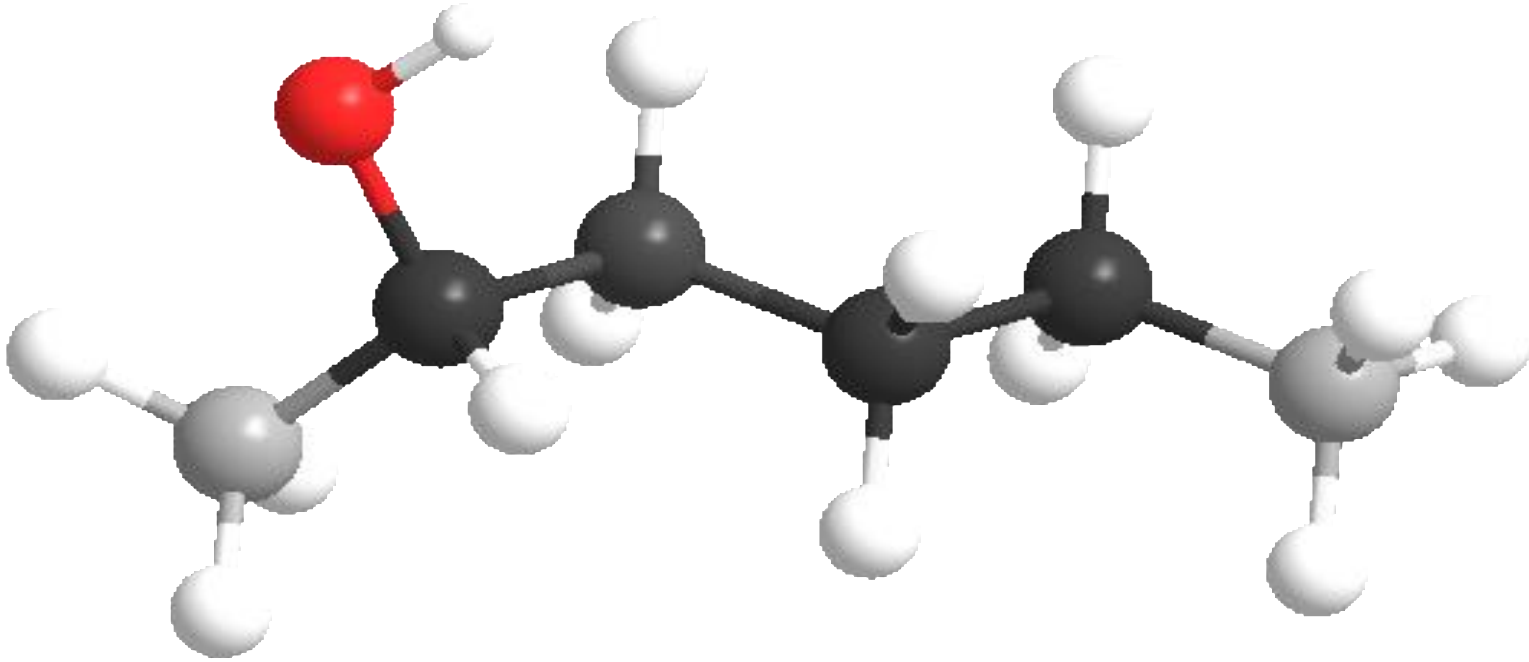
الكلية	العلوم
القسم	الكيمياء
المادة باللغة الانجليزية	Organic Chemistry
المادة باللغة العربية	الكيمياء العضوية
المرحلة الدراسية	الاولى
اسم التدريسي	محمد عدنان عبد منديل
عنوان المحاضرة باللغة الانجليزية	Hydrocarbons
عنوان المحاضرة باللغة العربية	الهيدروكاربونات
رقم المحاضرة	الرابعة
المصادر والمراجع	الكيمياء العضوية لمؤلفه (كلايدن)
	مبادي الكيمياء العضوية لمؤلفيه (موريون و بويد)



