Organic Chemistry

Organic chemistry

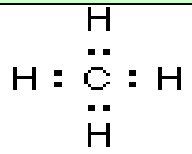
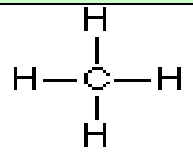
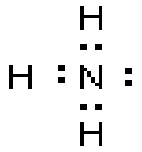
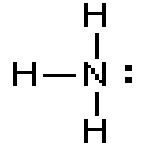
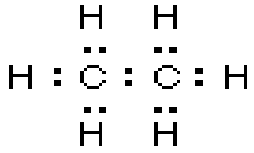
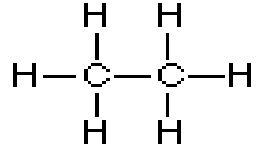
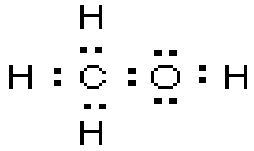
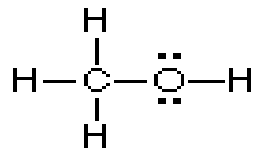
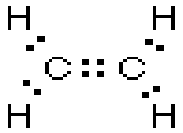
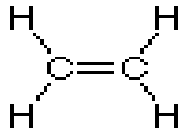
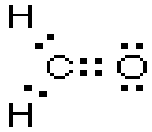
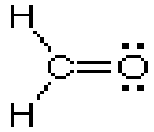
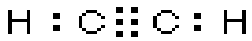
- **Organic compounds are compounds that contain carbon**
- **Carbon forms many compounds because:**
  - **Carbon forms covalent bounds**
  - **Covalent bonds can be single, double, or triple**
  - **Bonds easily with many different elements**
    - **Halogens**
    - **Nitrogen**
    - **Oxygen**
    - **Hydrogen**
  - **Atoms other than carbon can be at different places in the carbon chain**

Organic Compound Chemical Formulas

- **Formulas for organic compounds: Can be written the same as any other example:**
  Methane – CH_4
  Ethane – C_2H_6
- **Structural formulas are used to show a two dimensional shape**

Structural Formulas

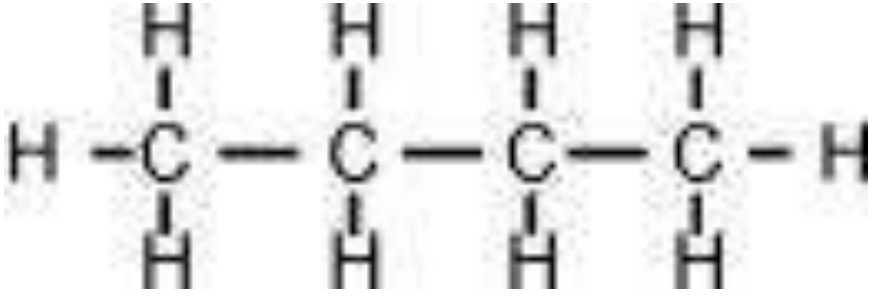
- Structural formulas show every atom and every bond
- Atoms are represented by their atomic symbol
- Bonds are represented by solid black lines.
- A single black line represents 2 shared electrons in a single covalent bond
- Two black lines represent 4 shared electrons in a double covalent bond
- Three black lines represent 6 shared electrons in a triple covalent bond

Common Name	Molecular Formula	Lewis Formula	Structural Formula
Methane	CH_4		
Ammonia	NH_3		
Ethane	C_2H_6		
Methyl Alcohol	CH_4O		
Ethylene	C_2H_4		
Formaldehyde	CH_2O		
Acetylene	C_2H_2		

