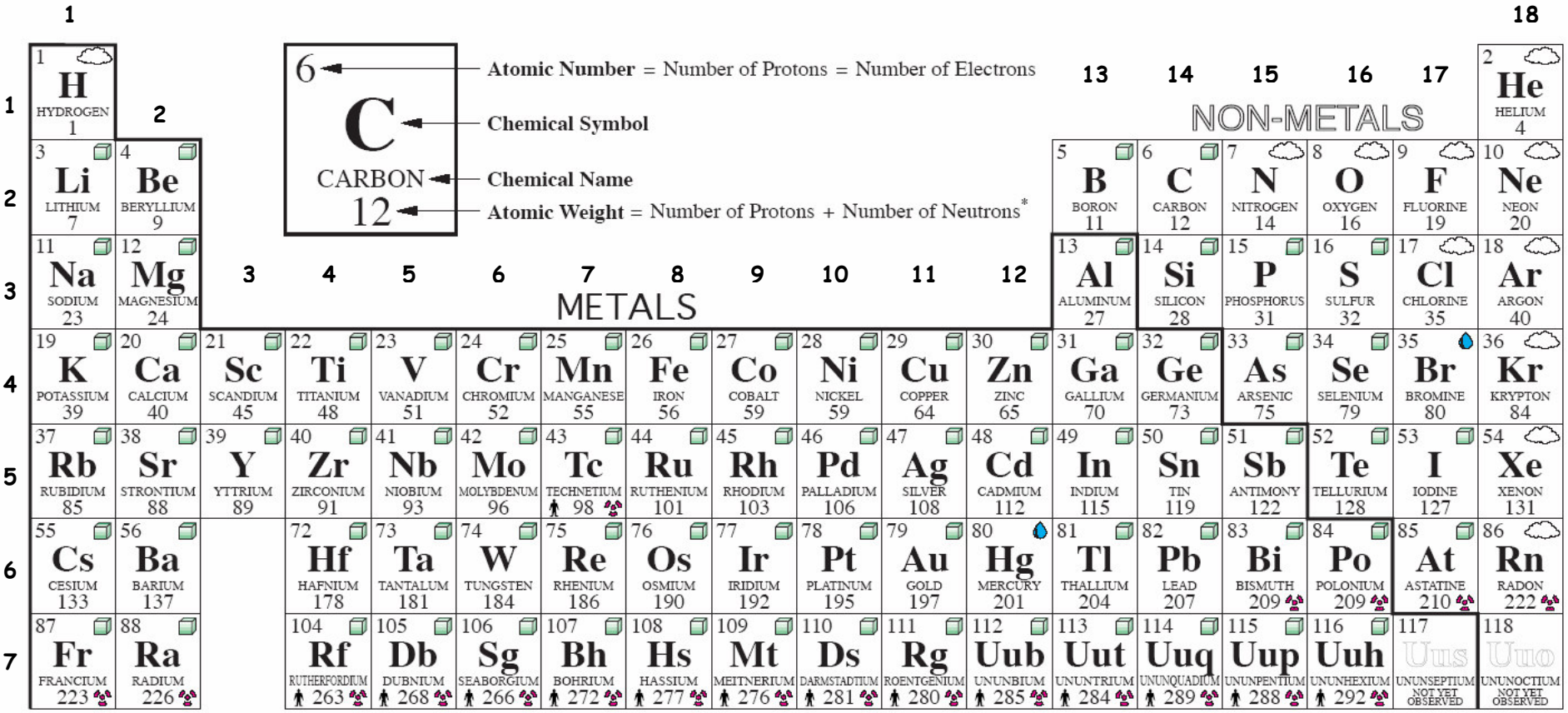
The Periodic Table of Elements



KEY

- = Solid at room temperature
- = Liquid at room temperature
- = Gas at room temperature
- = Radioactive
- = Artificially Made

* The atomic weights listed on this Table of Elements have been rounded to the nearest whole number. As a result, this chart actually displays the **mass number** of a specific isotope for each element. An element's complete, unrounded atomic weight can be found on the It's Elemental web site: http://education.jlab.org/itselemental/index.html

