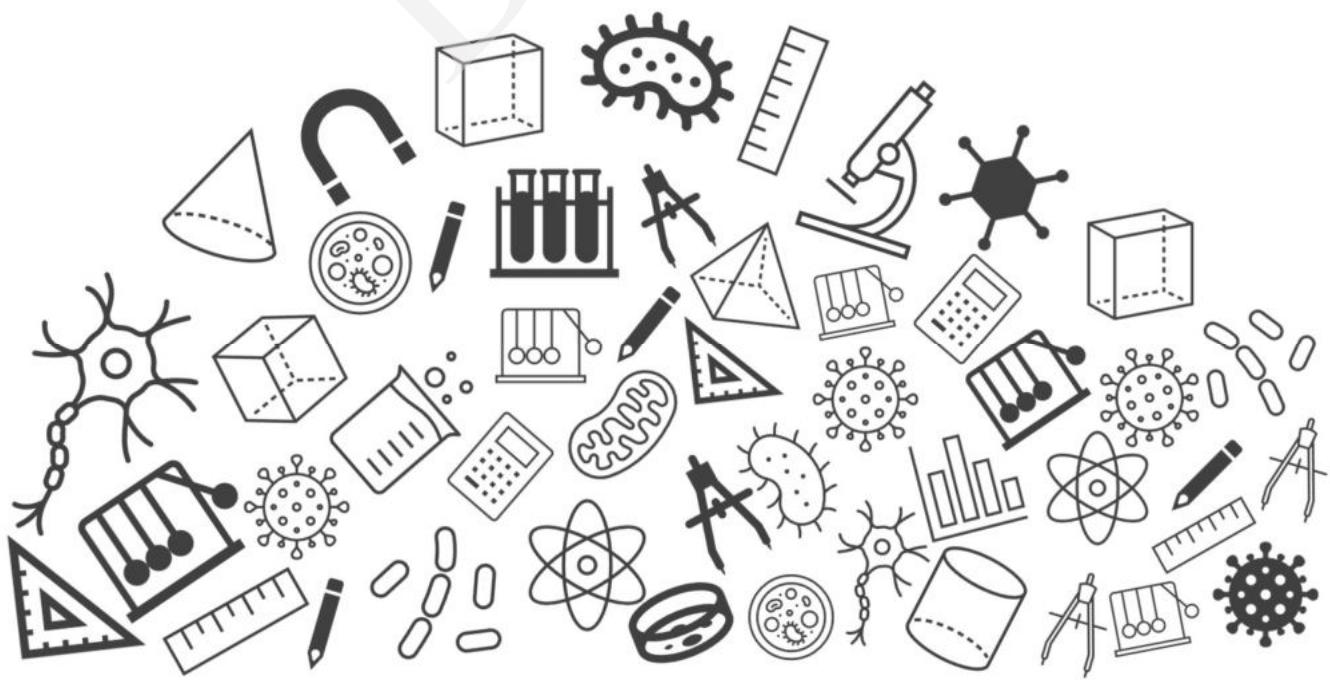




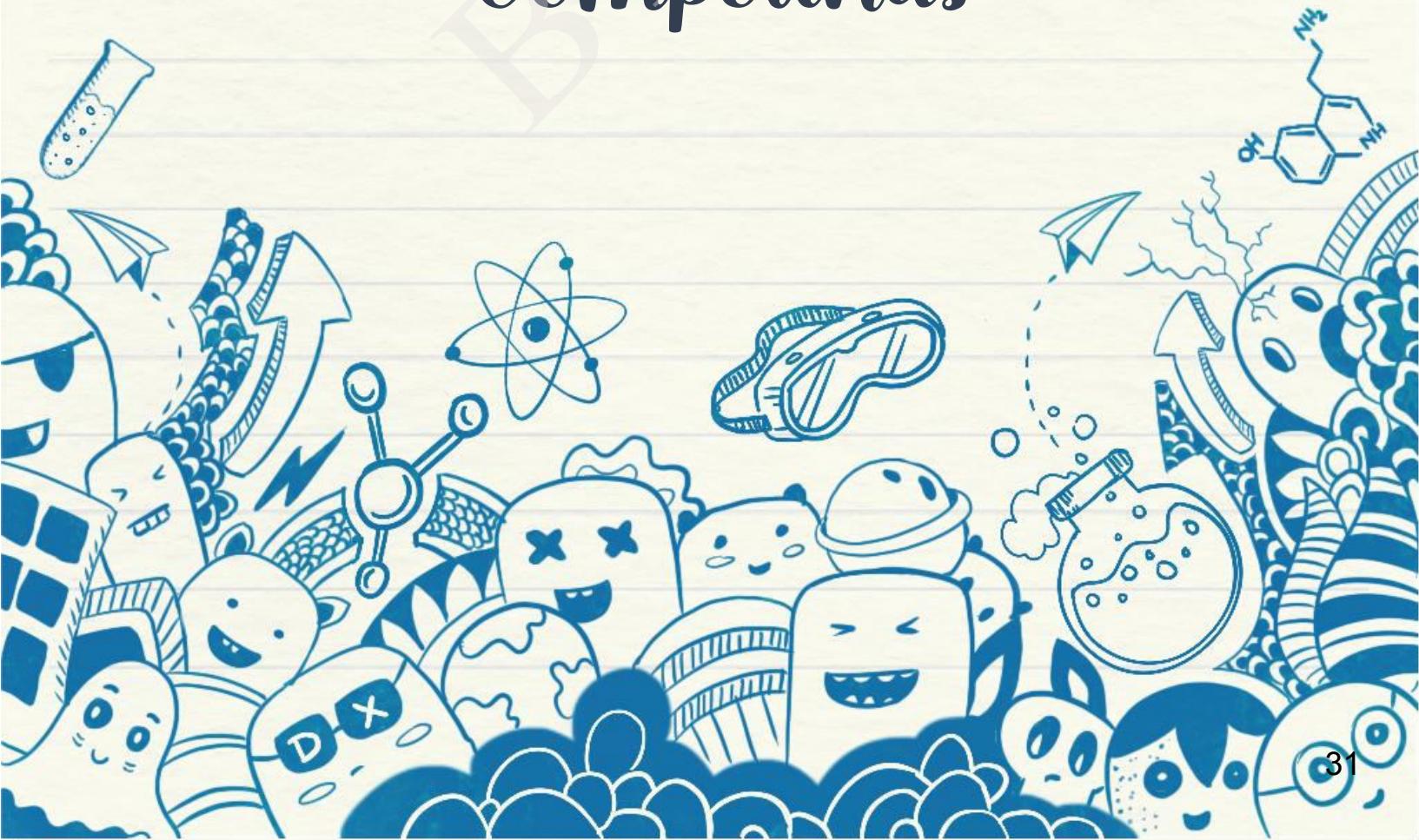
Grade 10: Science Chapter Notes



C H E M I S T R Y



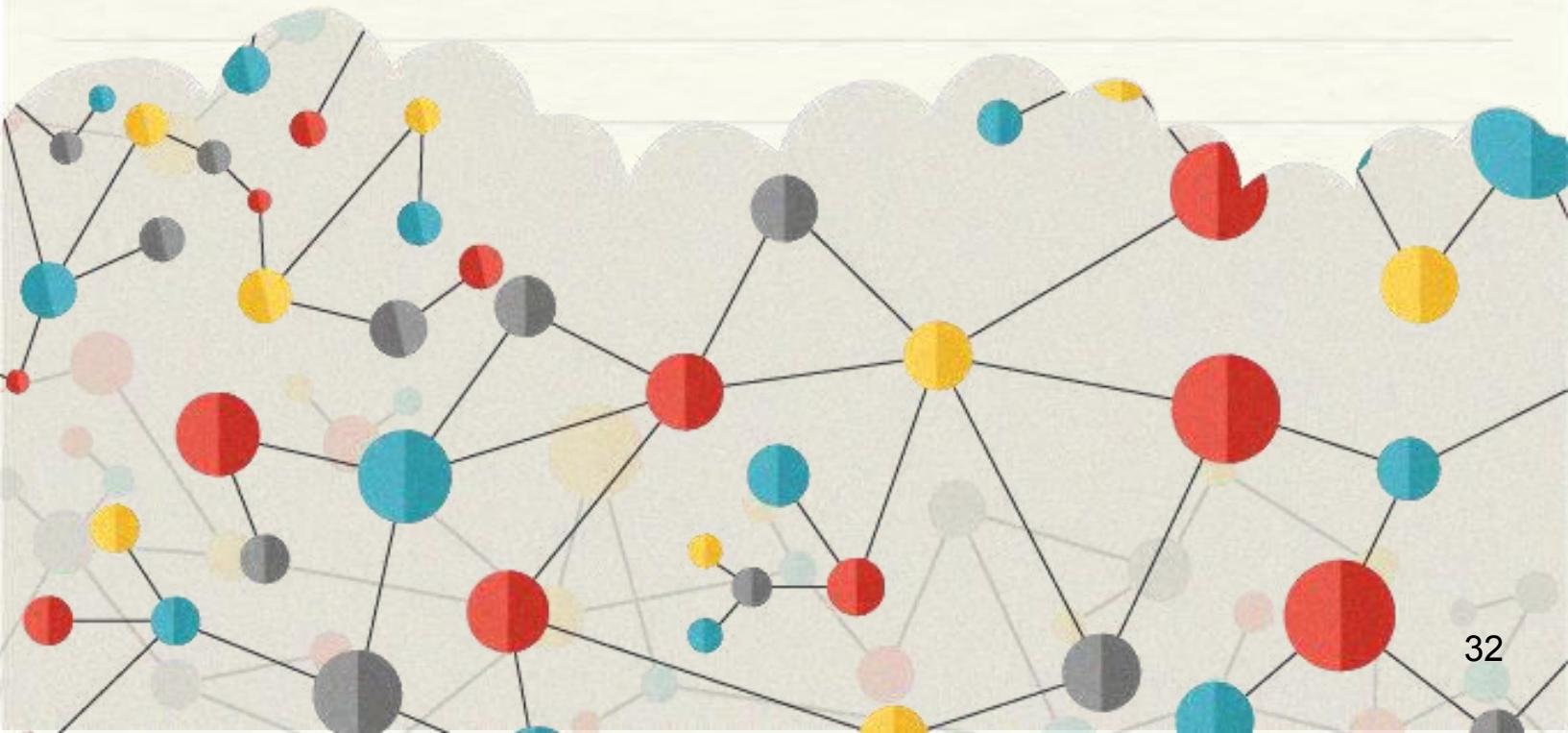
Carbon and Its Compounds