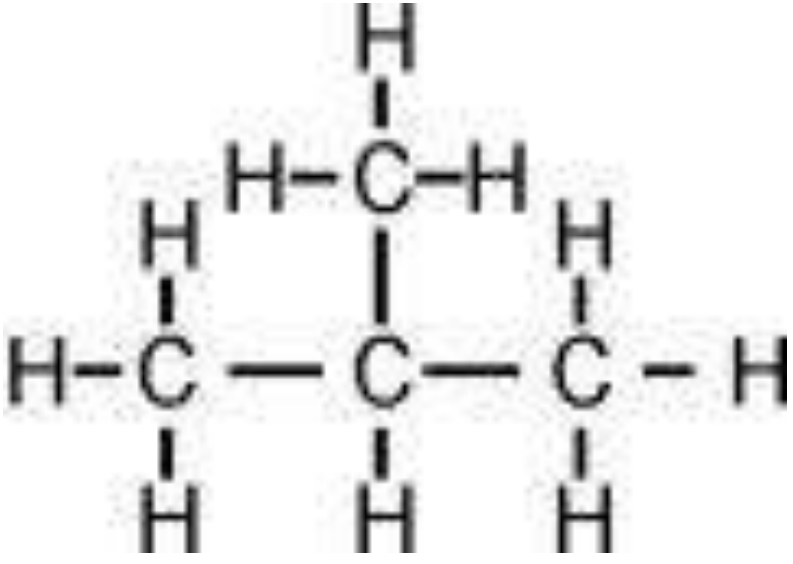
Isomers

- **Isomer – compounds which molecular formulas are the same, but have different structural formulas. Structural formulas show the arrangement of the atoms**

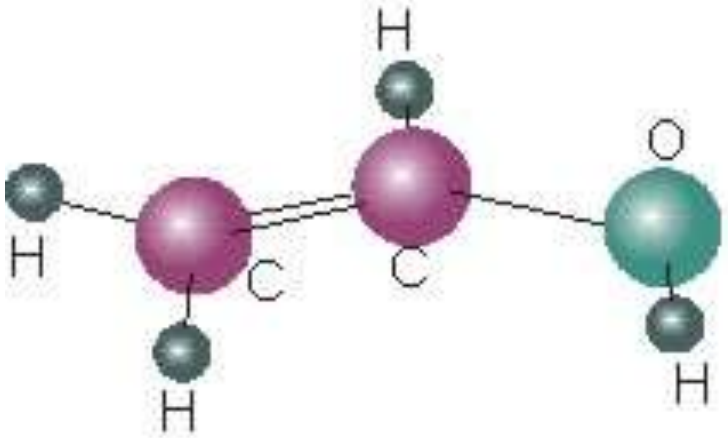
Example: Butane



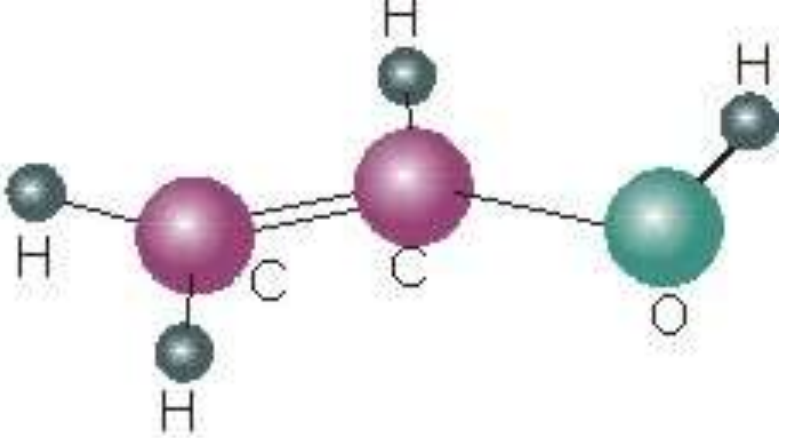
Isobutane



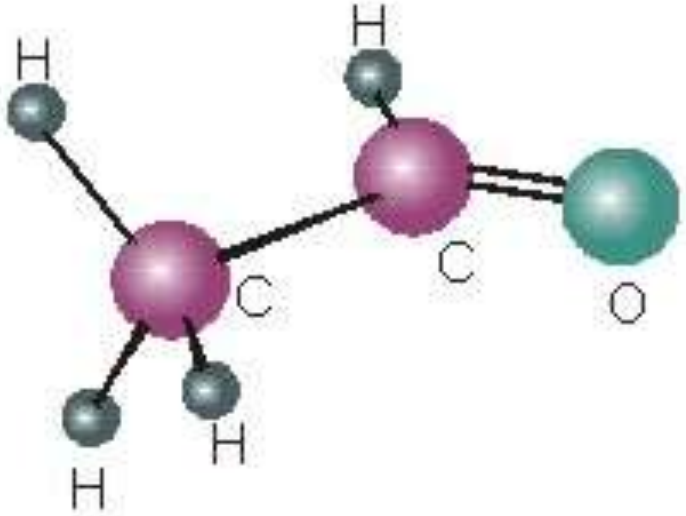
These two compounds have much different properties



