Atoms and Their Interactions
Chapter 6, Sections 1-3

I. Elements

A. Definition of an element

B. Natural Elements in Living Things

1. _____ elements occur naturally on Earth. Of these, about _____ are essential to living organisms.
2. More than 96% of the mass of the human body is made of 4 elements: _____, _____, _____, _____.
3. Abbreviations for elements

C. Trace Elements

1. Plants get these through the _____.
2. Animals get these through _____.

Table 6.1 Some Elements That Make Up the Human Body

Element	Symbol	Percent By Mass in Human Body	Element	Symbol	Percent By Mass in Human Body
Oxygen	O	65.0	Iron	Fe	trace
Carbon	C	18.5	Zinc	Zn	trace
Hydrogen	H	9.5	Copper	Cu	trace
Nitrogen	N	3.3	Iodine	I	trace
Calcium	Ca	1.5	Manganese	Mn	trace
Phosphorus	P	1.0	Boron	B	trace
Potassium	K	0.4	Chromium	Cr	trace
Sulfur	S	0.3	Molybdenum	Mo	trace
Sodium	Na	0.2	Cobalt	Co	trace
Chlorine	Cl	0.2	Selenium	Se	trace
Magnesium	Mg	0.1	Fluorine	F	trace

D. The Periodic Table

1. The horizontal rows are called _____.
2. The vertical columns are called _____.

II. Atoms: The building Blocks of Elements

A. Definition of an atom

B. The structure of an atom

Name	Charge	Location	Symbol

C. Electron energy Levels

1. Number of energy levels based on the period the element is in: _____

2. Maximum # of electrons per energy level

   1st energy level

   2nd energy level

   3rd energy level

***In general, the number of electrons that an energy level can hold is _____, where n is the number of the energy level.

How many electrons can the 7th energy level hold?

If there were a level that could hold 288 electrons, what energy level would it be?

3. Atomic number

4. Mass number

5. In neutral atoms, _____ = _____.

6. Ions

Fluorine atom

Protons _____ Neutrons _____ Electrons _____

Fluoride ion (F^{-1})

Protons _____ Neutrons _____ Electrons _____

Calcium atom

Protons _____ Neutrons _____ Electrons _____

Calcium ion (Ca^{+2})

Protons _____ Neutrons _____ Electrons _____

III. Isotopes of an Element

A. Definition of an isotope

B. Isotopes of a given element have the same number of _____ and therefore have the same _____ number. However, since they have different numbers of _____, they have different _____ numbers.

C. Compare the number of protons, neutrons, electrons, mass numbers, and atomic numbers for hydrogen-1, hydrogen-2, and hydrogen-3 by filling in the chart below.

Isotope	Protons	Neutrons	Electrons	Mass #	Atomic #
Hydrogen-1					
Hydrogen-2					
Hydrogen-3					

D. Practical Uses of Isotopes – See Fig. 5 on p. 150

1. Diagnosing diseases

2. Treating diseases

IV. Compounds and Bonding

A. Definition of a compound

B. Examples of compounds

C. Covalent Bonds –

1. How are covalent bonds formed?

2. What types of elements form these bonds?

3. What is a molecule?

4. Examples of covalently bonded substances?

SEE FIGURE 9 on p. 152 & FIGURE 10 on p. 153

D. Ionic Bonds

1. How are ionic bonds formed?

2. What types of elements form these bonds?

3. Examples of ionically bonded substances

SEE FIGURE 11 on p. 153

Most compounds in organisms contain _____ bonds. These include _____, _____, _____, and _____.

E. van der Waals Forces

V. Chemical Reactions

A. Metabolism

B. Writing Chemical Equations

C. Why must chemical equations be balanced?

D. Balance the following equations:

1. $Na\ (s) + Cl_2\ (g) \rightarrow NaCl\ (s)$

2. $CO_2\ (g) + H_2O\ (l) \rightarrow C_6H_{12}O_6\ (s) + O_2\ (g)$

VI. Mixtures and Solutions

A. Definition of a Mixture

B. Two types of mixtures

1. Heterogeneous mixtures

2. Homogeneous mixtures (also known as _____)

C. Concentration of solutions & its importance to living things

D. Acids & Bases

1. Fill in the chart below regarding acids & bases

	Ion concentration	Red litmus test	Blue litmus test	pH values
Acidic				
Basic				
Neutral				

2. Importance of acids & bases to living things

VII. Water and Its Importance (see handout)

Life Substances
Chapter 6, Section 4

I. The Role of Carbon in Organisms

A. Each carbon atom has _____electrons for bonding and thus can form _____ bonds that are _____ bonds.

B. So many carbon structures are possible because

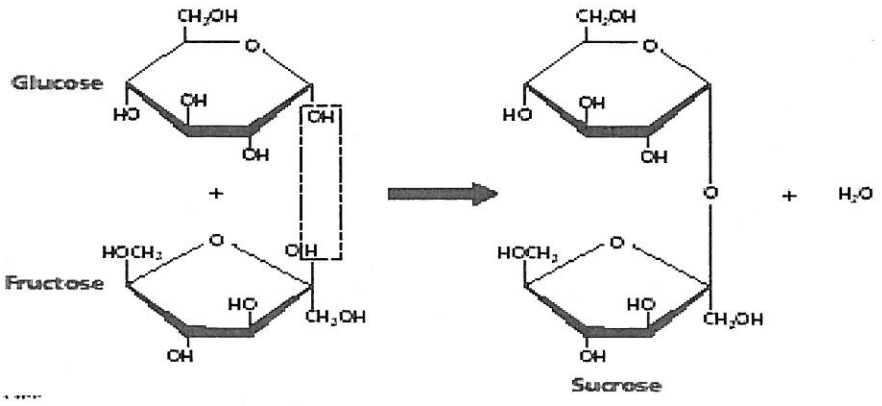
1.