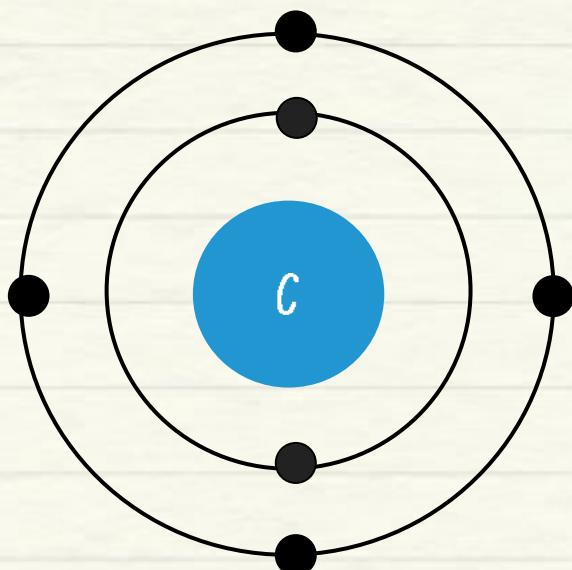
Topics



1. Carbon
2. Allotropes of carbon
3. Hydrocarbons
4. Chemical properties of carbon
5. Ethanol
6. Ethanoic acid
7. Saponification



1. Carbon



6

Atomic number

12

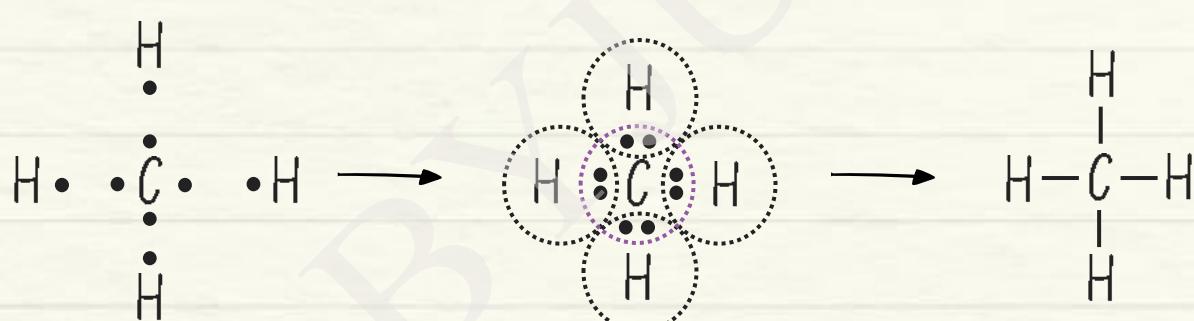
Mass number

2, 4

Electronic configuration

Carbon is tetravalent

1.1 Covalent Bonding in Carbon



Note: Usually, carbon does not form ionic bonds as losing or gaining four electrons requires a large amount of energy

