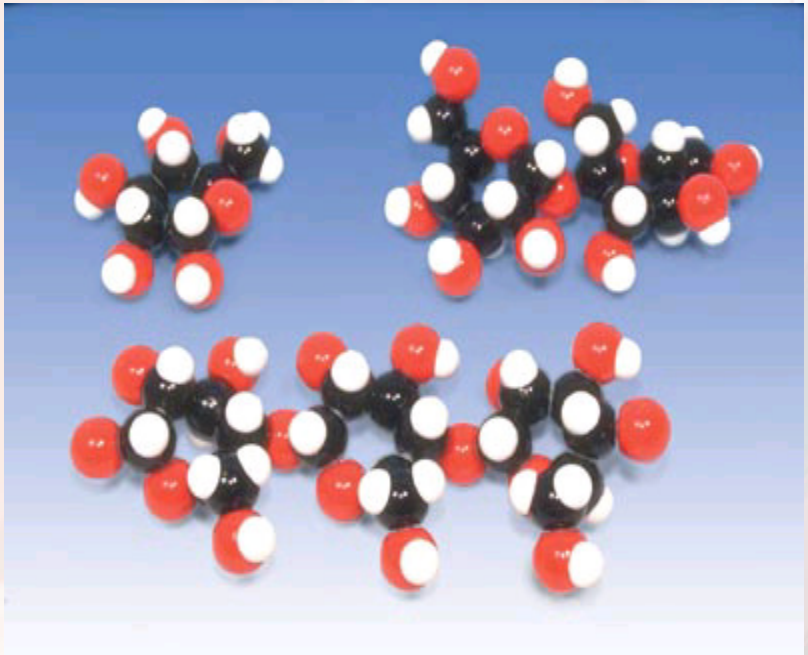
ORGANIC COMPOUNDS

- Contain carbon atoms that typically form covalent bonds with H, O, and N

Carbon-based Molecules

Although a cell is mostly water, the rest of the cell consists mostly of carbon-based molecules



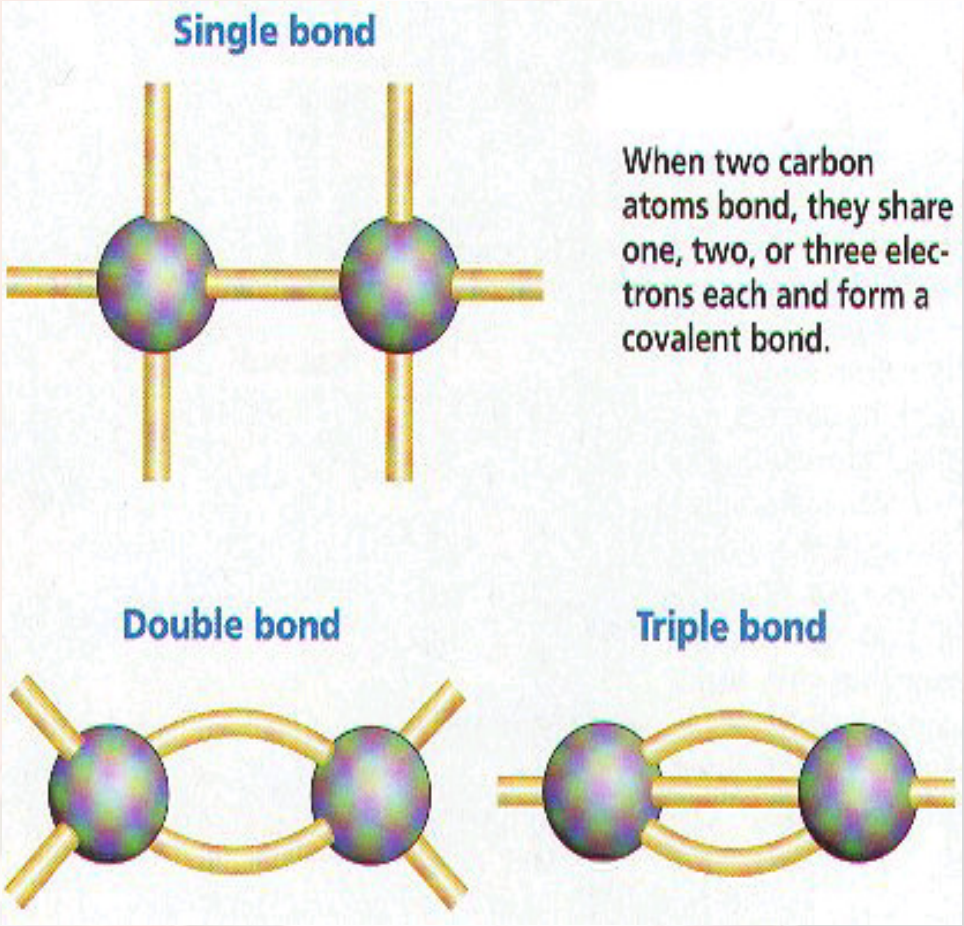
Organic chemistry is the study of carbon compounds

CARBON

- Contains 4 valence electrons
- Easily bonds with itself typically forming molecules with different shapes such as rings, branches, or chains
- May share 2 or 3 PAIRS of electrons with another atom forming single, double or triple bonds

