Biochemistry for Nurses

Introduction

- *Definition of Biochemistry*: Biochemistry is the chemistry of biological systems
- Molecules are lifeless but they compose living things
- These molecules are called Biomolecules

Biomolecules

Building block (Monomer)	**Macromolecule (Polymer)**
Amino Acids	Protein
Sugar residues (e.g glucose, sucrose, fructose)	Carbohydrate
Nucleic Acids	DNA, RNA
Glycerol and fatty acids	Lipids

What elements are biomolecules composed of?

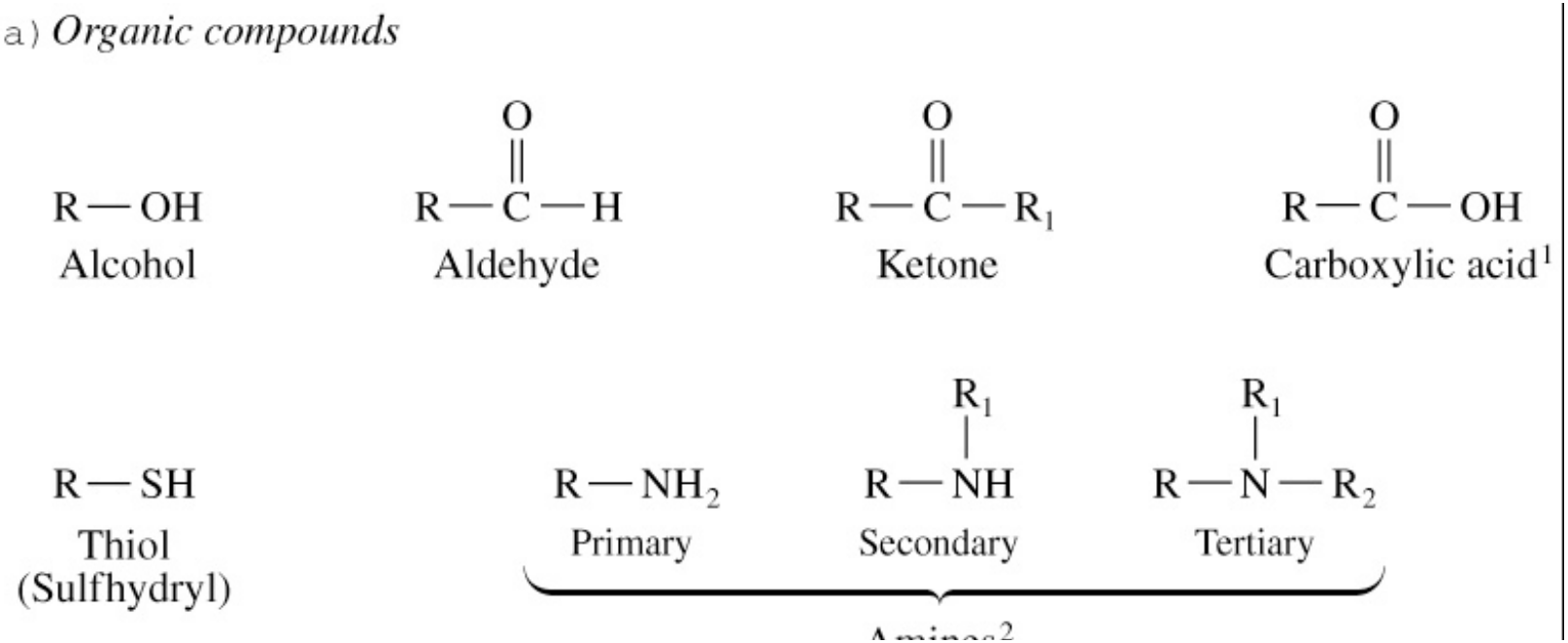
- Biomolecules are composed mainly of six nonmetallic elements: **carbon, oxygen**, **hydrogen**, **nitrogen, phosphorous**, and **sulfur**
- These atoms make up >97% of the weight of most organisms
- These elements can form stable covalent bonds

Points to note:

- Water is a major component of cells
- Carbon is more abundant in living organisms than it is in the rest of the universe