1.2 Catenation

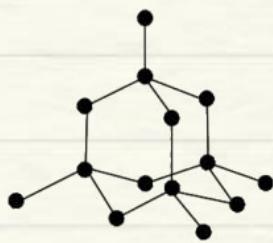
Carbon bonding with other atoms of carbon



2. Allotropes of Carbon

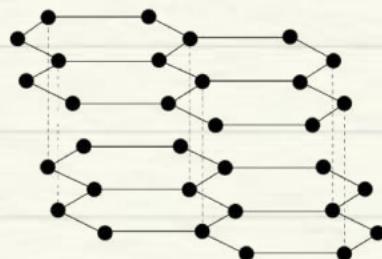
Allotropes are different forms of a chemical element

Diamond



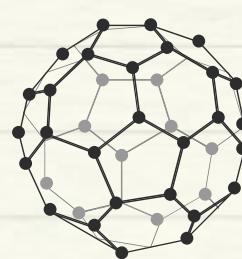
- ★ Regular tetrahedral arrangement of atoms (3D)
- ★ Each carbon atom bonded to four other carbon atoms
- ★ Extremely hard
- ★ Bad conductor of electricity

Graphite



- ★ Hexagonal arrangement of atoms in a single plane (2D)
- ★ Each carbon atom bonded to three other carbon atoms
- ★ Soft and slippery
- ★ Good conductor of electricity

Fullerene



- ★ Hollow molecules forming a closed cage or cylinder
- ★ Buckminsterfullerene (C_{60}) was the first fullerene to be discovered

3. Hydrocarbons

Saturated



Alkanes

Only single covalent bonds between carbon atoms

Unsaturated



Alkenes

At least one carbon-carbon double bond

Alkynes

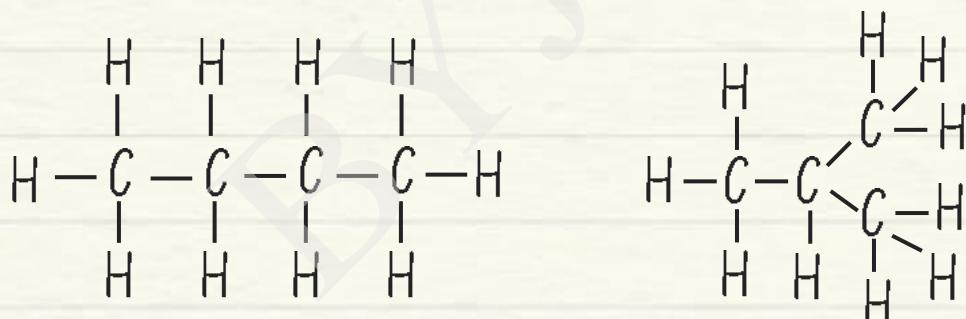
At least one carbon-carbon triple bond

3.1 Heteroatoms and Functional Groups

Heteroatom	Oxygen			
Functional group	Alcohol	Aldehyde	Ketone	Carboxylic acid
Formula of functional group	$-\text{OH}$	$\begin{matrix} \text{O} \\ \parallel \\ -\text{C}-\text{H} \end{matrix}$	$\begin{matrix} \text{O} \\ \parallel \\ -\text{C}- \end{matrix}$	$\begin{matrix} \text{O} \\ \parallel \\ -\text{C}-\text{OH} \end{matrix}$

3.2 Structural Isomers

Identical molecular formula but different arrangement of atoms



Structural isomers of C_4H_{10}

3.3 Homologous Series

- ★ Same functional group
- ★ Successive members differ by a $-\text{CH}_2$ unit
- ★ Different physical properties but similar chemical properties

General formula for homologous series of:

★ Alkane = $\text{C}_n\text{H}_{2n+2}$ ★ Alkene = C_nH_{2n} ★ Alkyne = $\text{C}_n\text{H}_{2n-2}$