Carbon is a Versatile Atom

It has four valence electrons in an outer shell that holds eight

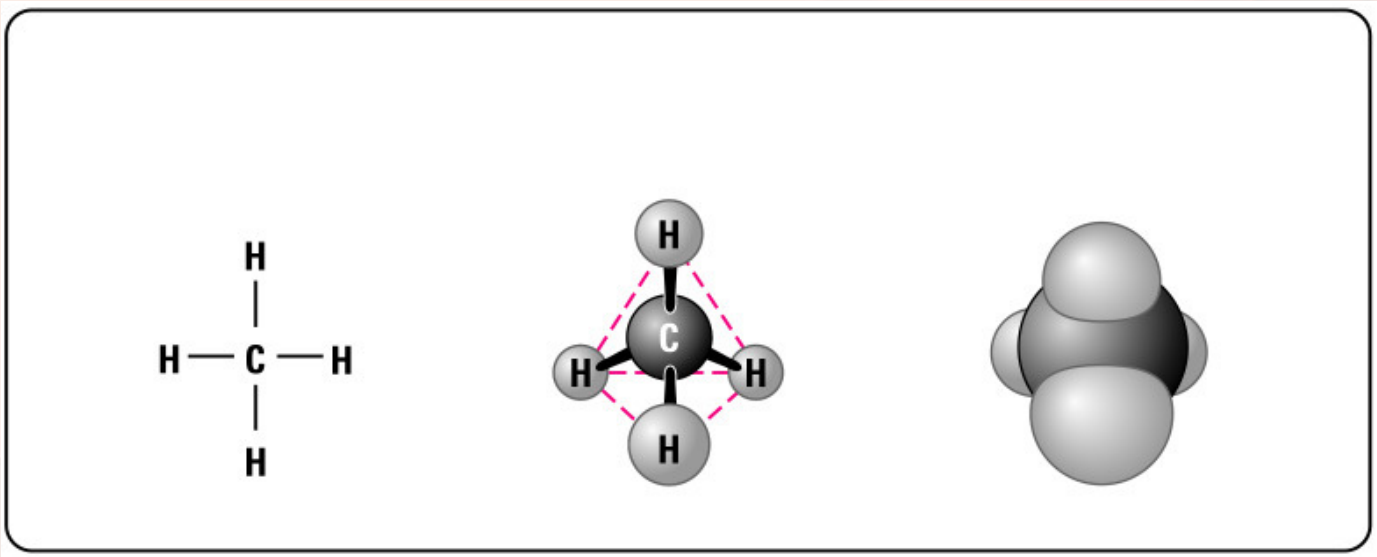


Carbon can share its electrons with other atoms to form up to four covalent bonds

Hydrocarbons

The simplest carbon compounds …

Contain only carbon & hydrogen atoms



Large Hydrocarbons:

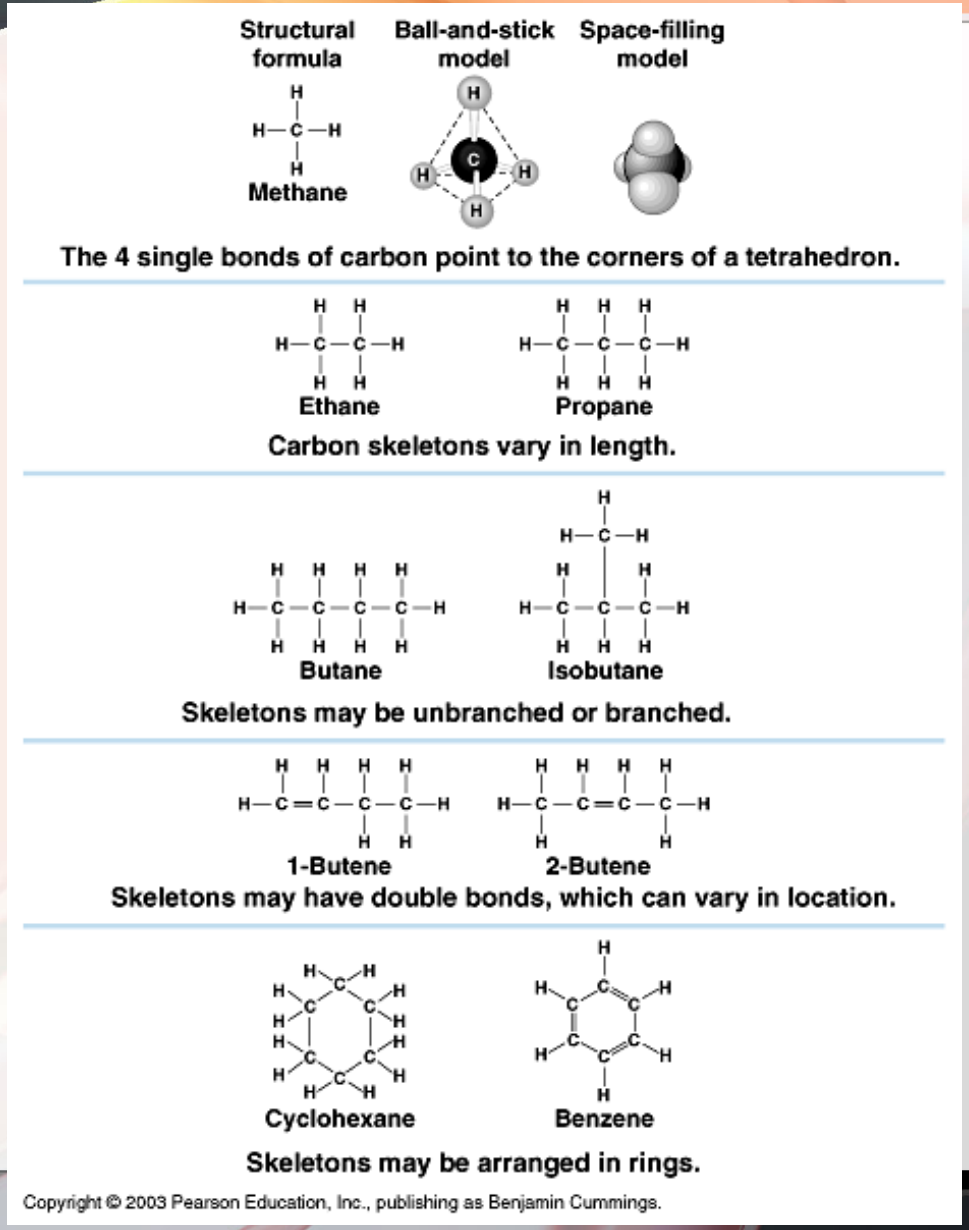
Are the main molecules in the gasoline we burn in our cars

The hydrocarbons of fat molecules provide energy for our bodies

Carbon can use its bonds to::