Hydrocarbons

by

Mohammed Adnan Abid

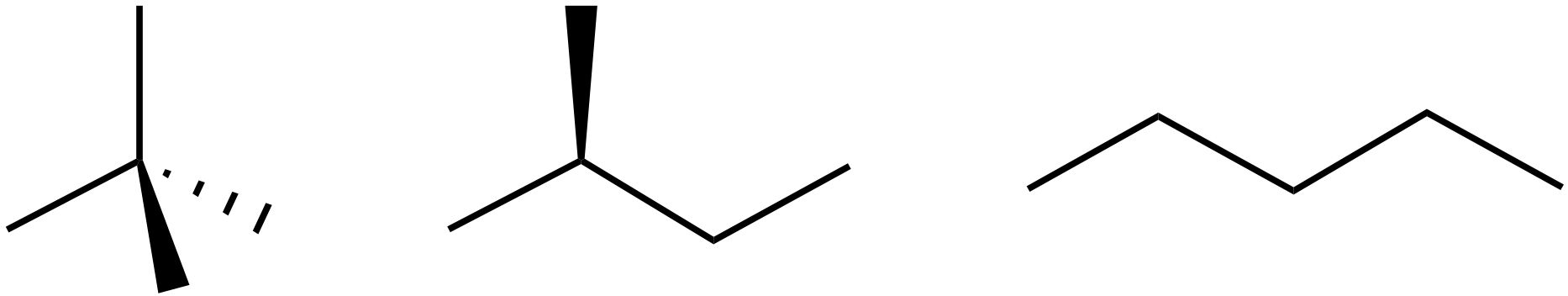
Hydrocarbons

- What are the hydrocarbons
- How many groups can hydrocarbons be classified
- How can nomenclature the hydrocarbons
- The physical properties of hydrocarbons