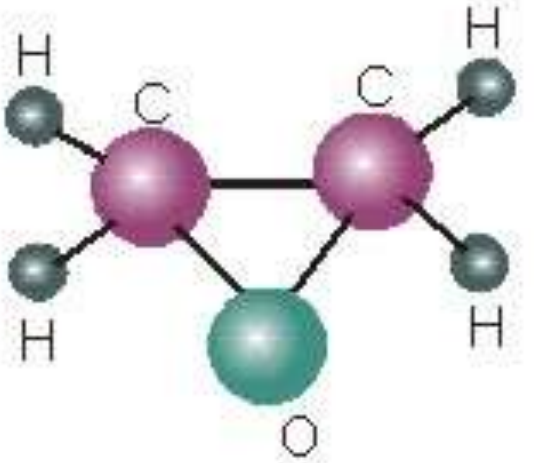
Vinyl alcohol (syn)



Vinyl alcohol (anti)



Acetaldehyde



Ethylene oxide

The more carbons present the more possible isomers there are.

Hydrocarbons

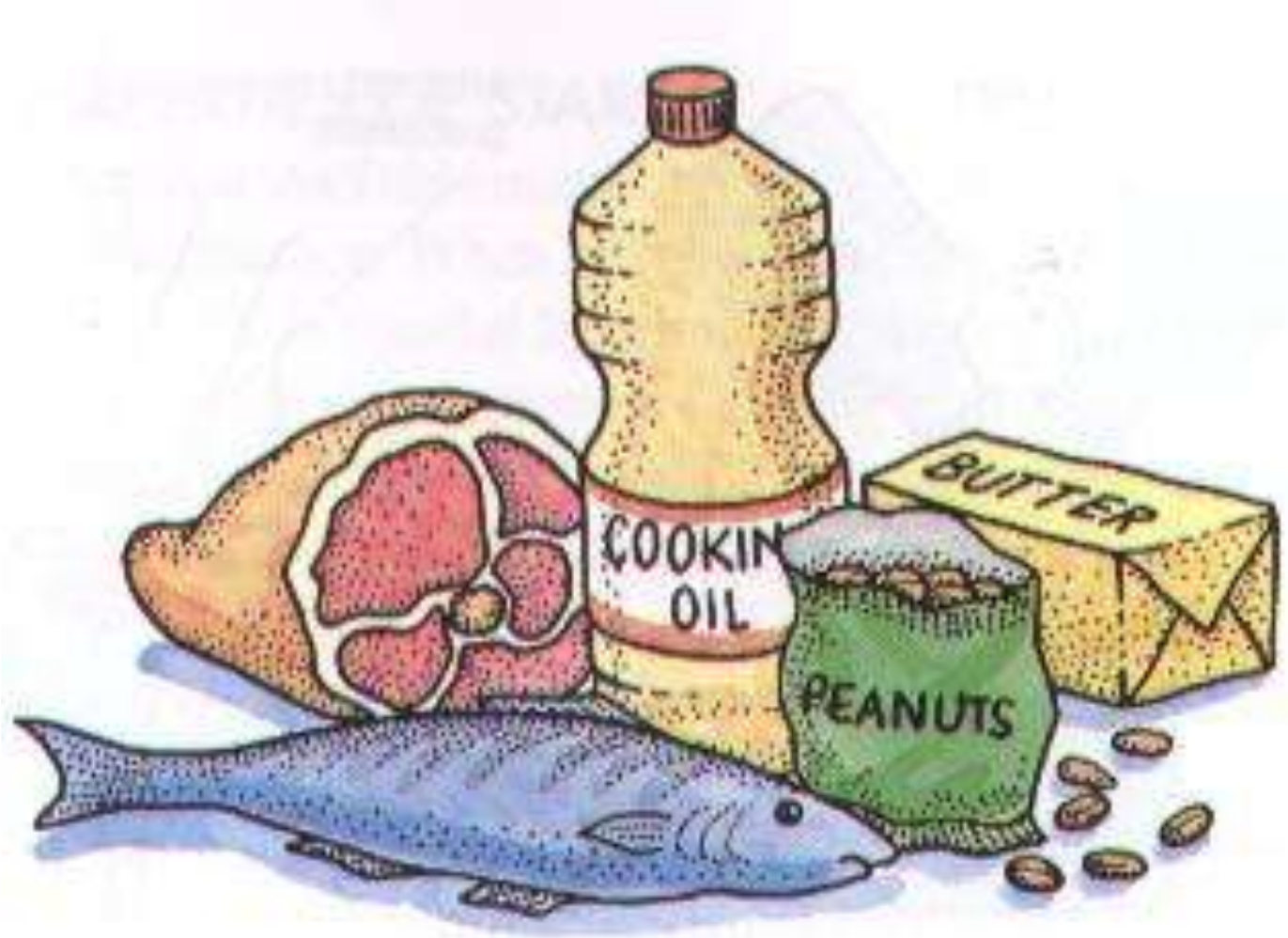
- **A compound that contain only hydrogen and carbon**
- **Vary from methane to waxes**