*Attach to other carbons

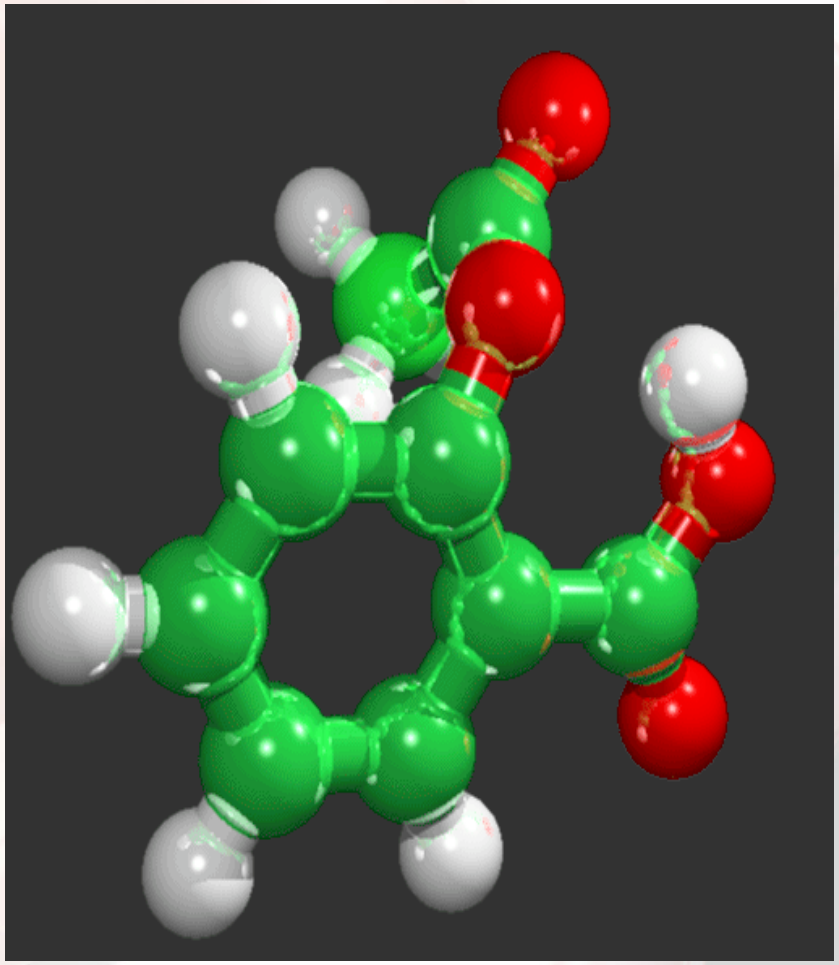
*Form an endless diversity of carbon skeletons (rings, branches, & chains)



Shape of Organic Molecules

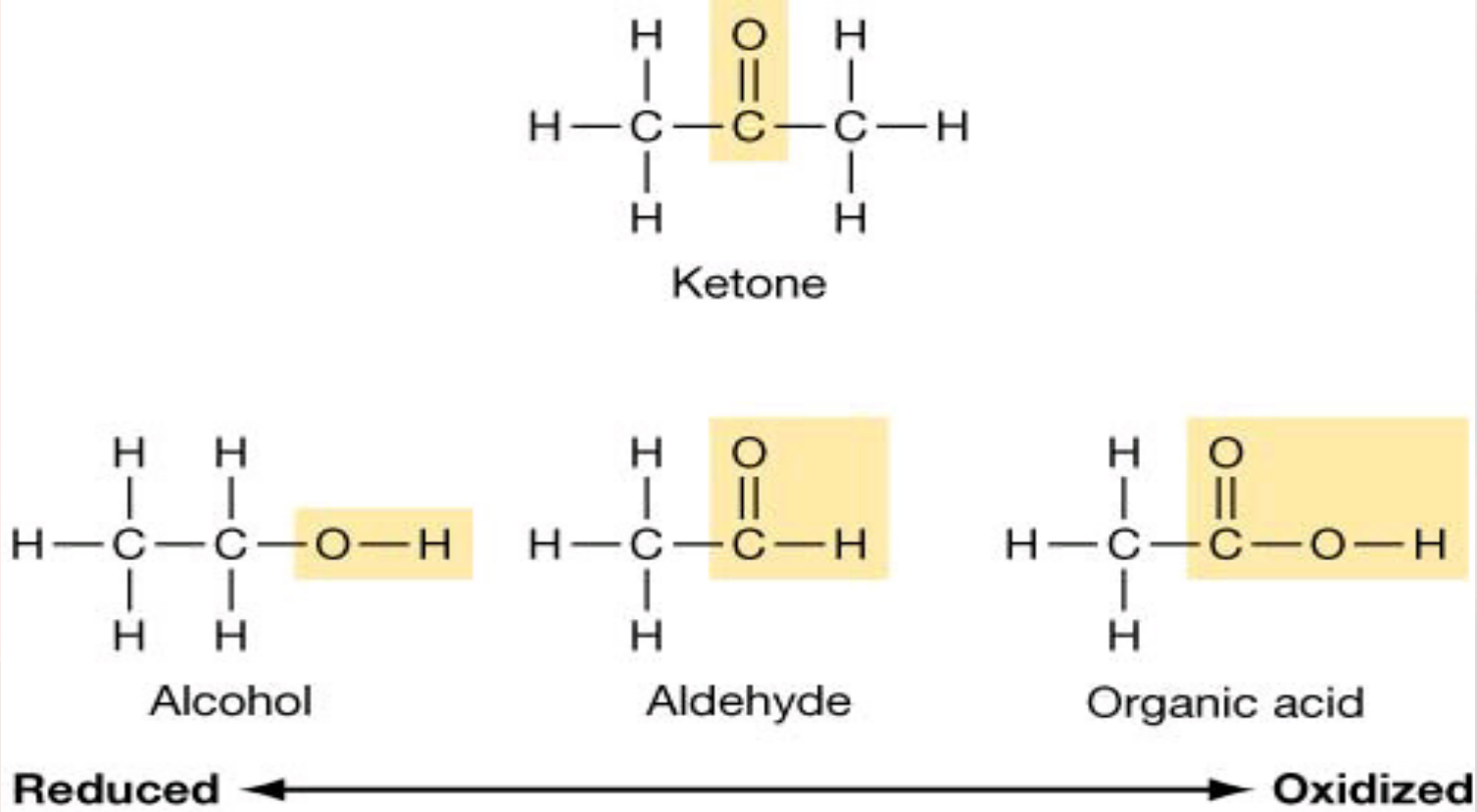
Each type of organic molecule has a unique three-dimensional shape

The shape determines its function in an organism



Functional Groups are:

Groups of atoms that give properties to the compounds to which they attach

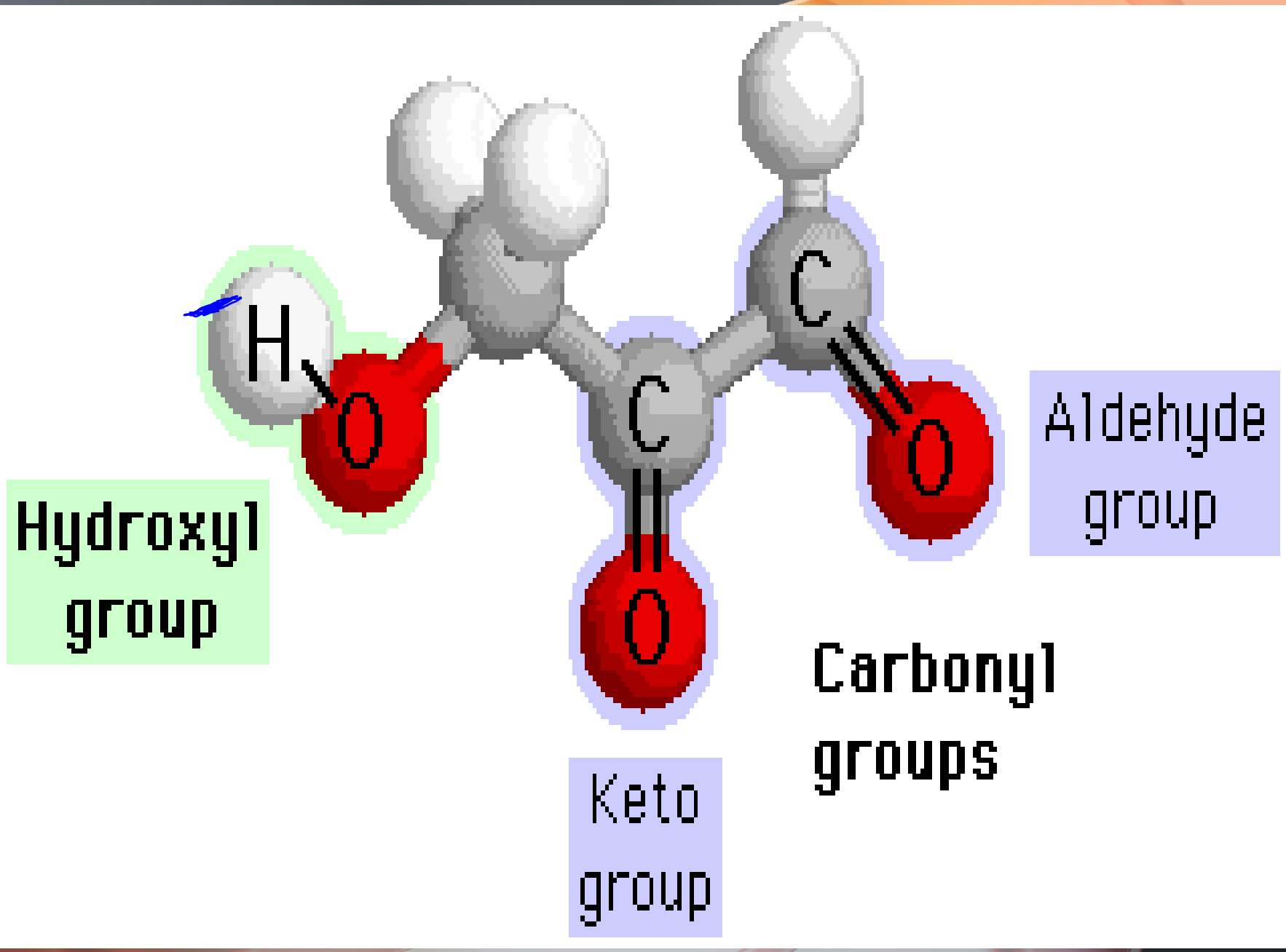


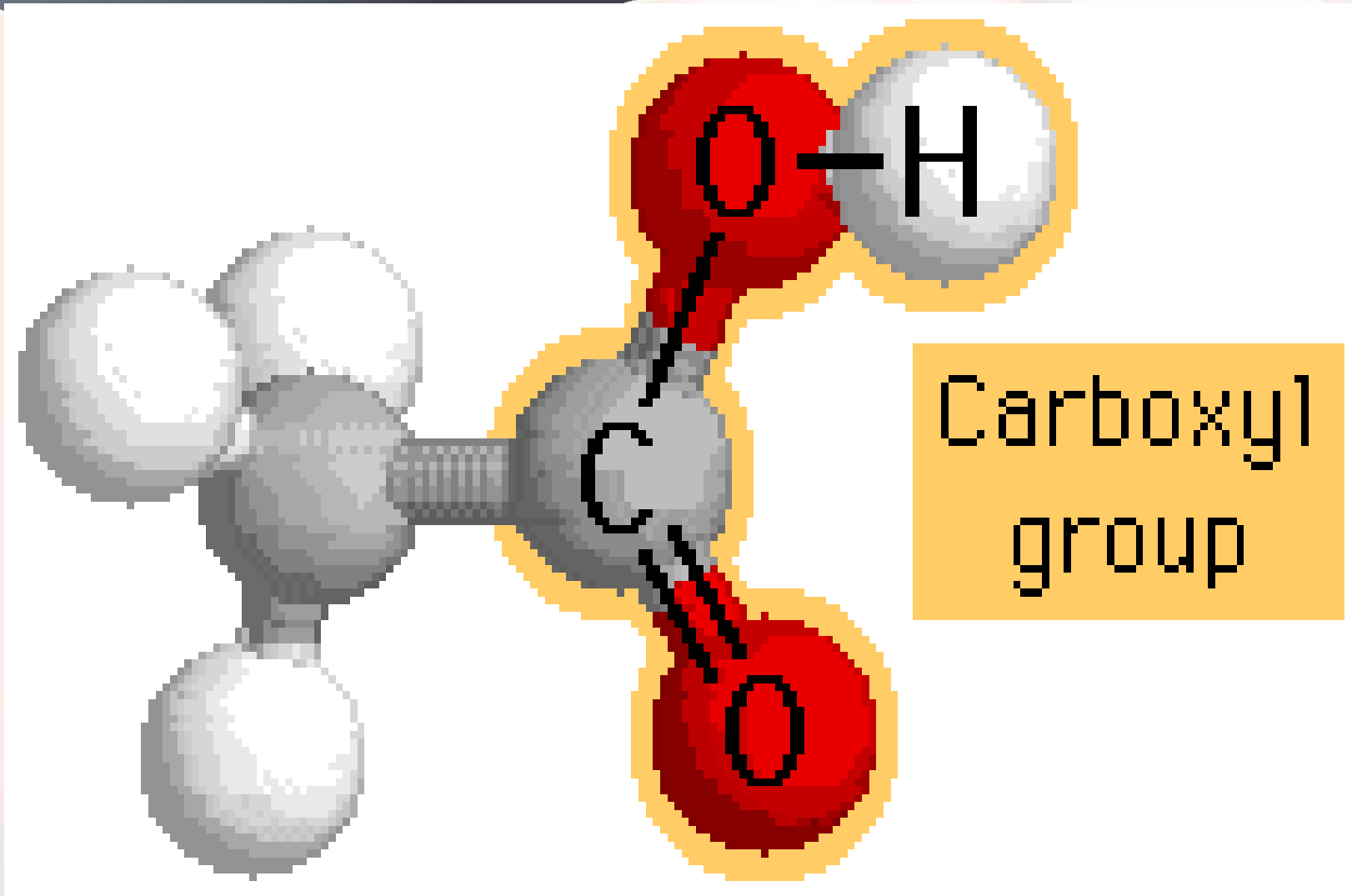
Gained Electrons

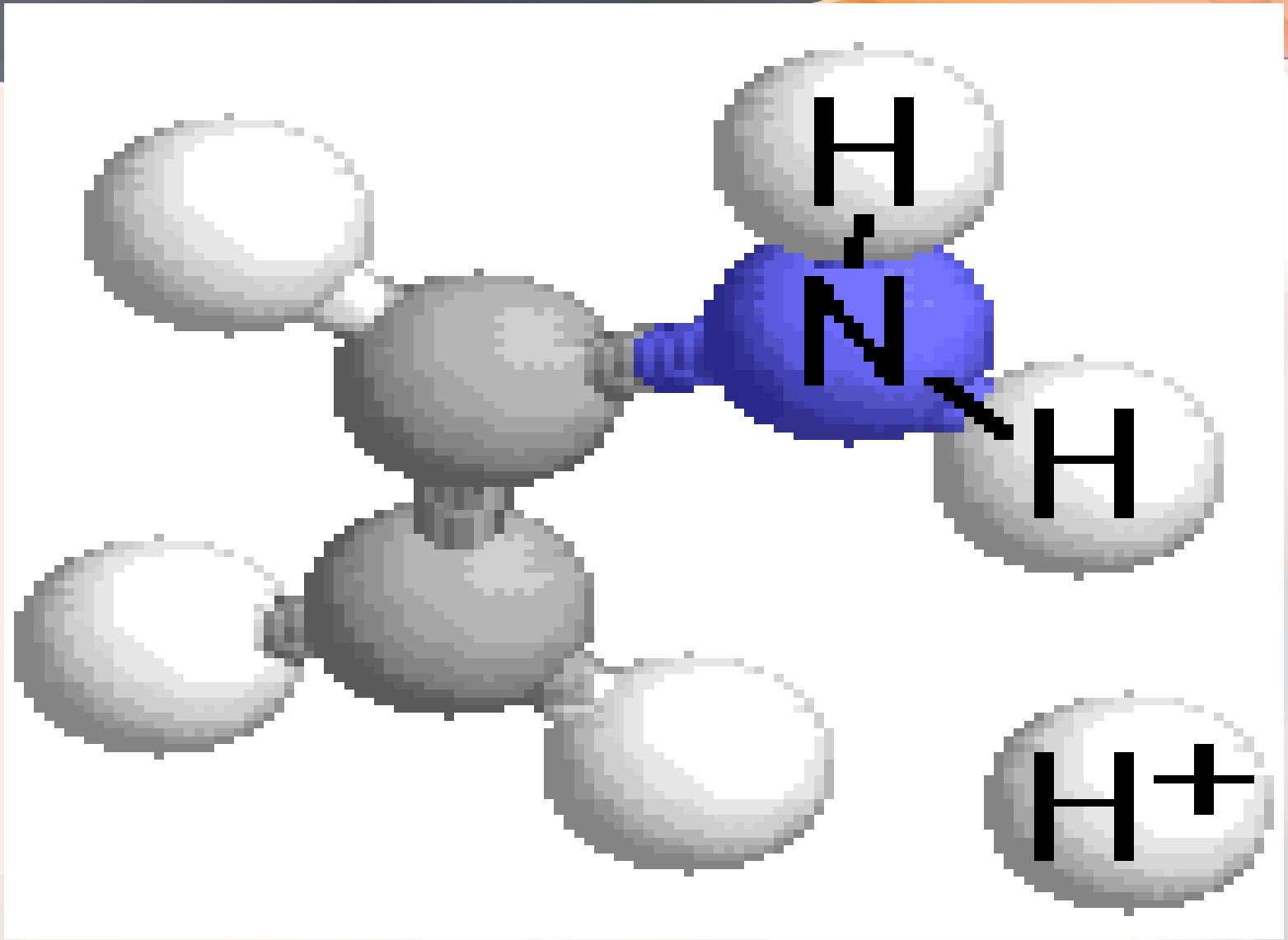
Lost Electrons

