

Organic molecules

- Nearly exclusively made by organisms
- Chains of carbon atoms with other atoms or groups ("functional groups") attached.
- Carbon is tetravalent- can make up to 4 covalent bonds- therefore suited to making complex molecules
I misspoke at one point in this piece of narration- can you find the mistake?
- What about silicon?





Valences for the major elements of organic molecules

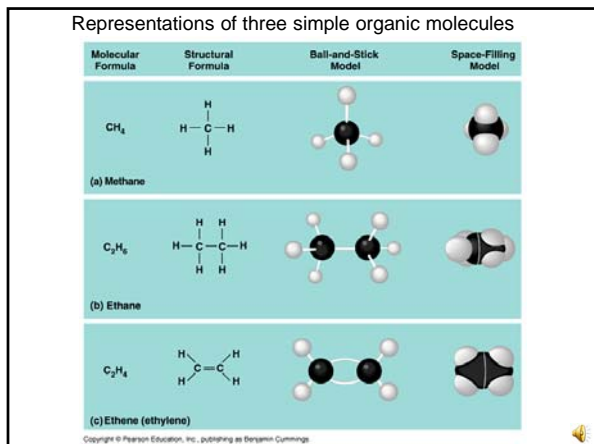


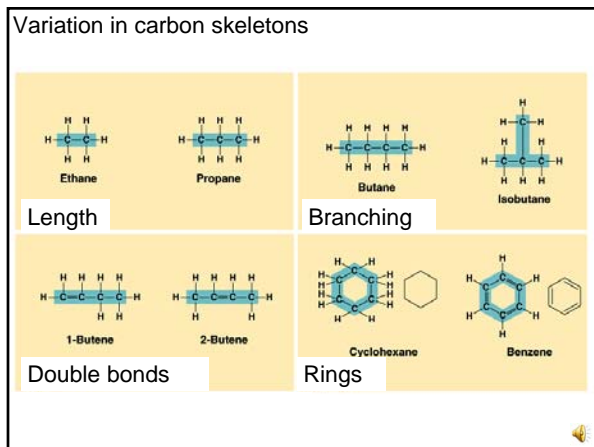
Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

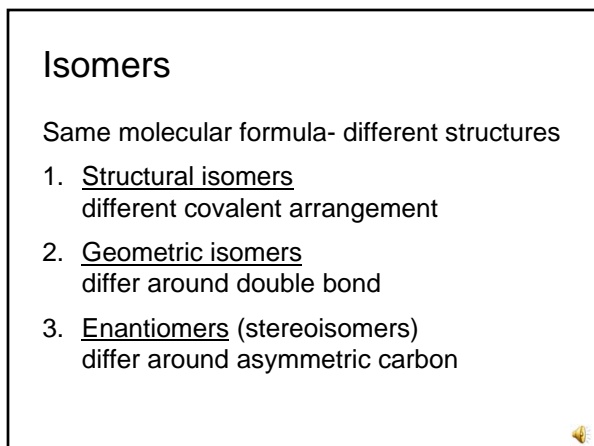
Valence reveals the number of covalent bonds the atom will tend to make

It is the number of shared electrons needed to fill the outermost, or valence, shell

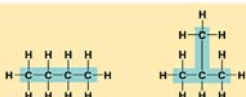


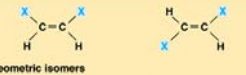


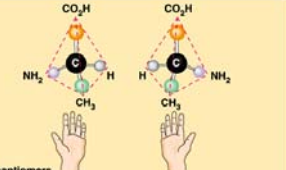


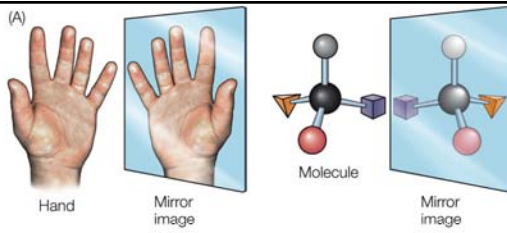


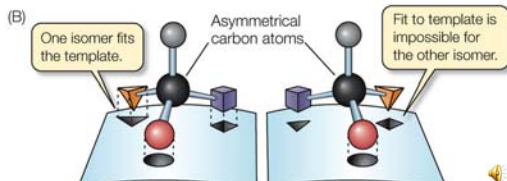
Isomers

(a) Structural isomers

Structural-branching of carbon chain

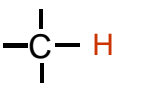
(b) Geometric isomers

Geometric- no rotation around double bonds

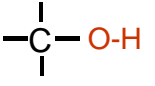
(c) Enantiomers

**Enantiomers-
 -dextral vs. sinister
 -mirror images
 -asymmetric carbon**

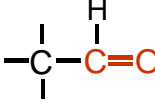
(A)

 Hand Mirror image Molecule Mirror image

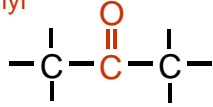
(B)

 One isomer fits the template. Asymmetrical carbon atoms. Fit to template is impossible for the other isomer.

