**Chapter 3 Elements and Atoms**

**3-1 What are Elements?**

**Elements-** substances that cannot be broken down into simpler substances.

-there are more than 100 known elements; most are solid at room temp.

-92 of the known elements are found in nature, the rest have been created by scientists (examples of elements; hydrogen, carbon, helium, gold, copper, mercury etc)

**3-2 What are atoms?**

**Atom-**smallest part of an element that can be

 identified as that element.

 -scientists contributing to our modern

 theory of atoms; Democritus, Dalton,

 Rutherford, Thomson, Bohr

**3-3 What are the parts of an atom?**

* An atom has a center or core called a nucleus
* Located in the nucleus are protons and neutrons

 -Protons have a positive charge

 -Neutrons have no charge, they are neutral

* Located in Energy Levels around the nucleus are particles called electrons (Sometimes these energy levels are called shells, orbitals or energy clouds)

 -Electrons have a negative charge

**3-4 What is an atomic number?**

\*Each element on the periodic table has an

atomic number. This is the whole number located in the box with the symbol of the element. For example, Oxygen (O) has an atomic number of 6.

**atomic number =** number of protons in an atom

 of that element and…….

**atomic number =**number of electrons in an atom

 of that element

**3-5 What is an atomic mass**

**Atomic Mass-**the total mass of the protons and neutrons in an atom.

This is measured in atomic mass units (amu)

 ***Atomic Mass = # Protons + # Neutrons***

**Therefore because the atomic number is the same as the number of protons………**

Atomic Mass – Atomic Number = # Neutrons

**Example;**

How many neutrons does an atom of Lithium (Li) usually have?

**Atomic Mass – Atomic Number = # Neutrons**

 **6.9 - 3 = 4**

 **(Round the 6.9 to 7)**

\*On a periodic table, the atomic mass is the number with a decimal point. This is because atoms of the same element sometimes have different numbers of neutrons. The atomic mass is an average, which results in a number with decimals.

**3-6 How are Electrons arranged in an atom?**

-Remember electrons are negatively charged and the number of electrons an element has is equal to the atomic number.

-Electrons are located in energy levels around the nucleus of an atom.

-Each energy level can hold a certain number of electrons

-The closest energy level to the nucleus is the first, or lowest energy level. It can hold up to 2 electrons.

-The second energy level can hold up to 8 electrons

-The third energy level can hold up to 18

 Electrons

-Electrons fill up the lower energy level first.

-The electrons in the outer energy level are called valence electrons. It is these electrons that are involved with chemical bonding.

-Bohr diagrams show the electron arrangement, or configuration.

 **Bohr diagram of carbon…………**

**3-7 Periodic Table**

-Chemical symbols are used to depict elements

 symbols are usually one or two, sometimes

 three letters

-Dmitri Mendeleev in 1869 developed a list of elements by increasing atomic mass

-In our modern periodic table, elements are arranged in columns (groups) and

 rows (periods)

-Periodic table allows us to predict how atoms

of elements will combine.

# 3-8 Metals and Nonmetals

-Dark zigzag line running along the right side

 of the table separates the metals and nonmetals

-Elements to the left of the line (except H) are metals. Elements to the right are nonmetals.

**Metals are;**

 **Malleable-** can be hammered into sheets

 **Ductile-**can be bent and made into wires

 Are shiny and reflect light… luster

Most metals are good conductors of electricity. Copper wire is used for electricity

**Nonmetals are;**

-dull and brittle.

 -poor conductors of electricity and heat

 -can be solids, liquids or gasses at room temperature

**3.9 What are the halogens and the noble gases?**

-Group 17 contains the five elements that make up the halogens (F, Cl, Br, I, At)

-In element form, all halogens are poisonous and burn the skin.

-Fortunately, they do not occur free in nature

-When the halogens combine, they form very useful compounds such as table salt and fluoride to prevent tooth decay

**Noble Gases**

- Group 18, all are gases

 (He, Ne, Ar, Kr, Xe, Rn)

-Used in neon signs, helium balloons

**3.10 What are isotopes?**

-Isotopes are atoms of the same element with different atomic masses…..this is because they have a different number of neutrons in their nucleus

\*Remember the atomic mass on the periodic

 table is the average of the masses of all of the isotopes of that element.

Example; H-1…has 0 neutrons, 1 proton

H-2…has 1 neutron, 1 proton

H-3…has 2 neutrons, 1 proton