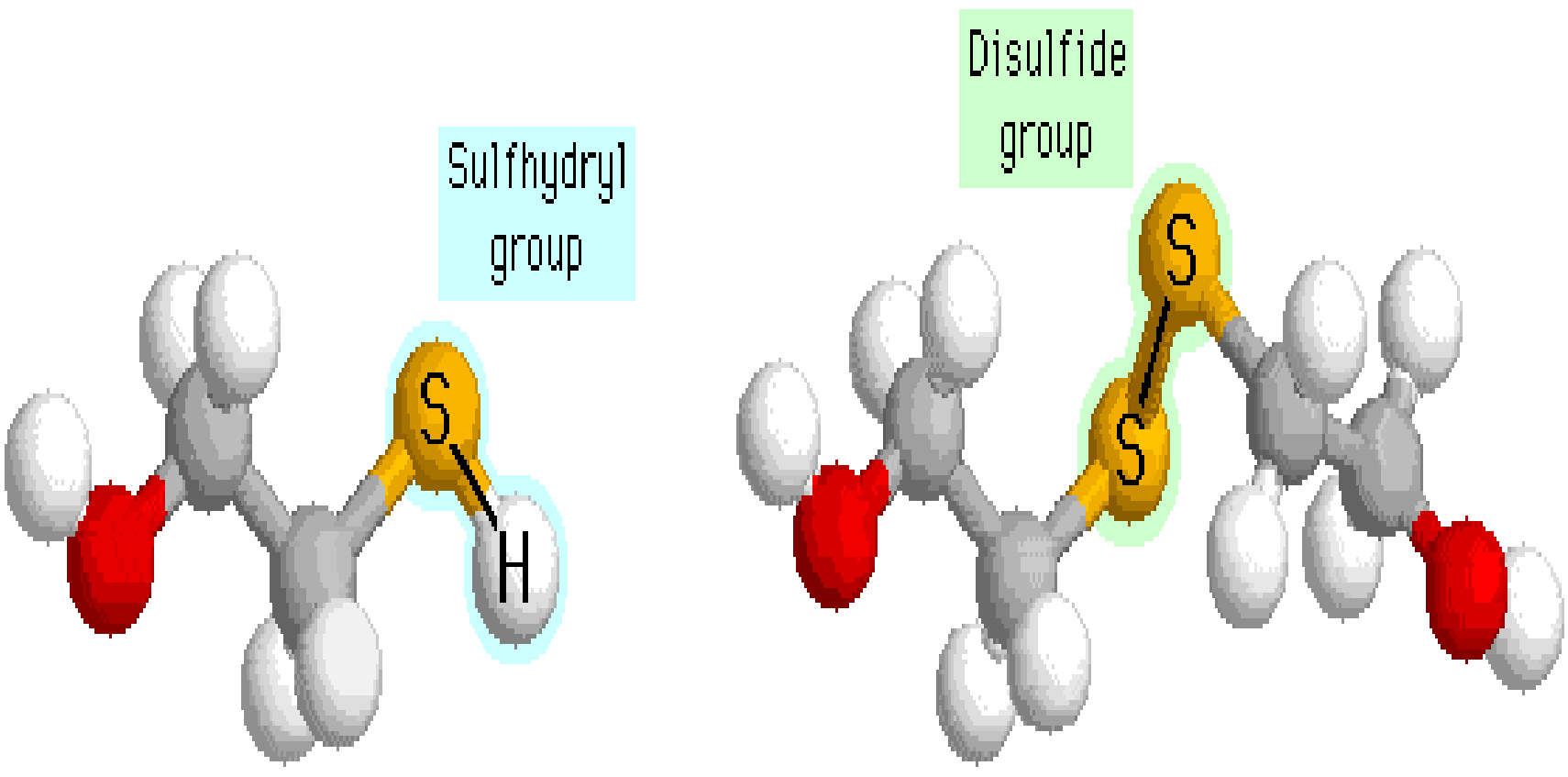
6 FUNCTIONAL GROUPS

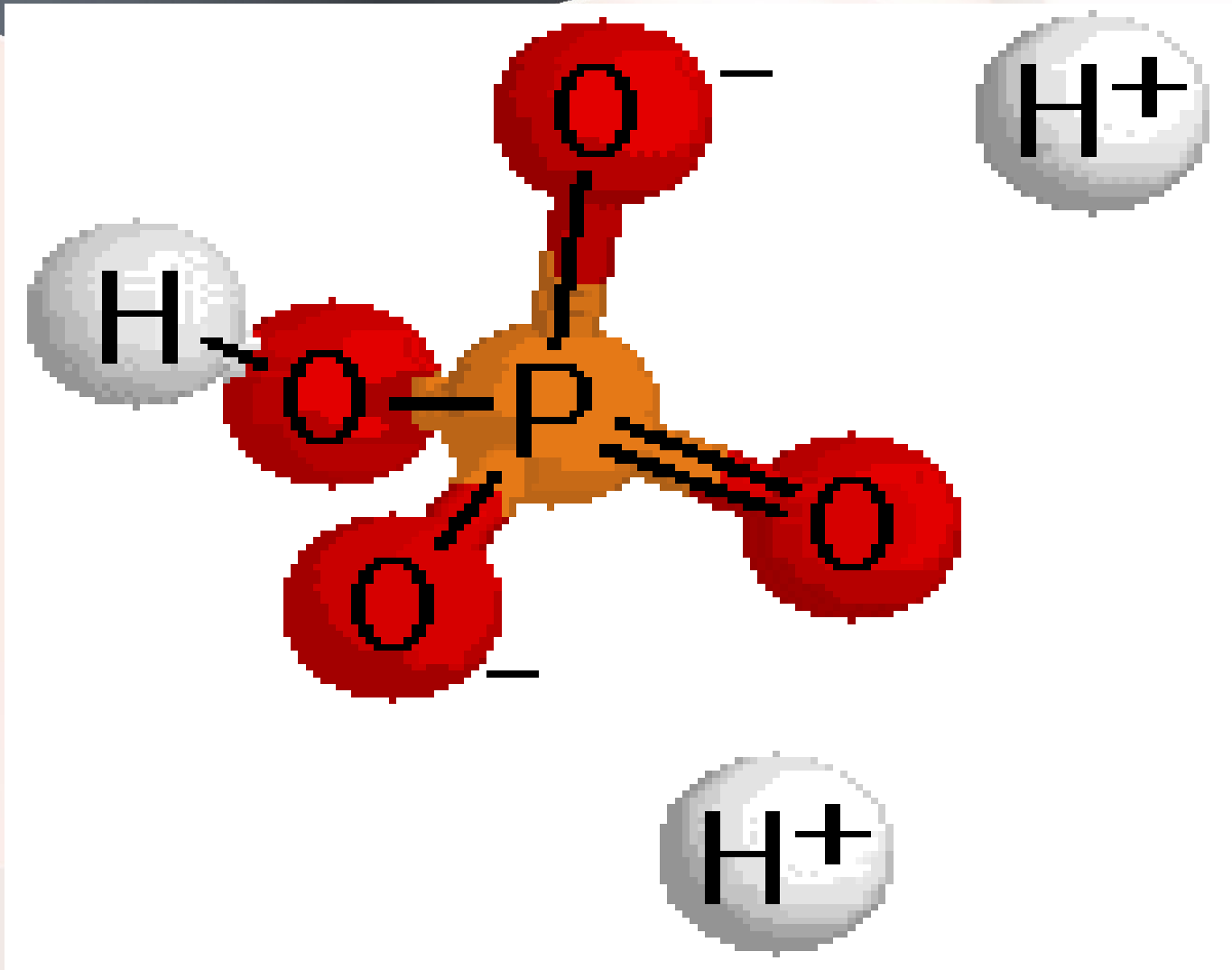
- Hydroxyl
- Carbonyl—2 types; if group is on the end of molecule, it's an aldehyde; if it's in the middle, it's a ketone
- Carboxyl
- Amino
- Sulfhydryl
- Phosphate