Two types of Hydrocarbons

- **Saturated**
- **Contain only single carbon bond and are called *alkanes***
- **Unsaturated Hydrocarbons**
  - **These have double and triple bonds**
    - **Double bounds are called *alkenes***
    - **Triple bonds are called *alkynes***

Saturated and unsaturated oils in our diet

- **Unsaturated are oils**
- **Saturated are fats**



Polymers

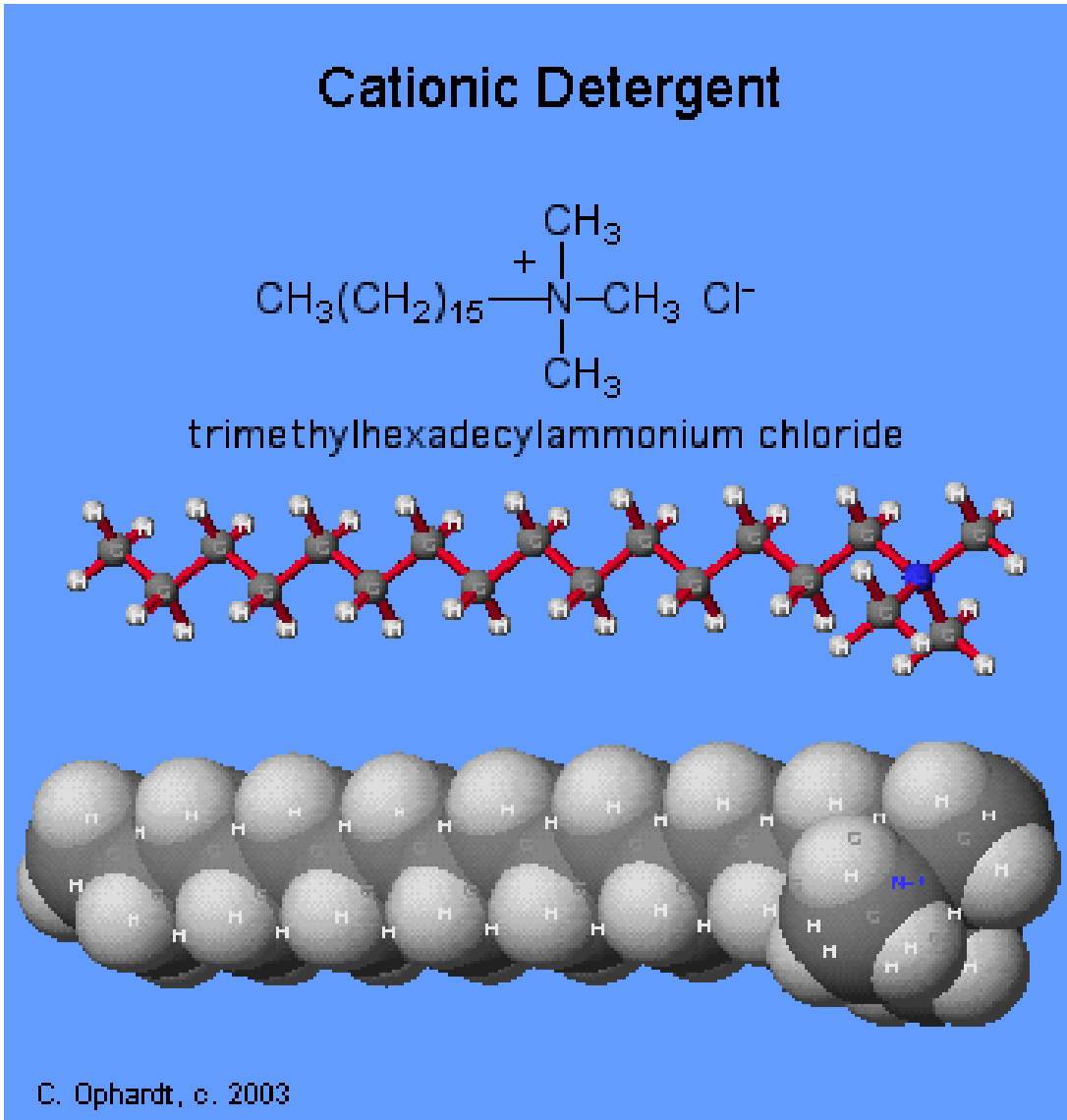
- **Polymers are small organic molecules called monomers combined to form polymers**
- **Polymers make up most plastics and synthetic fibers: Dacron, nylon, polypropylene, polyvinyl chloride**