3.4 Heteroatoms and Functional Groups

Prefix



Word root



Primary suffix



Secondary suffix

Prefix

Functional group

Chlorine

Bromine

Prefix

Chloro

Bromo

Word root

Carbon atoms

1

2

3

4

5

6

7

8

Word root

Meth

Eth

Prop

But

Pent

Hex

Hept

Oct

Primary suffix

Hydrocarbon

Alkane

Alkene

Alkyne

Primary suffix

ane

ene

yne

Secondary suffix

Functional group

Alcohol

Aldehyde

Ketone

Carboxylic acid

Secondary suffix

ol

al

one

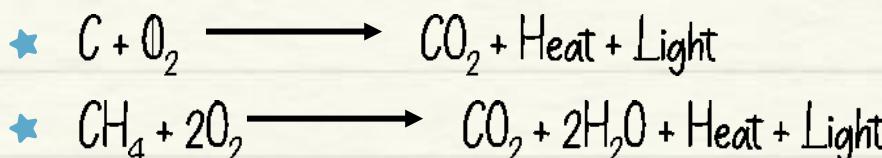
oic acid

* If the secondary suffix starts with a vowel, delete 'e' from primary suffix

4. Chemical Properties of Carbon

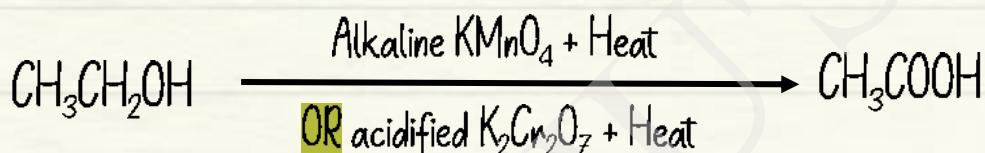
4.1 Combustion Reaction

Carbon and most of carbon compounds burn in oxygen to give carbon dioxide along with the release of heat and light



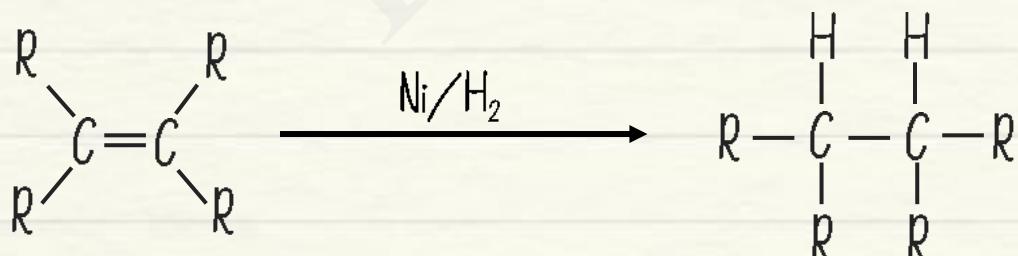
4.2 Oxidation Reaction

In the presence of oxidising agents, alcohols oxidise to carboxylic acid



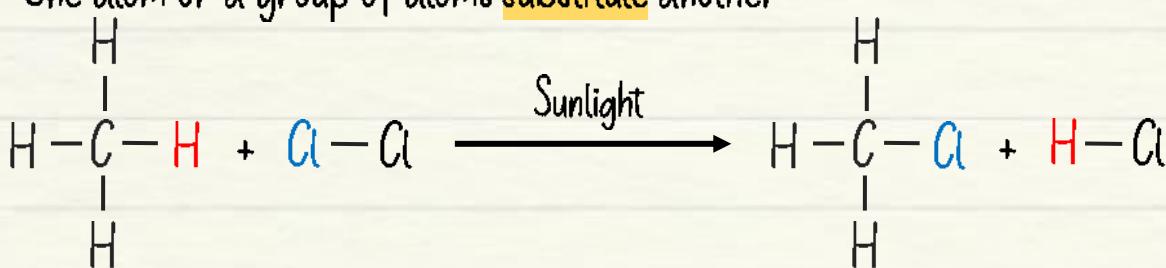
4.3 Addition Reaction

Hydrogen can be added to unsaturated hydrocarbons in the presence of catalysts to give saturated hydrocarbons



