Ministry of higher education and scientific research
AL-Mustaqbal University college
Department of medical physics

Organic chemistry(practical)

Lecture 1

Introduction to Organic chemistry

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Introduction:-

- Organic chemistry is a is the branch of chemistry that deals with carbon and its compounds. It is fundamental to biology and medicine.
- Organic chemistry is the chemistry of carbon, an element that forms strong chemical bonds to other carbon atoms as well as to many other elements like hydrogen, oxygen, nitrogen, and the halogens.
- Organic chemicals were used in ancient times by Romans and Egyptians as dyes, medicines and poisons from natural sources,but the chemical composition of the substances was unknown .

Hydrocarbons

- ✓ A hydrocarbon is any of a class of organic chemicals made up of only the elements carbon (C) and hydrogen (H)..
- ✓ Many organic molecules, such as fats, have

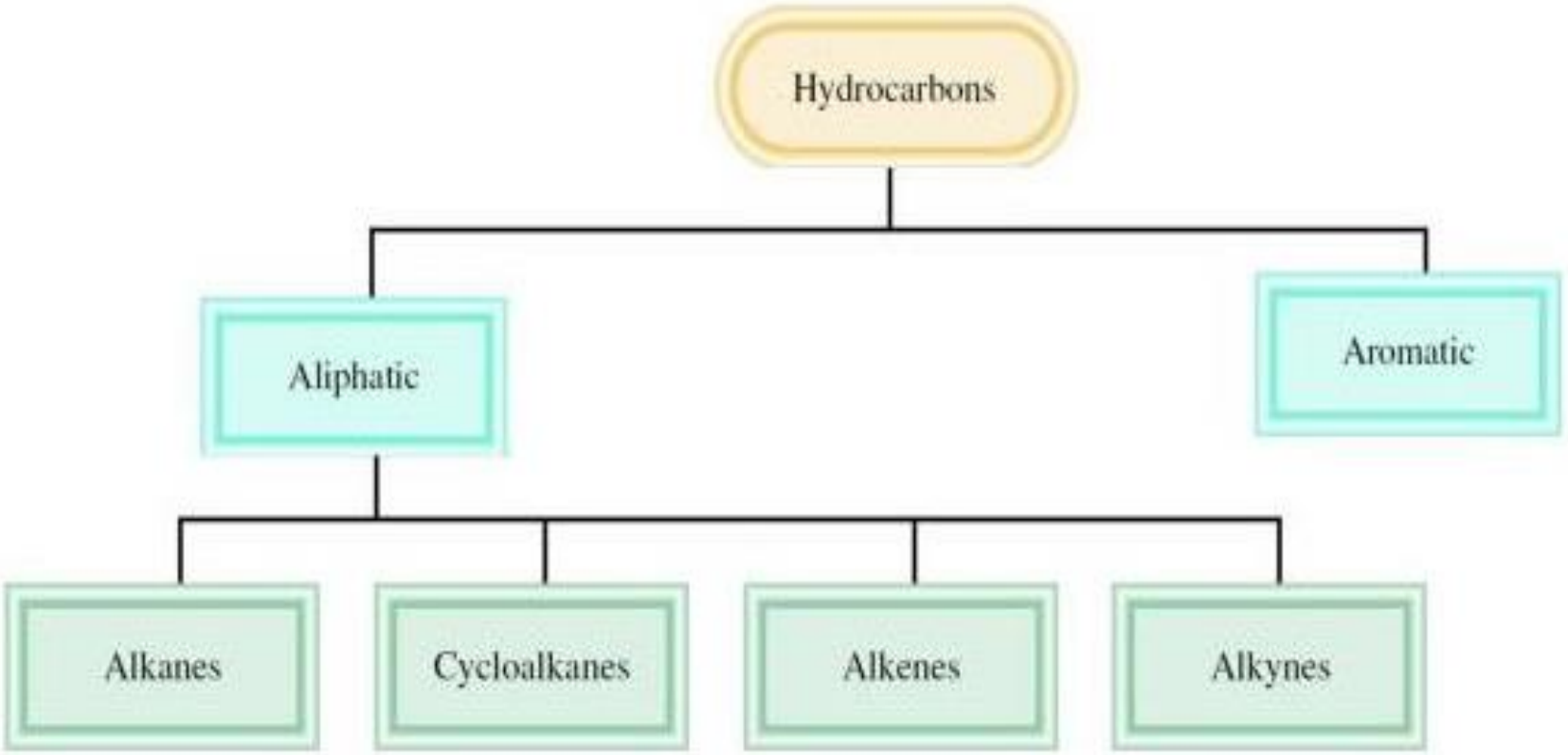
hydrocarbon components.

- ✓ Hydrocarbons can undergo reactions that release a

large amount of energy.

