**CHEMISTRY**

**CHAPTER 2**

1. **Introduction**
2. **Matter**

* term that describes anything that has mass and takes up space

1. **Chemistry**

* the study of the smallest forms of matter and their interactions
* primarily the study of atoms and molecules

**II. Atoms and Elements**

1. **Atoms**

* atoms are the smallest units of matter that have unique properties
* they are extremely small
* they are composed of smaller components called subatomic particles
* there are around 90 different kinds of naturally-occurring atoms in the universe; these

varieties are known as the elements

**B. Elements**

* + - a way to identify the type of atom in question
    - each of the approximately 90 naturally-occurring elements has been given a name

and a chemical symbol (abbreviation) to help identify atoms

* + - the elements are organized & listed in The Periodic Table of Elements (Appendix A)
    - each element has unique properties that distinguish it from the others
    - the most abundant and significant elements in the human body include carbon,

oxygen, hydrogen, nitrogen, phosphorus, calcium, potassium, sodium, and iron

**III. Atomic Structure**

1. **Subatomic Particles**

* objects that can combine in a variety of quantities to create an atom
* there are three kinds of subatomic particles: protons, neutrons, and electrons

1. **Protons**

* possess a positive electrical charge
* are always found in the very center of an atom called the nucleus
* have a mass of 1 atomic mass unit (1 a.m.u. or 1 unit)

**2. Neutrons**

* possess no electrical charge
* are also always found within the atomic nucleus
* also have a mass of 1 unit

**3. Electrons**

* possess a negative electrical charge
* are found orbiting the atomic nucleus at the speed of light
* have no significant mass

1. **Atomic Number and Atomic Mass**

**1. Atomic Number**

* in addition to being assigned a name and symbol, each element is assigned a unique

number that corresponds with how many protons its atoms will always have; this number is called the atomic number

**2. Atomic Mass**

* the atomic mass for an atom is equal to the sum of the number of protons and

neutrons that is has

**IV. Electron Location**

**A. Energy Levels**

* electrons orbit an atom’s nucleus at specific distances called energy levels
* there are 7 possible distances (levels) at which electrons can be found orbiting
* electrons prefer to orbit in the lowest energy level possible (closest to the nucleus)
* each level can hold a specific maximum of electrons before it is considered full

Level 1 can hold up to 2 electrons

Level 2 can hold up to 8 electrons

Level 3 can hold up to 18 electrons, but only 8 of these are significant

Levels 4-7 can hold up to 8 significant electrons

**B. Valence Electrons**

* + - valence electrons are the electrons found in an atom’s outermost energy level
    - if Level 1 is an atom’s outermost level, it can have up to 2 valence electrons
    - if Levels 2-7 are the outermost energy level, they can have up to 8 valence electrons

**V. Neutrality and Stability**

**A. Neutrality**

* + - an atom is considered neutral if it has no overall electrical charge
    - this occurs when an atom has an equal number of protons and electrons

**B. Stability**

* + - an atom is considered stable if it has a full outermost energy level
    - atoms can become stable by gaining or losing electrons or by sharing electrons with

other atoms

**VI. Ions**

**A. Definition**

* + - ions are any atoms that have an overall electrical charge
    - they develop this charge by either gaining or losing electrons

**B. Types**

1. **Cations**
   * + atoms that have lost electrons develop a positive charge and are called cations

**2. Anions**

* + - * atoms that have gained electrons develop a negative charge and are called anions

**VII. Molecules and Bonds**

**A. Molecules**

**B. Types**

1. **Ionic Bonds**
2. **Covalent Bonds**
3. **Hydrogen Bonds**

**VIII. Electrolytes**

**IX. Solutions and Solutes**

**X. Acids, Bases, and pH**

**A. Acids**

**B. Bases**

1. **pH**
2. **pH Scale**

**XI. Organic Compounds**

1. **Carbohydrates**
2. **Composition**
3. **Roles**
4. **Types**
5. **monosaccharides**
6. **disaccharides**
7. **polysaccharides**
8. **Lipids**
9. **Composition**
10. **Roles**

1. **Types**
2. **fatty acids**
3. **triglycerides**
4. **phospholipids**
5. **steroids**
6. **Proteins**

**1. Composition**

**2.** **Roles**

**3.** **Types**

**a.** **amino acids**

**b. peptides**

**c. proteins**

1. **Nucleic Acids**
2. **Roles**
3. **Types**

**E. ATP**

**1. Composition**

1. **Roles**