Soap & detergents

- **Soap**
  - **Long chains of hydrocarbons with sodium or potassium at one end**
  - **Soaps increase the cleaning ability of water**
  - **Hydrocarbon in soap dissolves the grease and the metallic end of the molecule combine with the water and washes grease away**
  - **Soaps are made by putting NaOH in fat or glycerol and then separating the results of reaction into bars.**
  - **This process with oils makes liquid soap**
  - **This process with fats makes solid bar soap**
    Soaps can leave insoluble rings in a tub

Detergents

- **use a negative ion instead of a positive ion to attract to the water and do not form scum or rings when used in hard water**

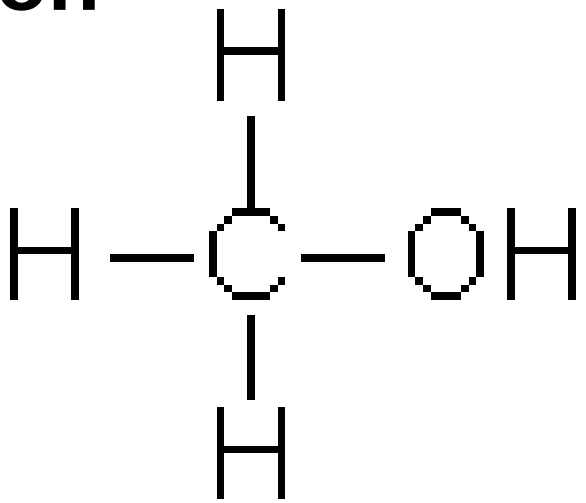


Petroleum

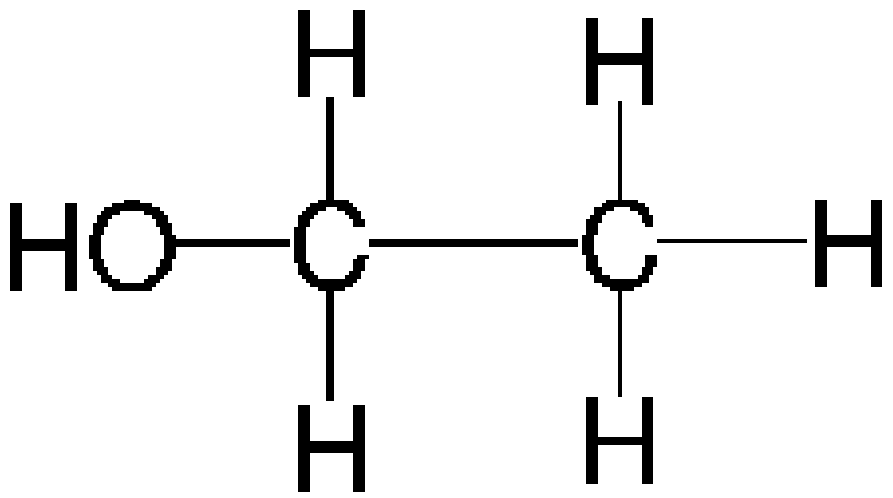
- **mixture of hydrocarbons**
- **Crude oil – the organic mixture of hydrocarbons pumped out of the ground**
- **Separated into its parts by fractional distillation**
- **Is the result of plant and animal life from the past**
- **Fossil fuels are burned when oxygen and the fuel are combined with an activator**
- **The results of this combination of a hydrocarbon and Oxygen is CO_2 & H_2O**
  $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