H
O
C
O
C
O
Hydroxyl group
Keto group
Carbonyl groups
Aldehyde group


O–H
C
O
Carboxyl group


H
N
H
H+

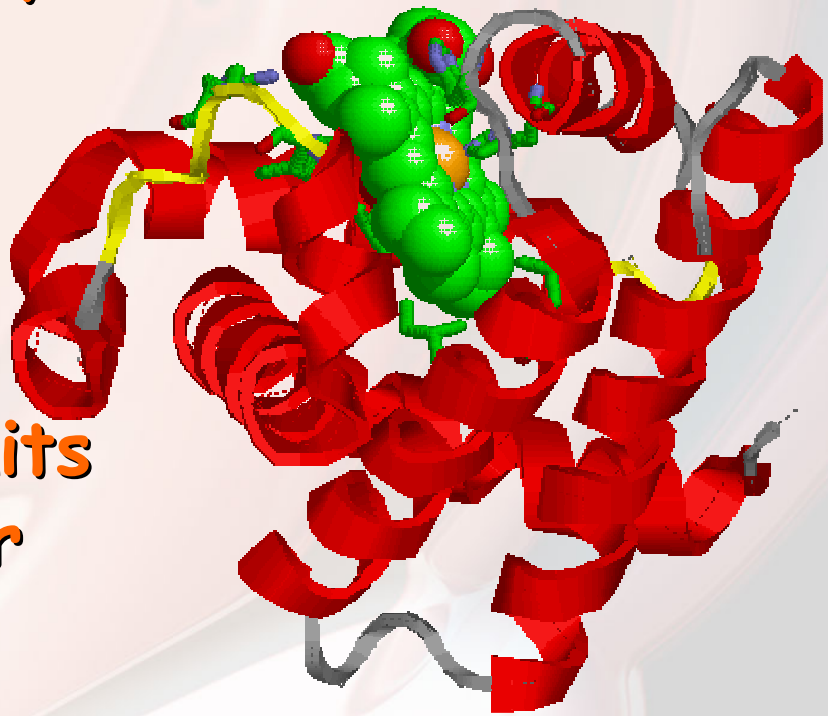

Sulfhydryl group
S
H
Disulfide group
S
S


O
−
H+
H
O
P
O
O
−
H+

ORGANIC MACROMOLECULES (polymers)