- ✓ Hydrocarbons can be divided into aromatic and aliphatic hydrocarbons.
- ✓ The carbon atoms join together to form the framework of the compound, and the hydrogen atoms attach to them in many different configurations. chemical compound.

Classification of Hydrocarbon

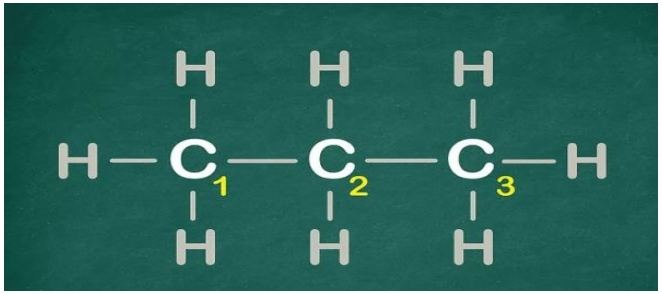


Nomenclature rules in organic chemistry

- IUPAC nomenclature is based on naming a molecule's longest chain of carbons connected by single bonds, whether in a continuous chain or in a ring.
- All deviations, either multiple bonds or atoms other than carbon and hydrogen, are indicated by **prefixes** or **suffixes** according to a specific set of priorities.

Organic chemistry
Compound Naming Steps

Step 1: Detecting(See how many Carbon atoms are in the chain) and Naming the Parent Chain.



Step 2: Finding the Substituents.

Step 3: Identifying the Functional Group.

Step 4: Naming the Functional Group.

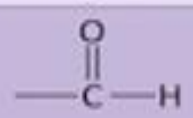
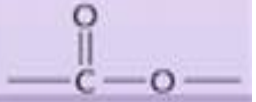
Step 5: Numbering Your Substituents on the Same Carbon.

Step 6: Put the side groups in alphabetical order.

Number of carbon	Base+suffix	Name of Hydrocarbons	Molecular formula
1	Meth+ane	Methane	CH_4
2	Eeth+ane	Eethane	C_2H_6
3	Prop+ane	Propane	C_3H_8
4	But+ane	Butane	C_4H_{10}
5	Pent+ane	Pentane	C_5H_{12}
6	Hex+ane	Hexane	C_6H_{14}
7	Hept+ane	Heptane	C_7H_{16}
8	Oct+ane	Octane	C_8H_{18}
9	Non+ane	Nonane	C_9H_{20}
10	Dec+ane	Decane	$C_{10}H_{20}$
16	Hexadec+ane	Hexadecane	$C_{16}H_{34}$
30	Triacont+ane	Triacontane	$C_{30}H_{62}$

Functional Groups:-

- ✓ Functional groups are the components of organic molecules that are most commonly involved in chemical reactions
- ✓ The number and arrangement of functional groups give each molecule its unique propertiesa

Functional Group Name	Suffix Ending	Functional Group Structure
Alkane	-ane	C-H atoms
Alcohol	-ol	--OH
Alkene	-ene	C=C
Alkyne	-yne	HC≡CH
Aldehyde	-al	
Amine	-amine	--N--
Ether	-ether	--O--
Ester	-oate	
Ketone	-one	
Nitrile	-ile	—C≡N

Hydroxyl

STRUCTURE

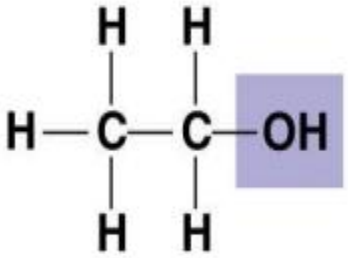
—OH

(may be written HO—)

NAME OF COMPOUND

Alcohols (Their specific names usually end in *-ol*.)

EXAMPLE



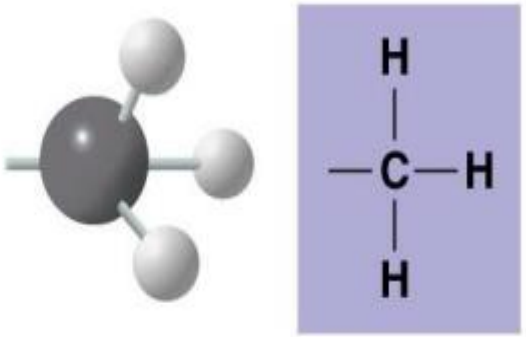
Ethanol

FUNCTIONAL PROPERTIES

- Is polar as a result of the electrons spending more time near the electronegative oxygen atom.
- Can form hydrogen bonds with water molecules, helping dissolve organic compounds such as sugars.

