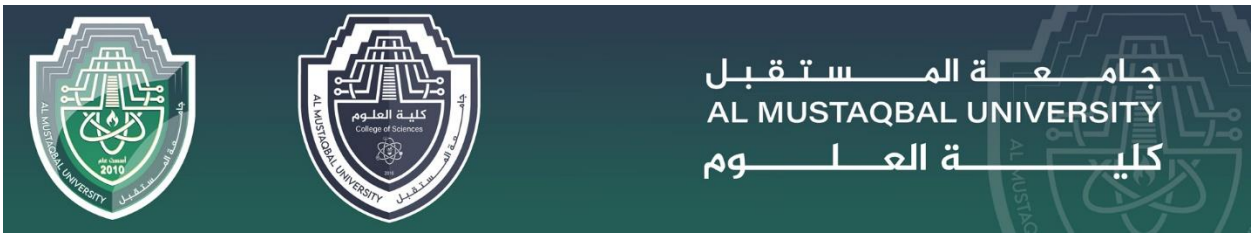

Organic Chemistry

1st stage

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Lecture 1: Introduction to organic chemistry

Department of Medical Physics

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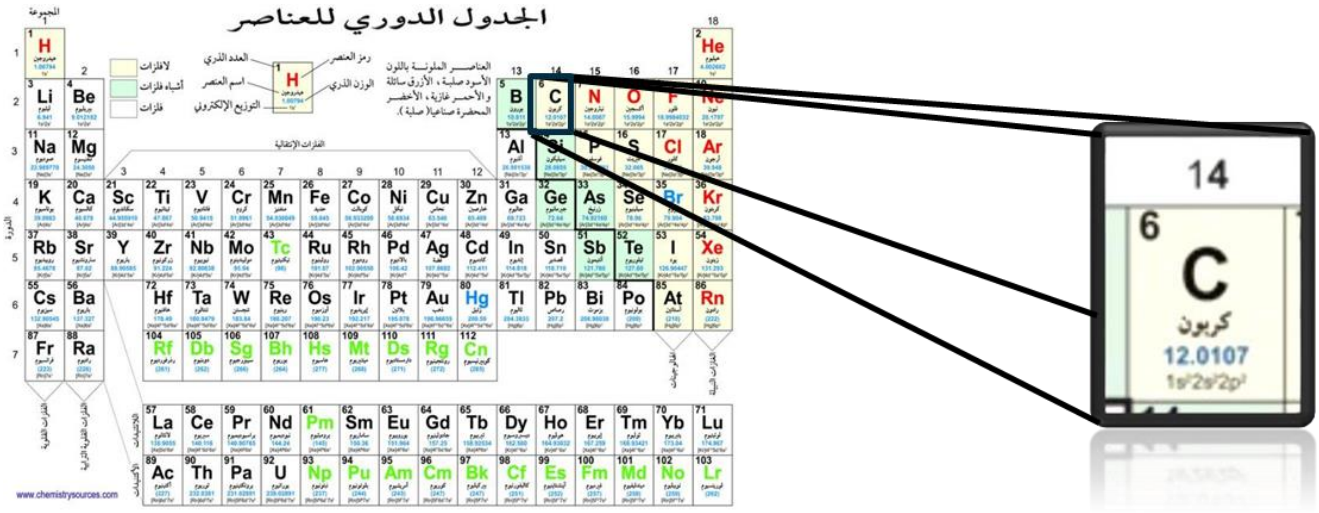
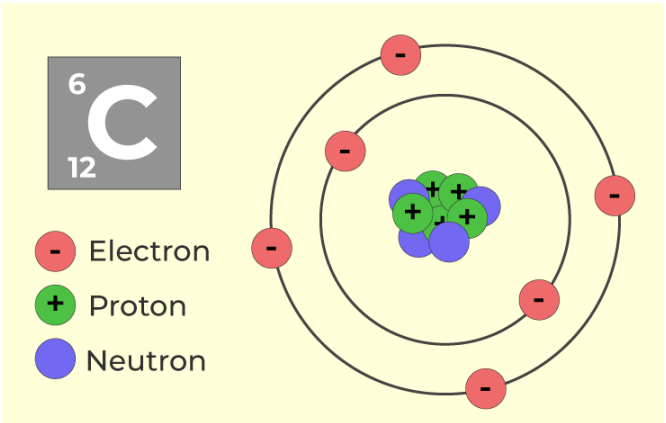
1.1 Introduction to organic chemistry

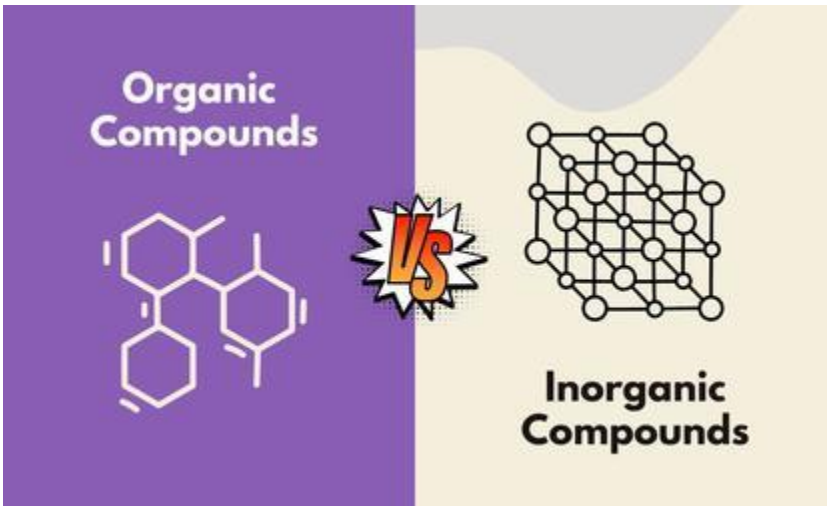
Organic chemistry is the branch of chemistry that studies compounds containing carbon as a main element.