- Carbohydrates, Lipids, Proteins, and Nucleic Acids

- Made up of many <u>monomers</u>—smaller units that make up a larger molecule (<u>polymer</u>)

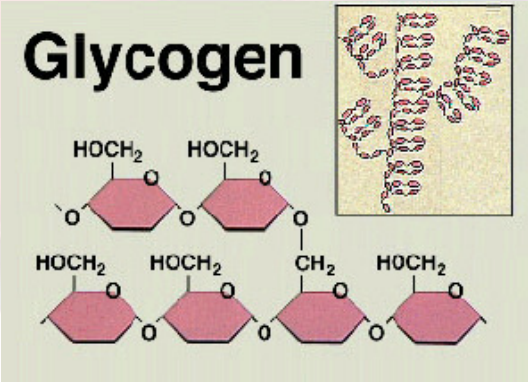


Examples of Polymers

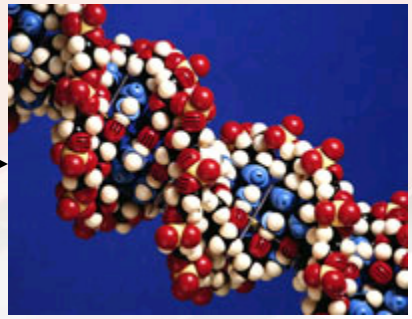
Proteins

Lipids

Carbohydrates



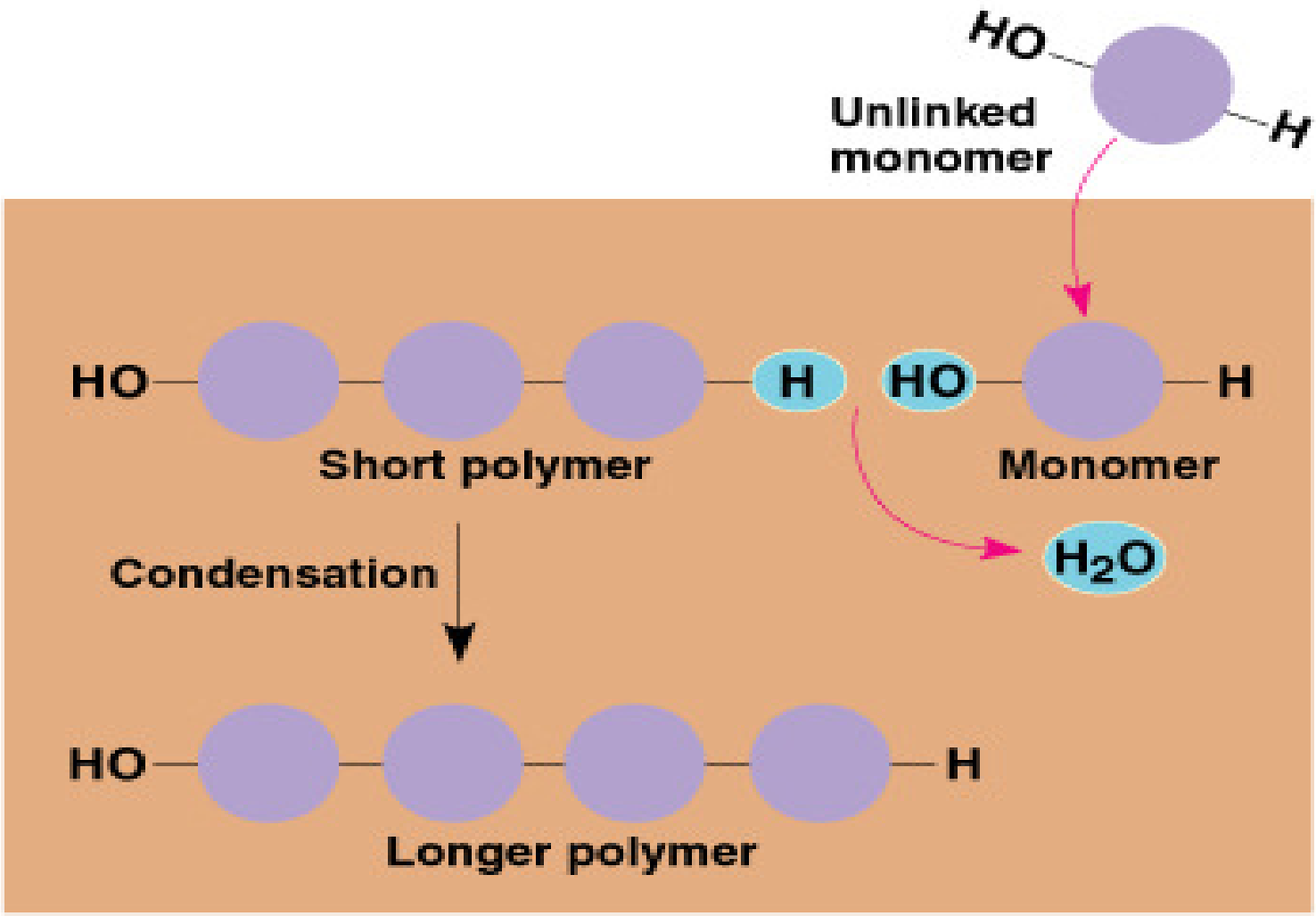
Nucleic Acids



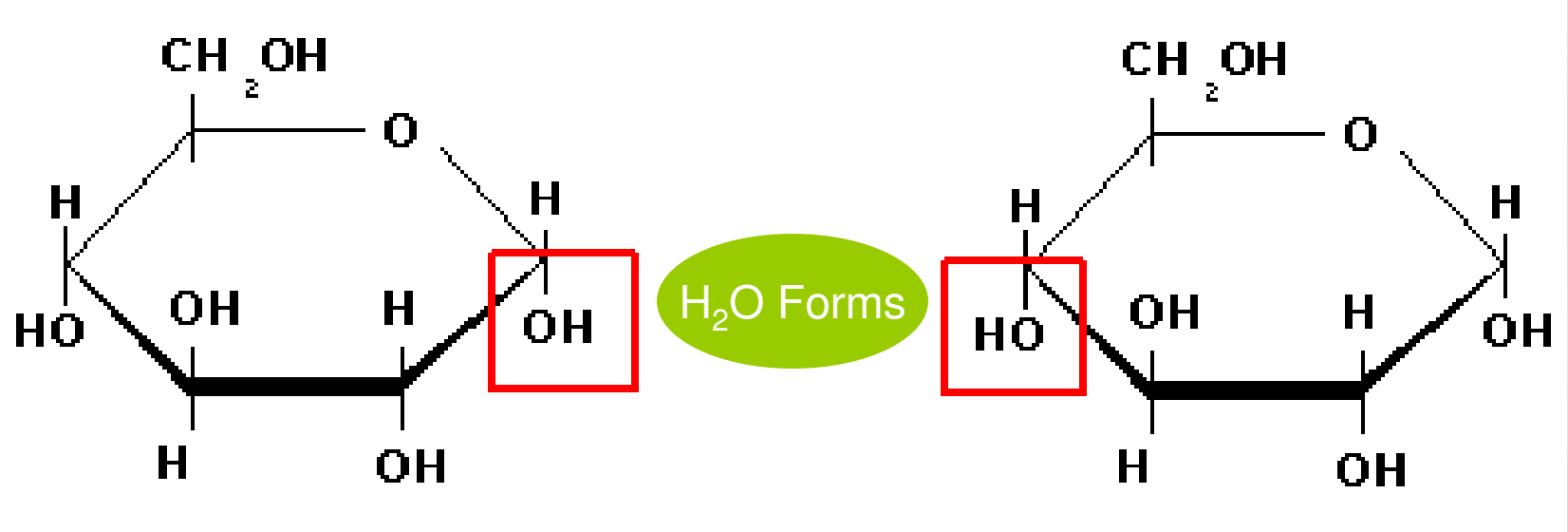
CONDENSATION (DEHYDRATION SYNTHESIS)

Cells link monomers by a process called dehydration synthesis (removing a molecule of water)