I. Design of the Periodic Table

A. Columns in the Periodic Table

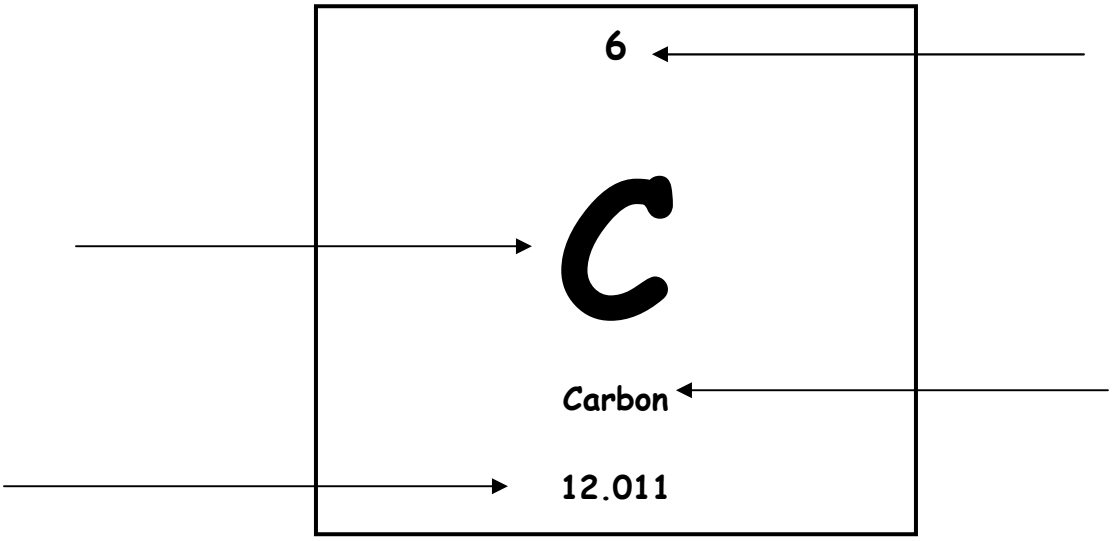
1. <u>Groups or Families</u> – elements within the same group or family have similar but not identical properties .

i.e. Lithium (Li), Sodium (Na), Potassium (K), and other members of family 1 are soft, white shinny metals. They are all highly reactive elements, which means they readily combine with other elements to form compounds.

B. Rows in the Periodic Table

1. <u>Period</u> – unlike elements in the same family, elements in the same period are not alike in properties. The properties of the elements change greatly across any given row.

C. Element Key



D. Properties of the Elements

1. Metals

a. Physical Properties

Luster, Ductile, Malleable

Define:

Luster –

Ductile –

Malleable –

b. Chemical Properties

Corrosion –

2. Nonmetals

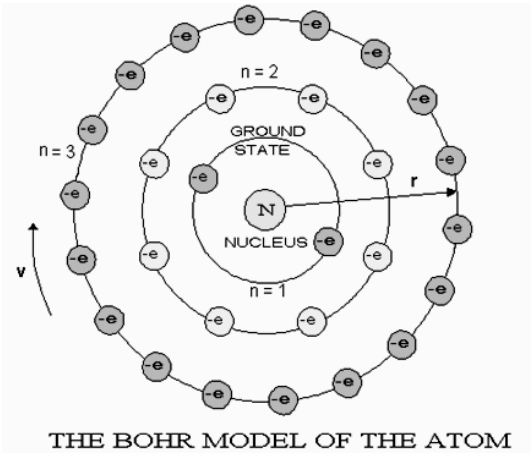
a. Physical Properties

b. Chemical Properties

3. Metalloids

II. Chemical Bonding

A. Valence Electrons and Energy Levels



1st Energy Level = _____

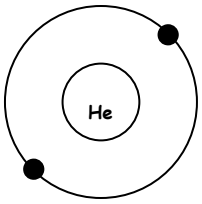
2nd Energy Level = _____

3rd Energy Level = _____

1. Valence Electrons –

2. Fill in the missing energy levels and indicate the number of electrons at each energy level. State the number of valance electrons in the outermost energy level.

Ex.