Biomolecules are essentially organic compounds

(a) *Organic compounds*

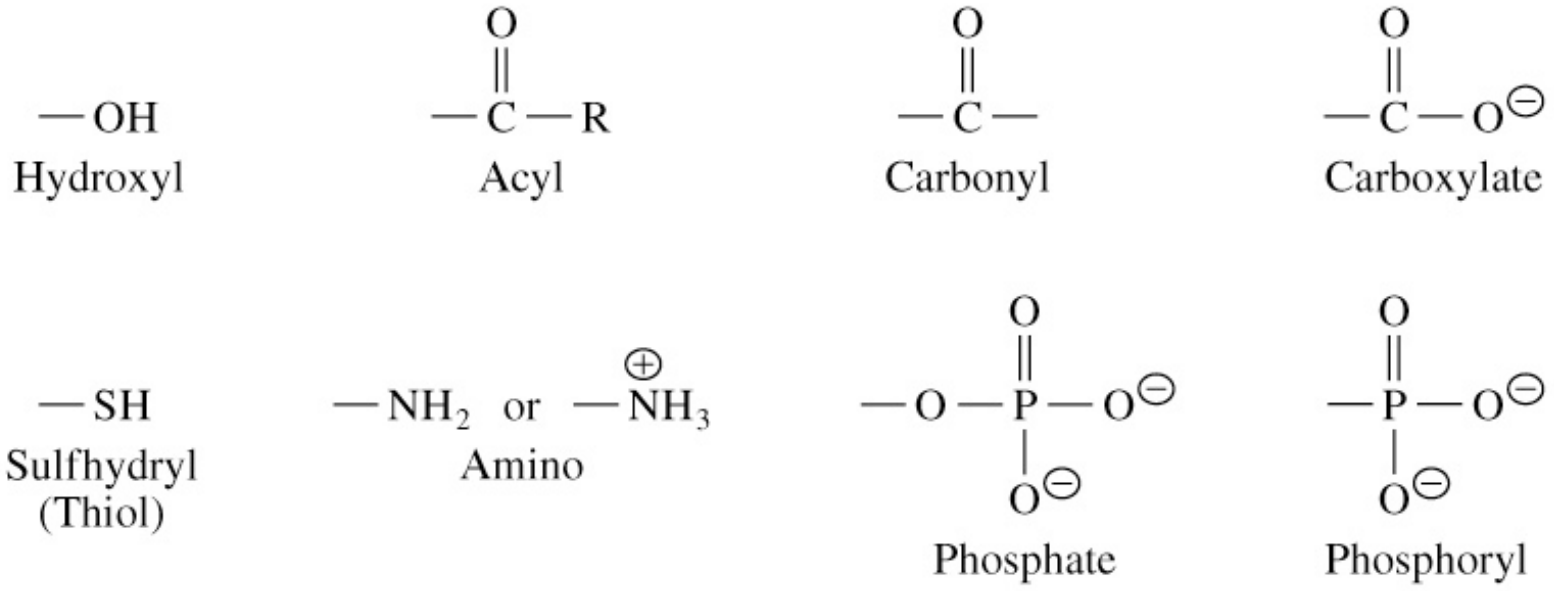


[1] Under most biological conditions, carboxylic acids exist as carboxylate anions: $R-\overset{\overset{O}{\|}}{C}-O^{\ominus}$.

[2] Under most biological conditions, amines exist as ammonium ions: $R-\overset{\oplus}{N}H_3$, $R-\overset{R_1}{\overset{|}{\overset{\oplus}{N}}}H_2$, and $R-\overset{R_1}{\overset{|}{\overset{\oplus}{N}}}H-R_2$.

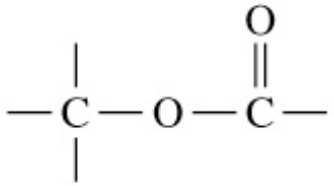
Common functional groups present in biomolecules

