

# Biology 20

## Chemistry of Life

### Chemistry:

#### MATTER:

92 Elements that occur in nature.

#### ELEMENT:

Ex. oxygen, gold, copper, carbon

#### COMPOUND:

Ex. salt (NaCl), H<sub>2</sub>O

### ELEMENTS ESSENTIAL TO LIFE: (Table 2.2 on p. 19)

25 of all elements are essential to life:

4 of these make up 96% of all living matter:

- 1.
- 2.
- 3.
- 4.

The remaining 4% include:

1. Phosphorus (P)
2. Sulfur (S)
3. Calcium (Ca)
4. Potassium (K)

The human body:

O, C, H, N, Ca, P, K, S, Na, Cl, Mg.

#### Trace elements:

Ex. Iron (Fe)

### ATOMS (p. 20; Fig. 2.4A)

Atoms consists of subatomic particles:

Particle	Found	~ Weight (Daltons)	Charge

#### Atomic Number:

mass # -> <sup>12</sup>C  
atomic # 6.

#### Atomic weight (or mass number):

Ex. <sup>12</sup><sub>6</sub>C = At. wt => 12 = 6p + 6n

#### Isotope:

Ex. Carbon: 12, 13, 14

<sup>13</sup><sub>6</sub>C => How many neutrons?

Proton?

Electrons?

## Radioactive isotope:

$^{14}_6\text{C} = \quad \Rightarrow 14 = 6p + 8n \Rightarrow$  Radioactive isotope  
Usefulness in science?

Electrons are found in **orbitals** around the nucleus.

SHELLS: 1st = up to  $2e^-$ .

2nd and subsequent shells = up to  $8e^-$ .

OCTET Rule:

**Noble Gases:**

## How do the elements stay together?

### Chemical bonds:

Three types of chemical bonds:

1. Covalent Bond (between elements)
2. Ionic Bond (between elements)
3. Hydrogen Bond (between molecules)

### **COVALENT BOND:** (p. 23, Figure 2.8)

Types of covalent bonds:

H-H  $\Rightarrow$  single covalent bond

O=O  $\Rightarrow$  double covalent bond

N  $\equiv$  N  $\Rightarrow$  triple covalent bond

H<sub>2</sub>O  $\Rightarrow$  compound

How are electrons attracted to another?

### **Electronegativity:**

#### **Non-Polar covalent bond:**

Ex. Oxygen (O<sub>2</sub>), Methane (CH<sub>4</sub>)

#### **Polar covalent bond:**

Occurs when:

Ex. Water (H<sub>2</sub>O) (p. 24; Figure 2.9)

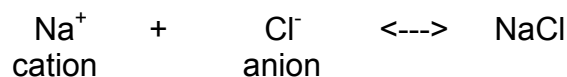
### **IONIC BOND** (p. 23, Fig. 2.7)

**ION:**

**CATION:**

**ANION:**

Ex. table salt (NaCl)



## **HYDROGEN BOND** (p. 24; Figures 2.10A)

Living cells: electronegative atom => O or N

Are weak bonds, therefore easy to break  
IMPORTANCE:

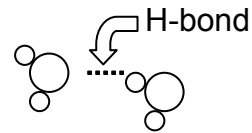
### **WATER AND ITS UNUSUAL PROPERTIES:**

Note: Understand these 5 properties & their significance to life.

Water:

Polar molecule

Hydrogen bonding **BETWEEN** each water molecule



a) **Cohesiveness**  
**cohesion:**

**adhesion:**

**surface tension** (p. 25, fig. 2.11)

b) **High specific heat**

c) **High heat of vaporization**

**Evaporative cooling:**

d) **Density of water** (p. 26; Fig. 2.13)

e) **Versatile solvent** (p.26; Fig. 2.14)

## **pH, acids, bases & buffers**

**Terms:**

**Solution:**

**Solvent:**

**Solute:**

**aqueous solution:**

Ex. kool aid

Dissociation of H<sub>2</sub>O (refers to the separation of H<sub>2</sub>O)



**Chemical equilibrium** = the amount of H<sup>+</sup> is equal to the amount of OH<sup>-</sup>.