2.

See Fig. 25 on p. 166

C. In addition, some elements combine so they have the same _____ formula but different _____ formulas. Such compounds are called _____.

Examples: _____and _____ have the same simple formula of _____ but the 3-D structures of these differ.

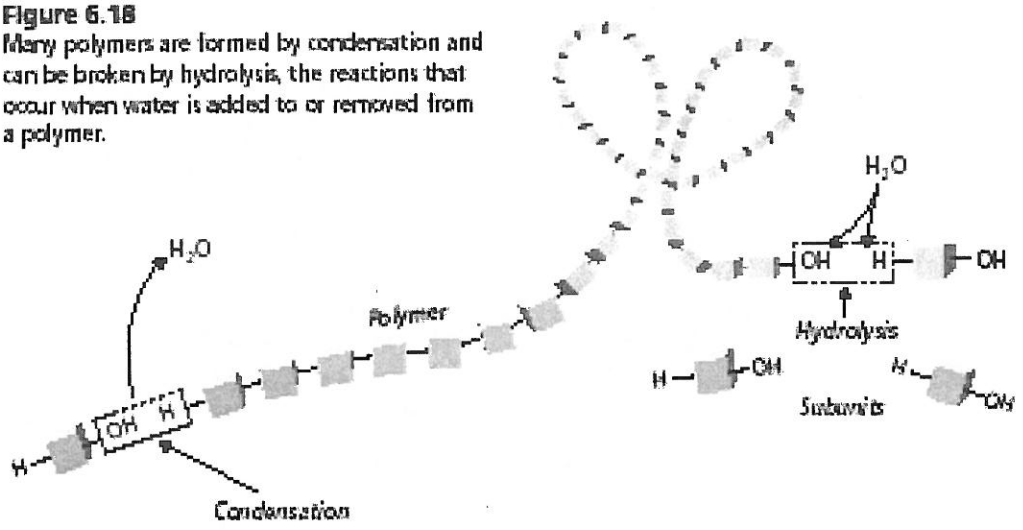


D. Carbon atoms can bond to form compounds with _____, _____, or even _____of carbon atoms. The large molecules are called _____. _____ are one example of these.

E. These large molecules are formed when many smaller molecules are bonded together to form long chains called_____.

F. To form these polymers, a process called _____ occurs. This occurs when one of the smaller molecules contains a –H and the other contains an –OH group. This removes H-OH or _____ from the substance. To break polymers apart, _____is added to the polymer in a process called_____. The prefix _____ means water; the suffix _____**s** means to break apart. Thus, _____literally means to "break something apart by using water".

Figure 6.18
Many polymers are formed by condensation and can be broken by hydrolysis, the reactions that occur when water is added to or removed from a polymer.



II. The Structure of Carbohydrates.

A. Carbohydrates contain____, _____, and _____ in a ratio of _____.

B. Carbohydrates are used by cells to _____. _____.

C. **Monosaccharrides – "Mono-" means _____**

1. Definition –

2. Examples:

D. **Disaccharides – "Di-" means _____**

1. Definition –

2. Examples:

E. **Polysaccharides – "Poly-" means _____**

1. Definition –

2. Examples:

a. **Starch –**

b. **Glycogen –**

c. **Cellulose** –

III. The Structure of Lipids

A. Lipids are commonly called _____ and _____. They contain _____ oxygen that carbohydrates. Because these molecules are _____, they are _____. in water.

B. Functions of Lipids

1.

2.

3.

C. Saturated vs. Unsaturated fats

1. _____fats contain only single bonds and thus have the max. amount of H bonded to the tail.
2. _____fats have double bonds and thus have room for at least one more H atom.

D. Phospholipids

_____form the structure of_____ _____ Lipids are _____which means they do NOT dissolve in water. This allows them to form barriers in biological membranes.

See Figure 28 on p. 169

E. Steroids

_____include _____ and _____.
Cholesterol is often considered "bad" but it forms the basis for forming other lipids, including _____and the hormones _____ and _____.

IV. The Structure of Proteins

A. Proteins are composed of ____, ____, ____, _____, and sometimes ____. The smaller subunits of proteins are called _____ of which there are about _____. These subunits are bonded _____ by bonds called _____ bonds. The kind of protein formed is determined by the _____ and _____ in which these amino acids are connected.

B. Functions of proteins

1.

2.

3.

4.

5.

6.

C. Proteins that speed up chemical reactions are called _____. These are used to speed up reactions in _____ of food, _____ of molecules, and _____ and _____ of energy.

See Figures 29 & 30 on p. 170.

V. The Structure of Nucleic Acids

A. Nucleic acids are biomolecules that are made of smaller subunits called _____. Nucleic acids are made of ____, ____, ____, ____,and ____. The 3 groups that make up a nucleotide are a 1) a _____, 2) a _____ _____ and 3) a _____ group. **See Figure 31 on p. 171.**

B. DNA

This stands for _____. It is the master copy of an organism's _____ code and carries all the information to form all an organism's _____and _____. It determines how the organism looks and acts. It is passed on every time a cell _____ and is also passed on from _____ to _____.

C. RNA

This stands for_____. It is used to form a copy of _____ for use in _____.