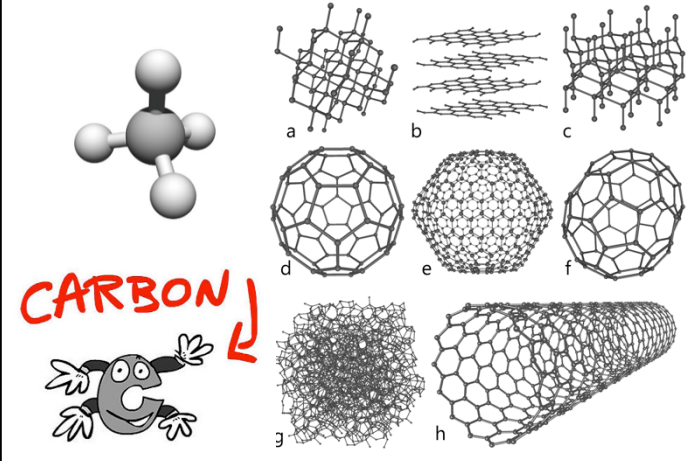


## The Star of The Show:



## Why study Carbon?

- Life on Earth is built of carbon
- Cells are about:
  - 72% H<sub>2</sub>O
  - 25% carbon compounds
    - carbohydrates
    - lipids
    - proteins
    - nucleic acids
  - 3% salts
    - Na, Cl, K...

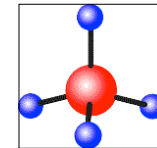
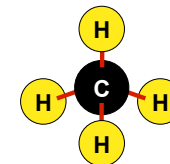
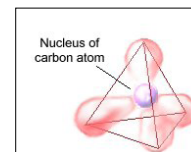


## Why Is Carbon So Important?

- Organic vs. Inorganic in Chemistry
  - **Organic** refers to molecules containing a carbon skeleton
  - **Inorganic** refers to carbon dioxide, carbon monoxide and all molecules without a carbon skeleton

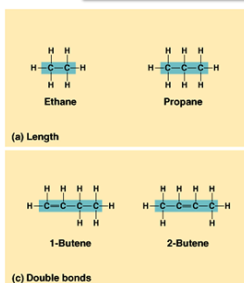
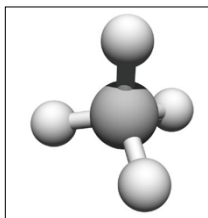
## Chemistry of Life

- Carbon atoms are versatile building blocks
  - Can form 4 stable non-polar covalent bonds



## Hydrocarbons

- Combinations of C & H
  - Non-polar covalent bond between the C and the H
    - not soluble in H<sub>2</sub>O
    - hydrophobic
  - stable
  - very little attraction between molecules

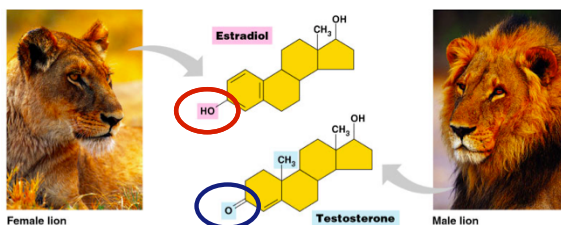


## Functional groups

- Parts of organic molecules that are involved in chemical reactions
  - give organic molecules distinctive properties
    - hydroxyl
    - carbonyl
    - phosphate
    - amino
    - carboxyl
- Affect reactivity
  - makes hydrocarbons hydrophilic
  - increase solubility in water

## For Example:

- Basic structure of male & female hormones is identical except for one functional group
  - identical carbon skeleton
  - attachment of different functional groups
  - interact with different targets in the body



## Hydroxyl



Table 4.1 Functional Groups of Organic Compounds			
Functional Group	Formula	Name of Compounds	Example
Hydroxyl	—OH	Alcohols	$\begin{array}{c} \text{H} & \text{H} \\   &   \\ \text{H}-\text{C}-\text{C}-\text{OH} \\   &   \\ \text{H} & \text{H} \end{array}$ <p>Ethanol (the drug of alcoholic beverages)</p>

## Carbonyl

– O double bonded to C

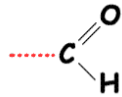


Table 4.1 Functional Groups of Organic Compounds

Functional Group	Formula	Name of Compounds	Example
Carbonyl		Aldehydes	 Propanal
		Ketones	 Acetone

## Carboxyl

– C double bonded to O & single bonded to OH group

- compounds with COOH = acids
  - fatty acids
  - amino acids

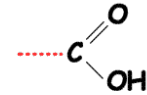


Table 4.1 Functional Groups of Organic Compounds

Functional Group	Formula	Name of Compounds	Example
Carboxyl		Carboxylic acids	 Acetic acid* (the acid of vinegar)

## Amino

– N attached to 2 H

- amino in amino acids

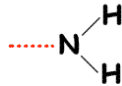


Table 4.1 Functional Groups of Organic Compounds

Functional Group	Formula	Name of Compounds	Example
Amino		Amines	 Glycine*

## Phosphate

– P bound to 4 O

- connects to C through an O
- lots of O = lots of negative charge
  - highly reactive and soluble in water
- transfers energy between organic molecules
  - ATP, GTP, etc.

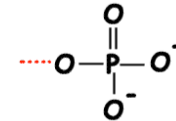


Table 4.1 Functional Groups of Organic Compounds

Functional Group	Formula	Name of Compounds	Example
Phosphate		Organic phosphates	 Glycerol phosphate