- Water is REMOVED from molecules in order to BUILD larger molecules.
- Puts monomers together to form polymers.


HO
H
Unlinked monomer
HO
H
H
HO
H
Short polymer
Monomer
H_2O
Condensation
HO
H
Longer polymer

Forming a disaccharide

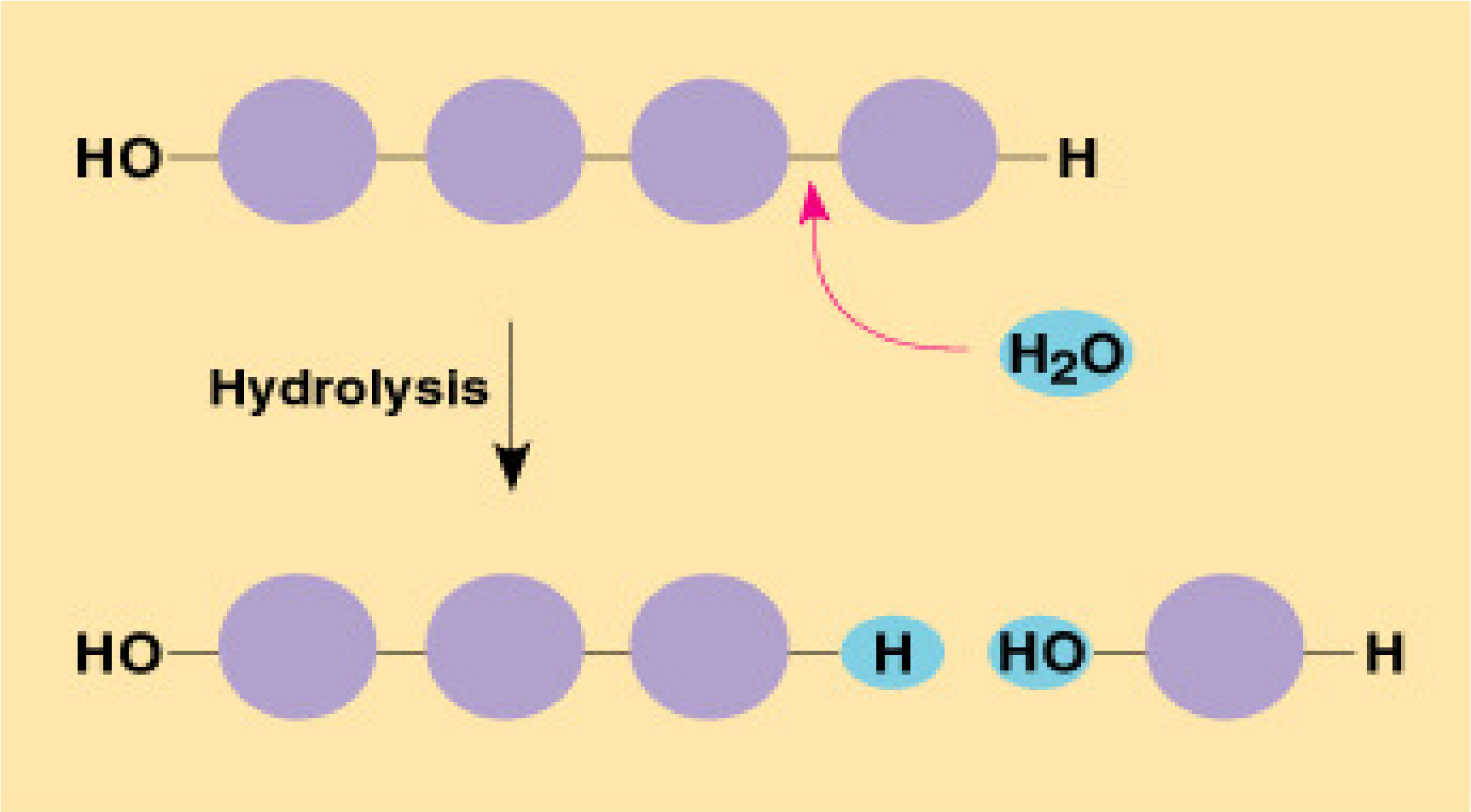


HYDROLYSIS

- Cells break down macromolecules by a process called hydrolysis (adding a molecule of water)

- Water is ADDED to molecules in order to break them apart into smaller molecules.

- Breaks polymers down into monomers.


HO
H
H_2O
Hydrolysis
HO
H
HO
H

Splitting a disaccharide