d) I and IV

FOAM WITH SOFT WATER

Foam Formed Easily

FOAM WITH HARD WATER

Foam Not Formed



Soap reacts with salts of Ca and Mg to form insoluble
Ca and Mg salts ppt

Detergents (effective in hard water)

Hard water
No ppt

Sodium salts of sulphonic acid or
Ammonium salts with chlorides or bromides

- Do not form insoluble precipitate with Ca and Mg salts of hard water
- Used to make shampoo and cleaning clothes

Take two test tubes X and Y with 10 mL of hard water in each. In test tube 'X', add few drops of soap solution and in test tube 'Y' add a few drops of detergent solution. Shake both the test tubes for the same period.

H.W. (CBSE 2023)

- (1) In which test tube the formation of foam will be more? Why? Q26
- (2) In which test tube is a curdy solid formed? Why?