

## Chapter 2 Life's Chemical Basis

### Organization of Matter

- All matter contains \_\_\_\_\_ and \_\_\_\_\_
- The simplest form of matter is an \_\_\_\_\_
- Different types of atoms are called \_\_\_\_\_
- The four most abundant elements in humans are \_\_\_\_, \_\_\_\_, \_\_\_\_, & \_\_\_\_  
(in decreasing order)
- \_\_\_\_\_ elements are found in small but important amounts
- \_\_\_\_\_ have elements in distinct \_\_\_\_\_

### Atomic Structure

- Atoms are made of three particles: \_\_\_\_\_, \_\_\_\_\_, & \_\_\_\_\_
- Protons (p+) are \_\_\_\_\_ charged and are found in the \_\_\_\_\_
- Neutrons (n<sup>o</sup>) are \_\_\_\_\_ charged and are found in the \_\_\_\_\_
- Electrons (e-) are \_\_\_\_\_ charged and are found \_\_\_\_\_ of the nucleus

### Atomic Structure

- Atomic number is the number of \_\_\_\_\_ in the nucleus
- \_\_\_\_\_ is the number of protons + neutrons in the nucleus
- Atomic mass is the \_\_\_\_\_ mass number in a specific element

### Radioisotopes

- Atoms with the same number of protons but different numbers of \_\_\_\_\_ are called \_\_\_\_\_

- Radioactive isotopes usually \_\_\_\_\_ at a predictable rate into more \_\_\_\_\_ atoms
- Radioisotopes may be useful in \_\_\_\_\_ testing or determining \_\_\_\_\_ of organic matter

### Atomic Bonds

- A chemical bond is a union between two atoms involving \_\_\_\_\_
- Electrons are attracted to protons, but \_\_\_\_\_ by other electrons
- \_\_\_\_\_ permit electrons to stay as close to the \_\_\_\_\_ and as far from other electrons as possible
- Each orbital contains up to \_\_\_\_\_ electrons
- Atoms with unfilled \_\_\_\_\_ orbitals tend to \_\_\_\_\_ with other atoms

### Ionic Bonds

- If an atom loses or gains electrons, it becomes charged (an ion)
- Ionic bonds are attractions between ions of opposite charges
- Example:  $\text{Na}^+$  ionically bonds with  $\text{Cl}^-$

### Covalent Bonds

- If two atoms \_\_\_\_\_ a pair of electrons, they are held together by a \_\_\_\_\_ bond
- \_\_\_\_\_ covalent bonds result if the sharing of electrons is \_\_\_\_\_
- In a \_\_\_\_\_ covalent bond, because the atoms share the electrons \_\_\_\_\_, there is a slight difference in charge between the two \_\_\_\_\_ of the bond (example: \_\_\_\_\_)

## Hydrogen Bonding

- In a hydrogen bond, an atom or molecule interacts \_\_\_\_\_ with a hydrogen atom that is already in a \_\_\_\_\_ covalent bond
- Hydrogen bonds are extremely important in the behavior of liquid \_\_\_\_\_, the stability of \_\_\_\_\_ acids, and give structure to other \_\_\_\_\_ molecules

## Properties of Water

- Water is a \_\_\_\_\_ molecule with oxygen containing a slight negative charge, and each \_\_\_\_\_ slightly positive
- Water molecules form \_\_\_\_\_ bonds with each other
- Other polar substances are called \_\_\_\_\_ (water-loving), while nonpolar substances are \_\_\_\_\_ (water fearing)

## Properties of Water

- Water has several \_\_\_\_\_ but important properties
- Water stabilizes \_\_\_\_\_
- Water is \_\_\_\_\_ and \_\_\_\_\_
- Water is an excellent \_\_\_\_\_
- \_\_\_\_\_ !!!

## Acids & Bases

- Acids are substances that release \_\_\_\_\_
- Bases release \_\_\_\_\_ or take in  $H^+$
- The pH scale measures  $H^+$  \_\_\_\_\_: neutral substances have a pH of \_\_\_\_\_
- pH values below 7 are acids, the \_\_\_\_\_ values are stronger acids
- pH values above 7 are bases, the higher values are \_\_\_\_\_ bases

## Acids & Bases

- Most organisms have an \_\_\_\_\_ pH of about 7
- \_\_\_\_\_ are molecules that combine with or release  $H^+$  ions to prevent major \_\_\_\_\_ in pH
- \_\_\_\_\_ acid is an important human buffer

## Acids & Bases

- A \_\_\_\_\_ is an ionic compound that is formed when an acid combines with a \_\_\_\_\_
- Example:  $NaOH + HCl \rightarrow$  \_\_\_\_\_ +  $HOH$
- Salts \_\_\_\_\_ into useful ions such as  $Na^+$  or  $Ca^{2+}$  in body fluids