Methyl

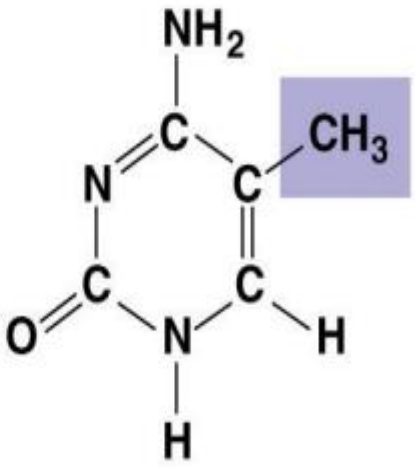
STRUCTURE



Methylated compounds

NAME OF COMPOUND

EXAMPLE



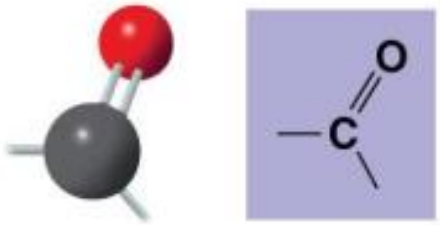
5-Methyl cytidine

FUNCTIONAL PROPERTIES

- Addition of a methyl group to DNA, or to molecules bound to DNA, affects the expression of genes.
- Arrangement of methyl groups in male and female sex hormones affects their shape and function.

Carbonyl

STRUCTURE

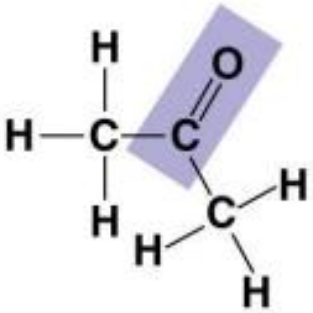


Ketones if the carbonyl group is within a carbon skeleton

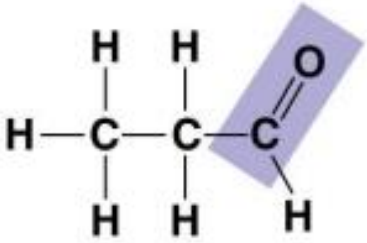
Aldehydes if the carbonyl group is at the end of the carbon skeleton

NAME OF COMPOUND

EXAMPLE



Acetone

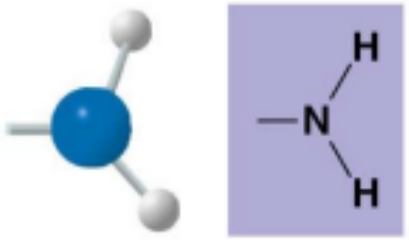


FUNCTIONAL PROPERTIES

- **A ketone and an aldehyde may be structural isomers with different properties, as is the case for acetone and propanal.**
- **Ketone and aldehyde groups are also found in sugars, giving rise to two major groups of sugars: ketoses (containing ketone groups) and aldoses (containing aldehyde groups)**

Amino

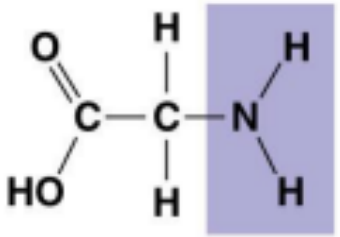
STRUCTURE



Amines

NAME OF COMPOUND

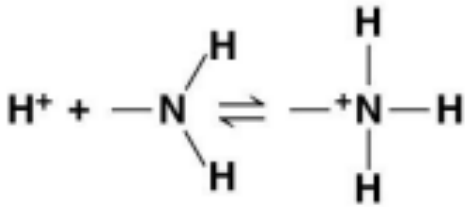
EXAMPLE



Glycine

FUNCTIONAL PROPERTIES

- Acts as a base; can pick up an H^+ from the surrounding solution (water, in living organisms):

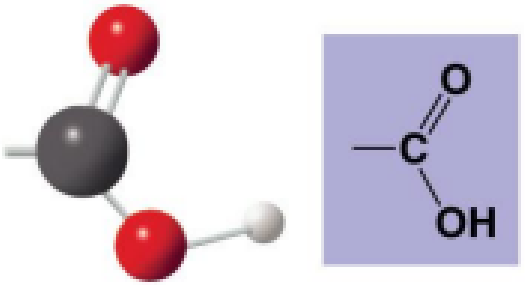


Nonionized Ionized

- Found in cells in the ionized form with a charge of 1+.