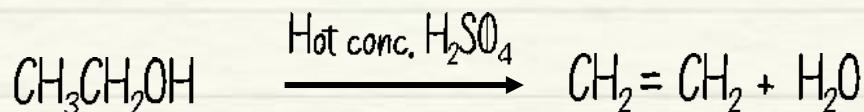
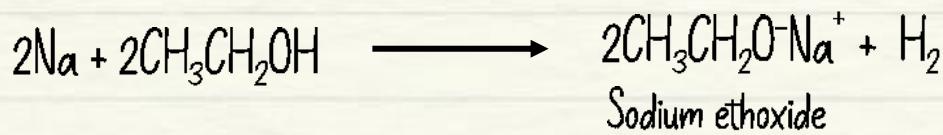
4.4 Substitution Reaction

One atom or a group of atoms substitute another

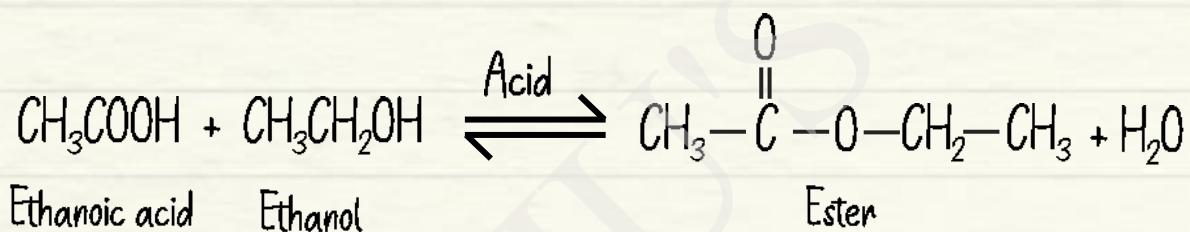




5. Important Reactions of Ethanol



b. Important Reactions of Ethanoic Acid



Esterification reaction:- Carboxylic acid reacts with an alcohol in the presence of an acid catalyst to form ester and water



1. Saponification

- ★ Preparation of soap
 - ★ When an ester is treated with an alkali like sodium hydroxide, it is converted to an alcohol and a sodium salt of the carboxylic acid



7.1 Soaps and Detergents

Soap

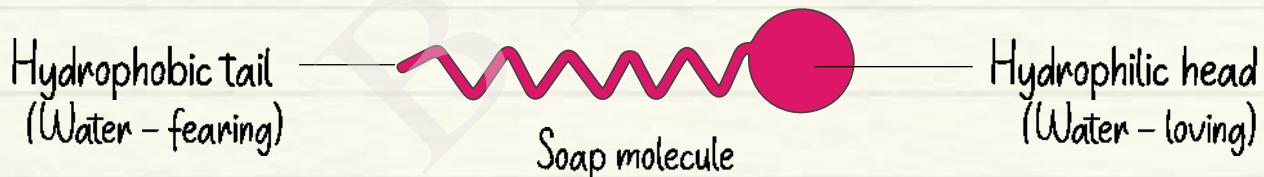
- ★ Sodium or potassium salts of long-chain carboxylic acids
- ★ Produces scum in hard water
- ★ Hard water affects its cleansing action

Detergent

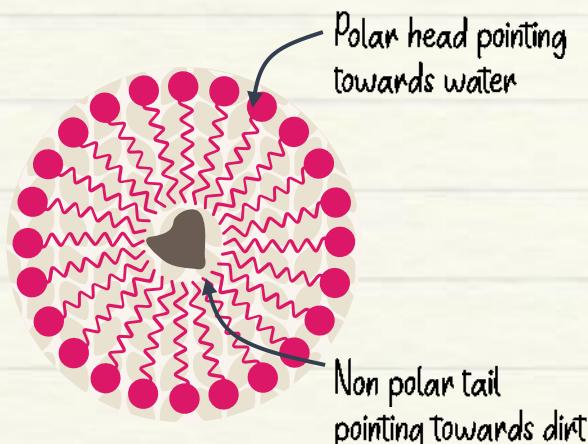
- ★ Sodium salts of sulphonic acids or ammonium salts with chlorides or bromides ions
- ★ Does not produce scum in hard water
- ★ Hard water does not affect its cleansing action

7.2 Cleansing Action of Soap

Hydrophobic tail of soap molecule interacts with oil, the hydrophilic head interacts with water



When dissolved in water, soap molecules form micelles which remove the oily dirt from the clothes





Mind Map