Compounds that contain carbon are placed in one branch of chemistry, while compounds that contain other elements are placed in a different branch.





1.2 Difference between organic and inorganic compounds



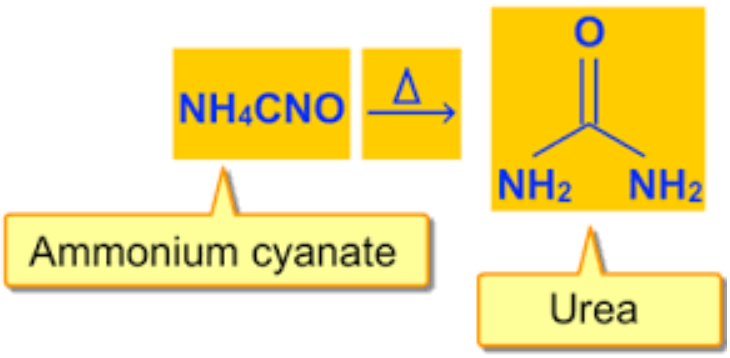
Organic Compounds	Inorganic Compounds
Use mostly covalent bonding	Mostly ionic bonding
Are gases, liquids or solids with low melting points	Are generally solids with high melting points
Mostly insoluble in water	Many are water soluble
Many are soluble in organic solvents such as petroleum, benzene and hexane	Most are not soluble in organic solvents
Solution in water generally do not conduct electricity	When dissolved in water conducts electrical current
Almost all burn	Most not combustible
Slow to react with other chemicals	Often undergo fast chemical reactions

1.3 Vital Force Theory

This theory was based on the old belief that living organisms were the only source of organic compounds, and that it was impossible to make these compounds in a laboratory. It stated that there was a special “vital force” inside the tissues of living organisms, which was responsible for creating organic compounds.

However, this theory was disproven in 1828 when the German chemist Friedrich Wöhler synthesized urea by heating ammonium cyanate, an inorganic substance.

After this discovery, scientists began to produce many organic compounds in the laboratory. For example, Hermann Kolbe prepared acetic acid, and Marcellin Berthelot synthesized methane and acetylene. Chemists soon realized that organic compounds could be created artificially, and so the Vital Force Theory lost its importance.



1.4 Sources of Organic Compounds

Natural Sources:

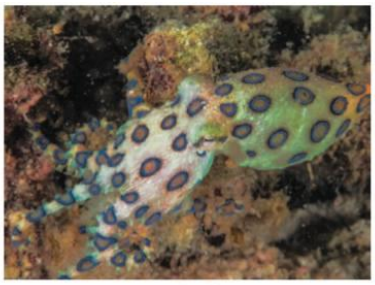
1. Extracted from plants (e.g., essential oils, pigments)
2. Derived from animals (e.g., fats, hormones)
3. Produced by microorganisms (e.g., antibiotics, enzymes)

Synthetic Production:

1. Made in laboratories through organic synthesis
2. Derived from petrochemicals (using crude oil and natural gas)

Biotechnological Methods:

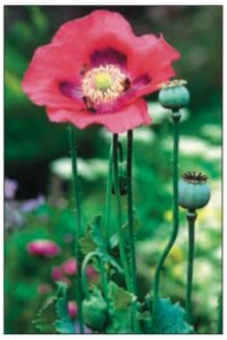
Produced via fermentation and genetic engineering techniques



tetrodotoxin

vitamin C

carmine



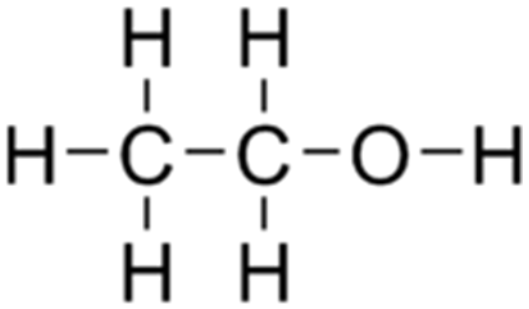
morphine

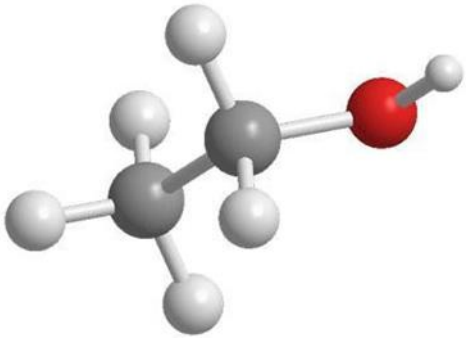
1.5 Structure of Organic Compounds

Molecular Formula: shows the types and number of atoms in one molecule.

$C_6H_{12}O_6$ **glucose**

Structural Formula: shows how atoms in a molecule are organized and connected.





1.6 Classification of organic compounds