Carboxyl

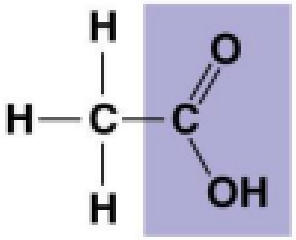
STRUCTURE



Carboxylic acids, or organic acids

NAME OF COMPOUND

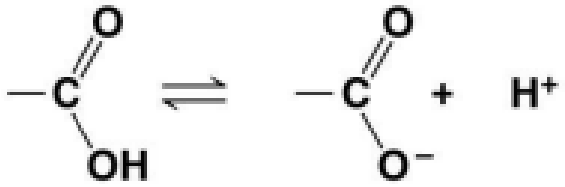
EXAMPLE



Acetic acid

FUNCTIONAL PROPERTIES

- Acts as an acid; can donate an H^+ because the covalent bond between oxygen and hydrogen is so polar:

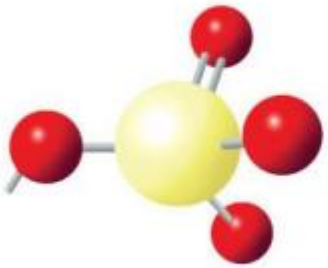


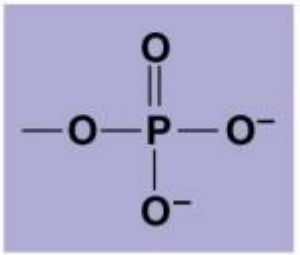
Nonionized Ionized

- Found in cells in the ionized form with a charge of 1– and called a carboxylate ion.

Phosphate

STRUCTURE

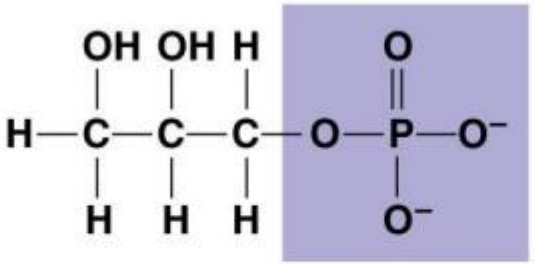




Organic phosphates

NAME OF COMPOUND

EXAMPLE



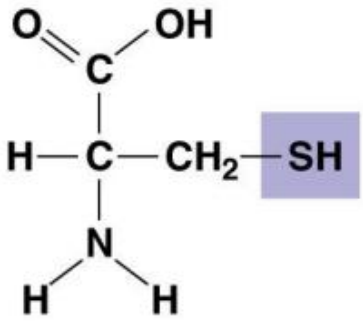
Glycerol phosphate

FUNCTIONAL PROPERTIES

- **Contributes negative charge to the molecule of which it is a part (2– when at the end of a molecule, as at left; 1– when located internally in a chain of phosphates).**
- **Molecules containing phosphate groups have the potential to react with water, releasing energy.**

Sulfhydrel

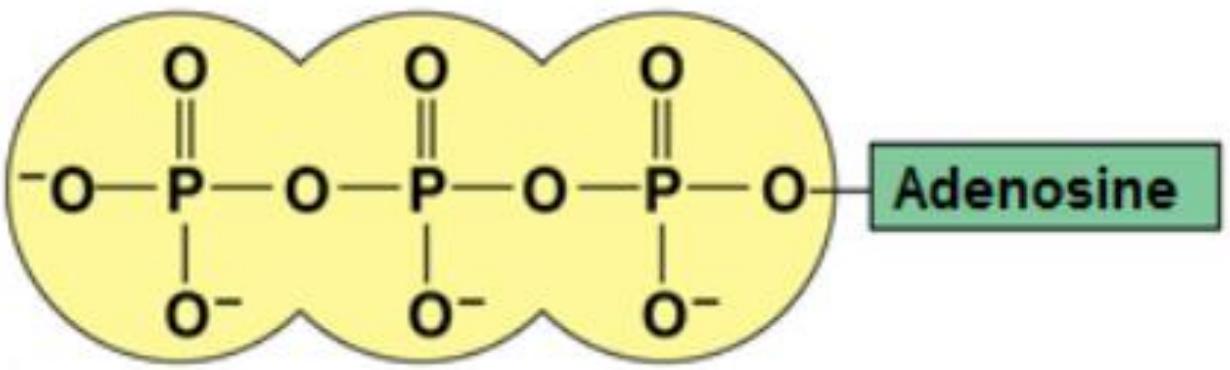
STRUCTURE	Thiols	NAME OF COMPOUND
 —SH (may be written HS—)		
EXAMPLE	• Two sulfhydryl groups can react, forming a covalent bond. This "cross-linking" helps stabilize protein structure. • Cross-linking of cysteines in hair proteins maintains the curliness or straightness of hair. Straight hair can be "permanently" curled by shaping it around curlers and then breaking and re-forming the cross-linking bonds.	**FUNCTIONAL PROPERTIES**



Cysteine

ATP: An Important Source of Energy for Cellular Processes

- ✓ One phosphate molecule, adenosine triphosphate(ATP), is the primary energy-transferring molecule in the cell
- ✓ ATP consists of an organic molecule called adenosine attached to a string of three phosphate groups



Final Thoughts

- ✓ The versatility of carbon makes possible the great diversity of organic molecules
- ✓ Variation at the molecular level lies at the foundation of all biological diversity


THANK
YOU!