Valence Electrons = _____

Energy Levels = _____

Valence Electrons = _____

Energy Levels = _____

Valence Electrons = _____

Energy Levels = _____

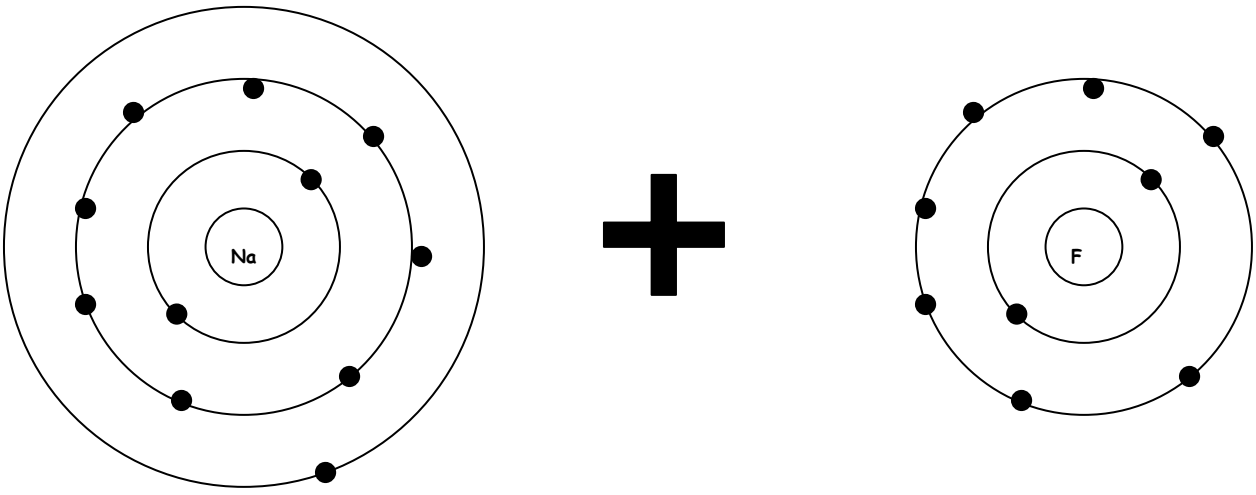
Valence Electrons = _____

Energy Levels = _____

B. Electrons and Bonding

1. The electron arrangement of the outermost energy level of an atom determines whether or not the atom will form chemical bonds. All atoms want to achieve stability; an atom will either gain or lose electrons to complete its outermost energy level. One atom will bond with another atom if the bonding gives both atoms complete outermost energy levels.

a. Ionic Bonds



# of Valance Electrons = _____

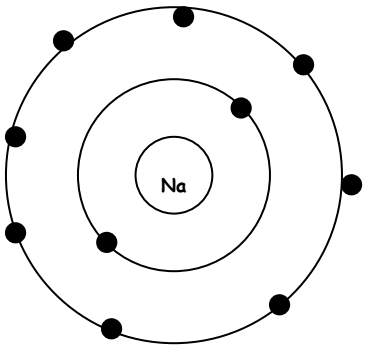
# of Total Electrons = _____

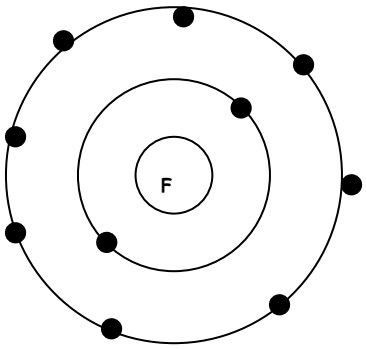
# of Protons = _____

# of Valance Electrons = _____

# of total Electrons = _____

# of Protons = _____





# of Valance Electrons = _____

# of Total Electrons = _____

# of Protons = _____

# of Valance Electrons = _____

# of total Electrons = _____

# of Protons = _____

State an observation about what happened to each atom when they formed a bond with one another.

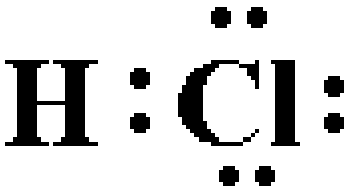
b. Define:

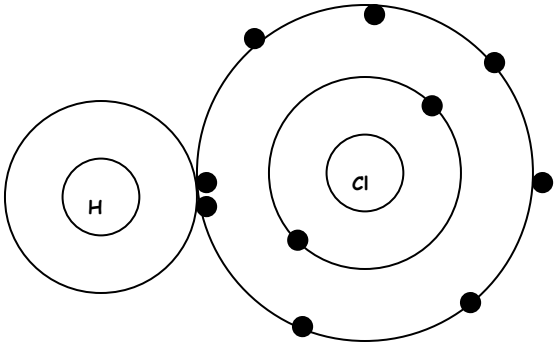
Ionic Bond –

Ion –

Ionization –

2. Covalent Bonds





State an observation about what happened to each atom when they formed a bond with one another.

a. Define:

Covalent Bond –

Electron-dot diagram –

Create electron-dot diagrams for the following elements:

C H Cl F O N

III. Predicting Bonds

The number of electrons an atom gains, loses or shares when it forms chemical bonds is called its oxidation number. The oxidation number of an atom describes its combining capacity.

Rule #1 – The sum of the oxidation numbers of the atoms in a compound must be zero.

Oxidation Numbers:

Na = 1+ Mg = 2+ Cl = 1-

a. How many sodium atoms are needed to bond with 1 atom of chlorine?

b. What would the chemical formula be for this compound?

c. How many chlorine atoms are needed to bond with 1 atom of magnesium?

d. What would the chemical formula be for this compound?

e. What are the oxidation numbers for the following elements?

C = _____ F = _____ O = _____ N = _____