Substituted hydrocarbons

- **Where another substance replaces the hydrogen**
  Alcohols are an example of a substituted hydrocarbon
  Methanol CH_3OH

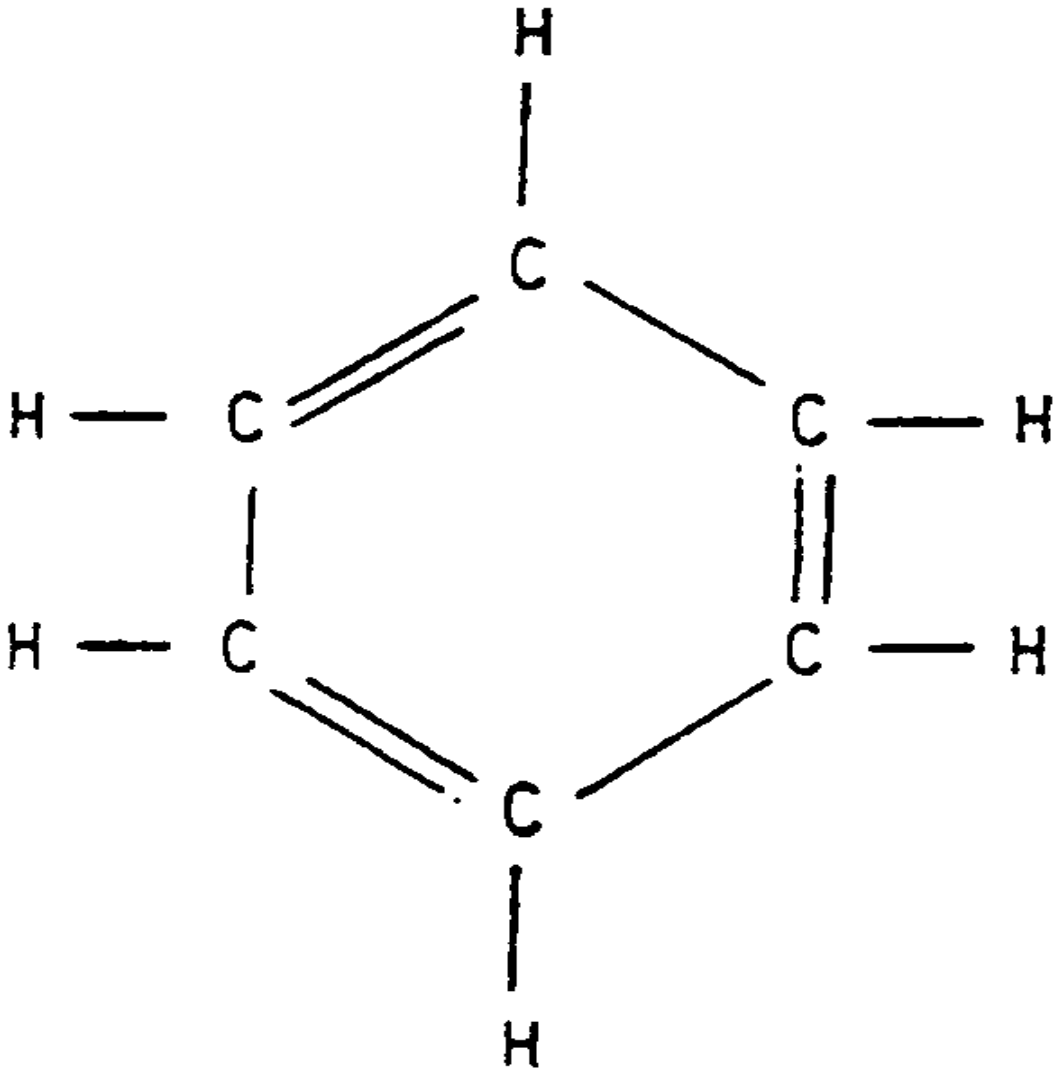


- **Ethanol CH_5OH**



Aromatic compounds

- **The Benzene ring C_6H_6**



Biological compounds

- **Proteins – are a polymer of amino acid monomers**
- **Nucleic Acids**
  - **DNA – double sided polymer of nucleotide monomers**
  - **RNA**
- **Carbohydrates – Polymer of sugar monomers called monosaccharides**
- **Lipids – Polymer from fatty acids and glycerol**
  - **Cholesterol – waxy like fat found in the body that can build up in the arteries**

- **Pheromones – Chemical that females of some species release to attract a male**