(b) *Functional groups*

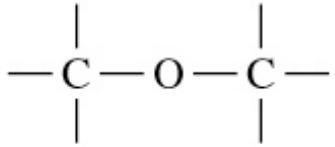


Common linkages present in biomolecules

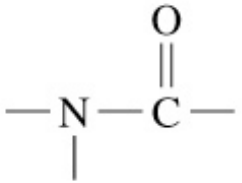
(c) *Linkages in biochemical compounds*



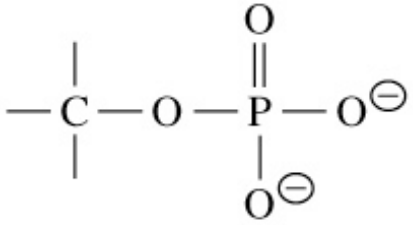
Ester



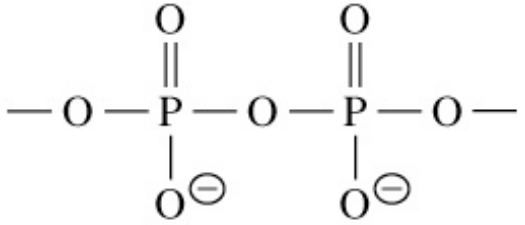
Ether



Amide



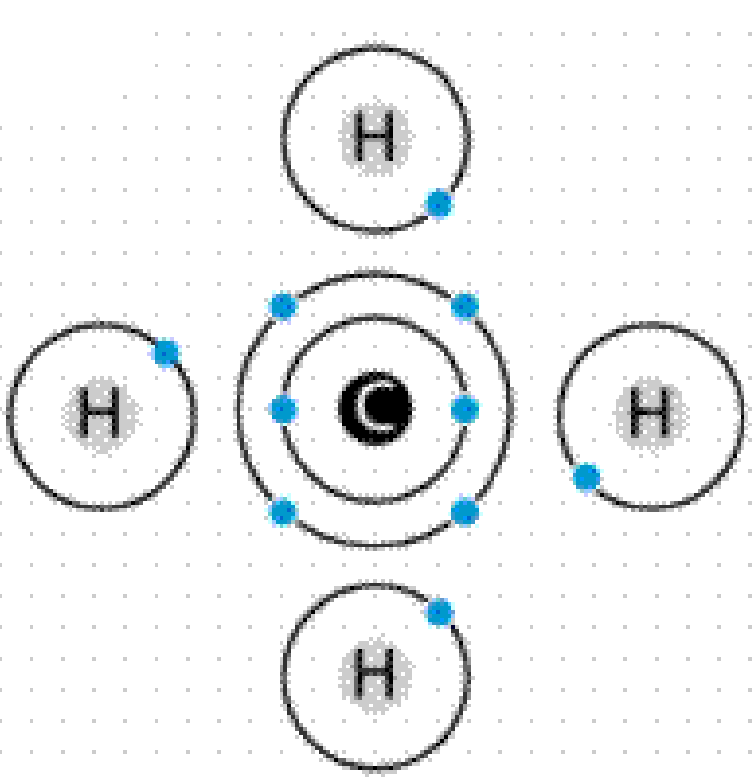
Phosphate ester

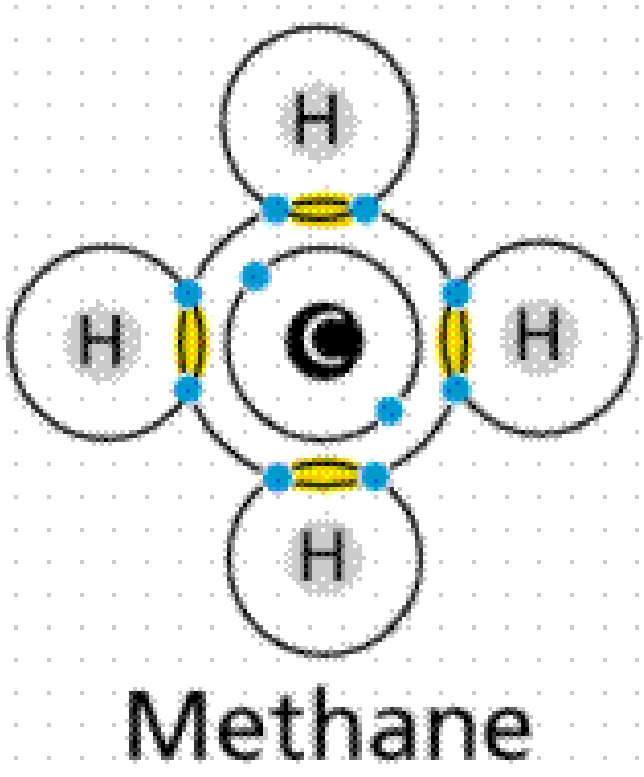


Phosphoanhydride

Why is carbon so predominant in living systems?