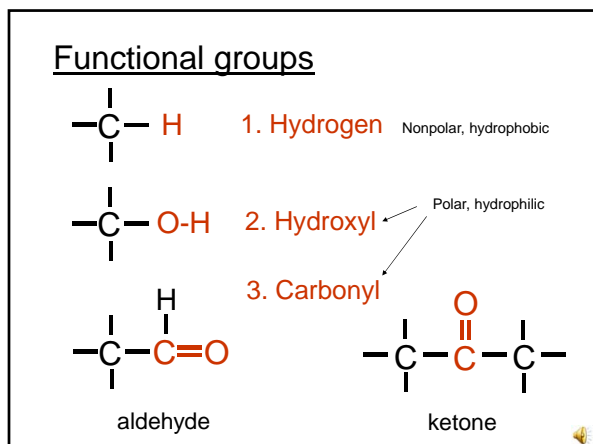
Functional groups

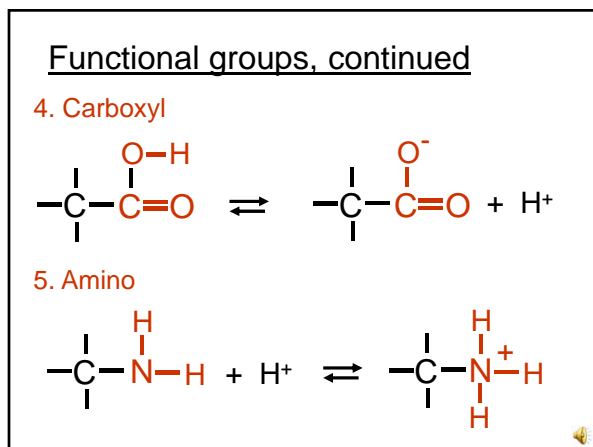

1. Hydrogen

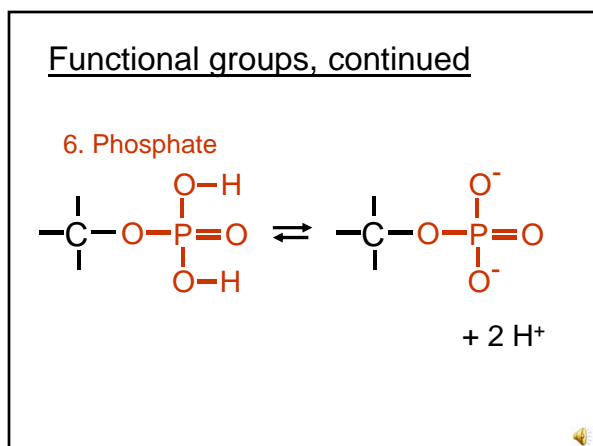

2. Hydroxyl


3. Carbonyl
 aldehyde


 ketone





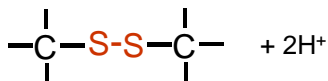


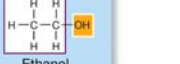
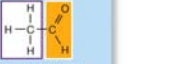
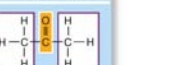
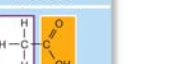
Functional groups, continued

7. Sulfhydryl



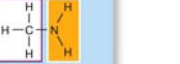
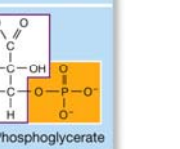
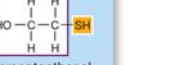
Disulfide bonds can link two organic molecules



Functional group	Class of compounds	Structural formula	Example
Hydroxyl —OH or HO—	Alcohols	R—OH	 Ethanol
Aldehyde —CHO	Aldehydes	R—C(=O)H	 Acetaldehyde
Keto CO	Ketones	R—C(=O)—R	 Acetone
Carboxyl —COOH	Carboxylic acids	R—C(=O)OH	 Acetic acid

LIFE 8e, Figure 3.1 (Part 1)

LIFE: THE SCIENCE OF BIOLOGY, Eighth Edition, © 2007 Sinauer Associates, Inc. and W. H. Freeman & Co.

Functional group	Class of compounds	Structural formula	Example
Amino —NH ₂	Amines	R—NH ₂	 Methylamine
Phosphate —OPO ₃ ²⁻	Organic phosphates	R—O—P(=O)(O ⁻) ₂	 3-Phosphoglycerate
Sulfhydryl —SH	Thiols	R—SH	 Mercaptoethanol

LIFE 8e, Figure 3.1 (Part 2)

LIFE: THE SCIENCE OF BIOLOGY, Eighth Edition, © 2007 Sinauer Associates, Inc. and W. H. Freeman & Co.

- End – intro to organic molecules