Hydrocarbons

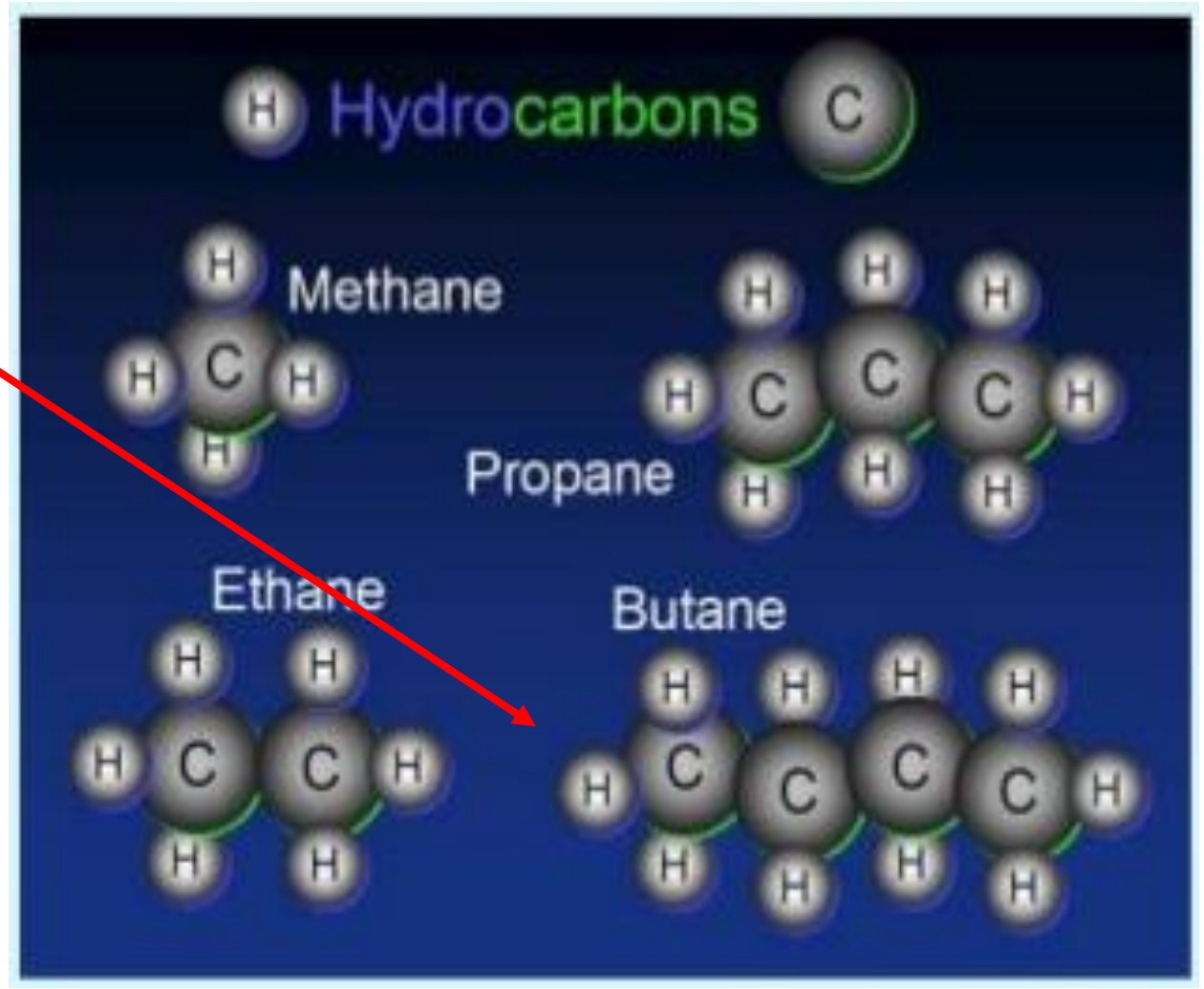
Hydrocarbons

Are the simplest organic compounds which are made up of Carbon and Hydrogen atoms only. Hydrocarbons are naturally-occurring compounds and form the basis of crude oil, natural gas, coal, and other important energy sources. They are highly flammable and produce carbon dioxide, water, and heat when they are burned. Therefore, hydrocarbons are highly effective as a source of fuel.



Hydrocarbons

Butane for example is the one of hydrocarbons, which is used as cooking gas in our daily activities. It is a gas at room temperature and atmospheric pressure. Butane is a highly flammable, colorless. Normal butane can be used for gasoline blending, as a fuel gas, fragrance extraction solvent, either alone or in a mixture with propane.



Hydrocarbons

- Depending upon the type of carbon-carbon bonds present, hydrocarbons can be classified into three main categories:

1. Saturated Hydrocarbons
2. Unsaturated Hydrocarbons
3. Aromatic Hydrocarbons

Hydrocarbons

Saturated Hydrocarbons

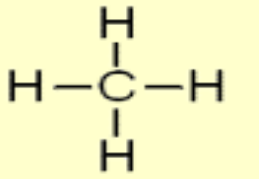
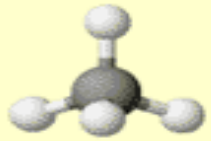
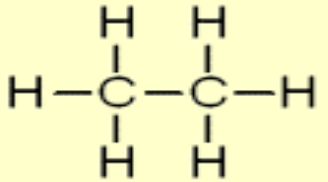
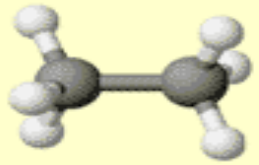
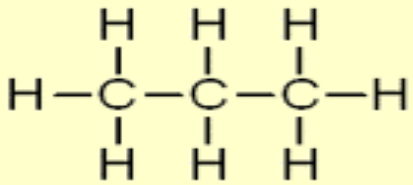
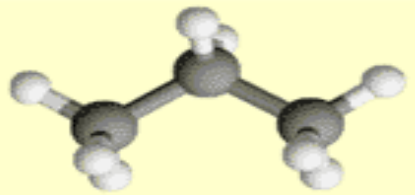
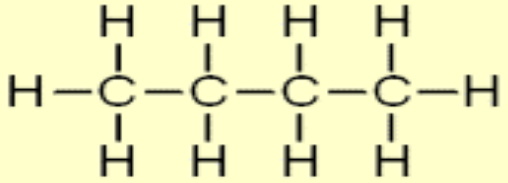
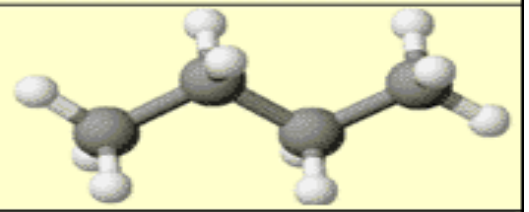
In these compounds, carbon-carbon atoms and carbon-hydrogen atoms are held together by single bonds. These single bonded compounds are the simplest hydrocarbons. These types of hydrocarbons don't have double or triple bonds. In terms of hybridization, they have Sp^3 hybridised carbon atom with no Sp^2 or Sp hybridised carbon atoms. They are together called as **alkanes** which have a general formula C_nH_{2n+2}. For example, CH_4, C_3H_8.

Hydrocarbons

These compounds called SATURATED (alkanes) due to they have maximum number of bonded hydrogen.