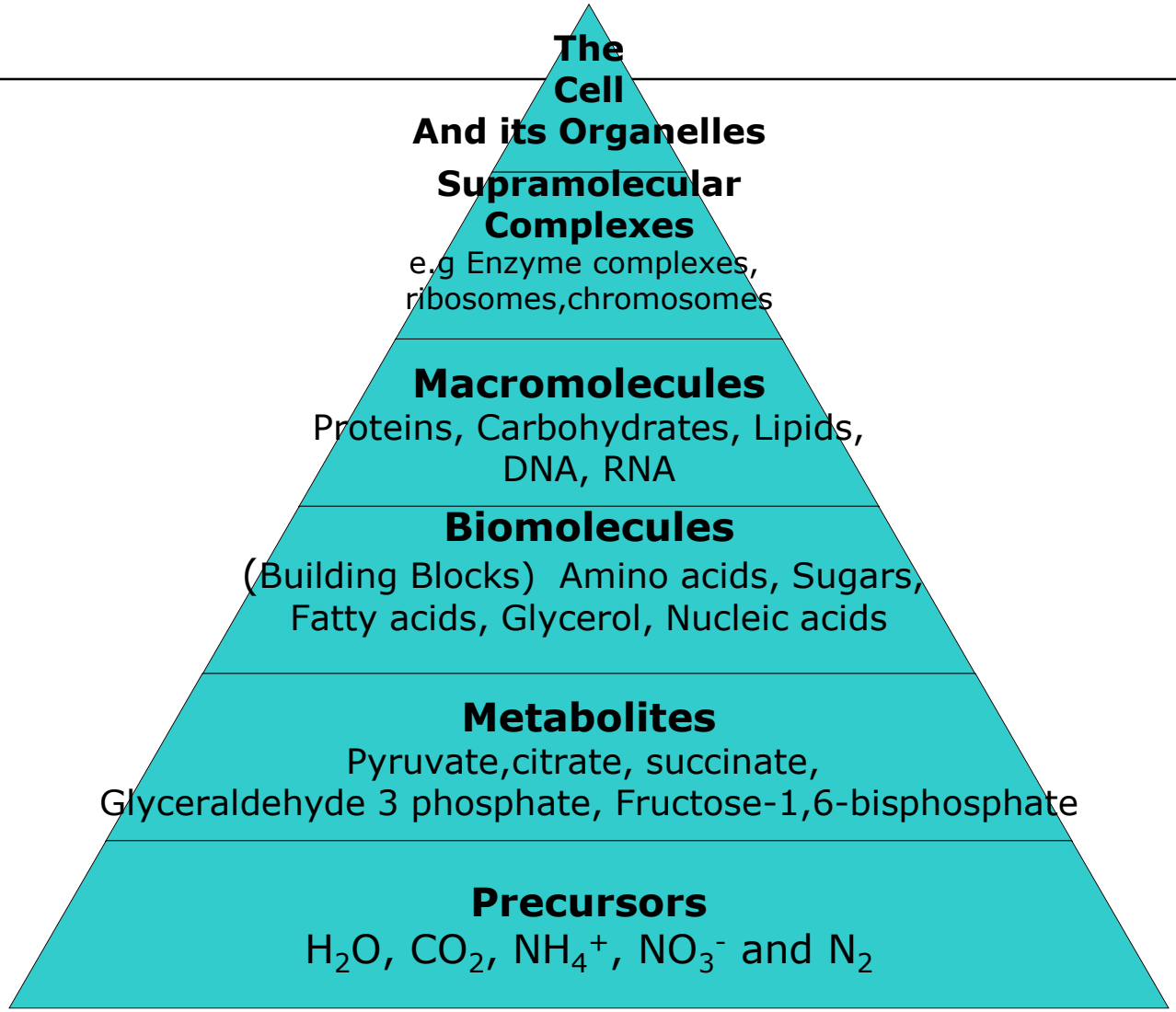
- This is because of the ability of carbon atoms to bond together to form long chains and rings.





Carbon can covalently bond with up to four other atoms.

Hierarchy of Molecular Components in a Cell



References

- Biochemistry (3rd Edition) by Garrett and Grisham
- *acad.erskine.edu/facultyweb/smith/.../**Powerpoint**s/HortonCH1.**ppt***
- *www.passovoy.com/biology/**Biochemistry**-Biomolecules.**ppt***