The main formula of alkane is

$$C_nH_{2n+2}$$

methane CH_4		
ethane C_2H_6		
propane C_3H_8		
butane C_4H_{10}		

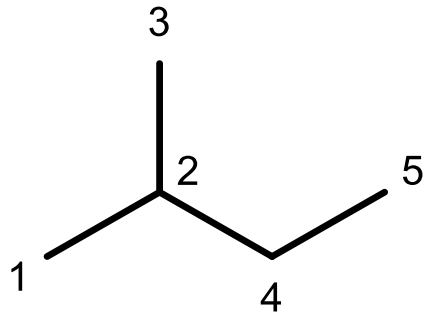
Hydrocarbons

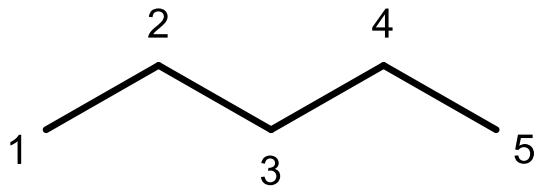
Alkanes

Also known as paraffins, are the simplest of organic compounds. They are saturated hydrocarbons that form an homologous series with the general formula C_nH_{2n+2}. The first few in the series are methane, ethane, propane, and butane; from pentane on they are named after the number of carbon atoms in the molecule. Lower members in the series are gases; from pentane (C_5H_{12}) to heptadecane ($C_{17}H_{36}$) they are liquids; higher members are waxy solids.

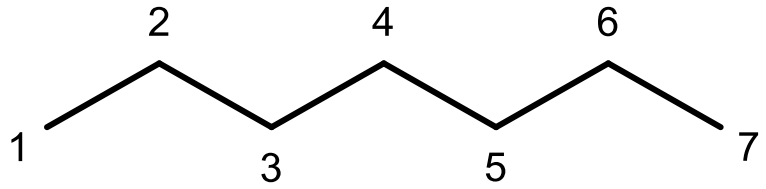
Hydrocarbons

- Alkanes with four or more carbon atoms have several isomers (will talk about it later on).





- The straight-chain isomers being called normal alkanes (*n*-alkanes).



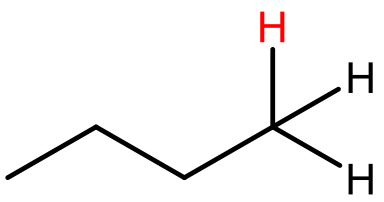
- Branched alkanes are named as derivatives of the longest straight chain in the molecule.

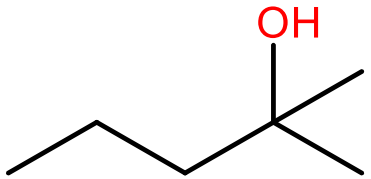
Hydrocarbons

- Alkanes are soluble in most organic solvents, but not in water.
- The lower alkanes are less reactive than the higher ones.
- Typical reactions include combustion in air, decomposition and rearrangement on heating, isomerization and condensation with alkenes (with acid catalyst), nitration, sulfonation, and halogenation by fluorine, chlorine, and bromine (with heat and light).

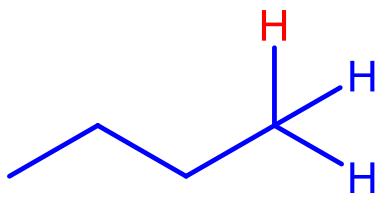
Hydrocarbons

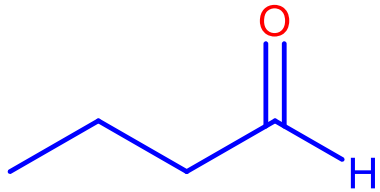
- Alkanes are converted into other compounds by replacing a hydrogen with other functional groups. The most important substitutions for biochemistry are -OH (alcohol), -CHO (aldehyde), -COO-R- (ester, R=alkyl group), -COOH (carboxylic acid), $-PO_4$ (organic phosphate), and $-NH_2$ (amine).





Alcohol





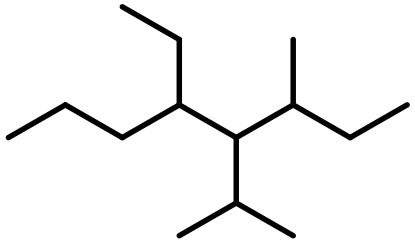
Aldehyde

Hydrocarbons

Alkanes also can be divided into two categories:

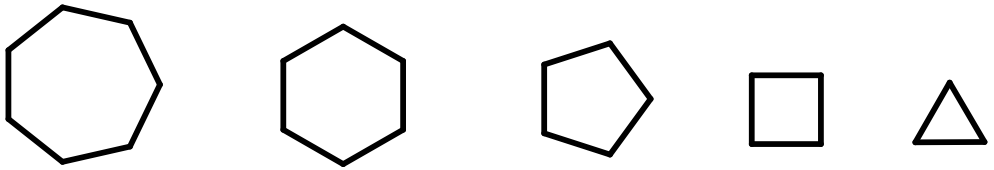
1. Open chain or Acyclic alkanes

Straight-chain alkanes



Branched alkanes

2. Cycloalkanes or cyclic alkanes: These hydrocarbons possess one or multiple carbon rings. The hydrogen atom is attached to the carbon ring.



cyclo alkanes

Thank you for attention