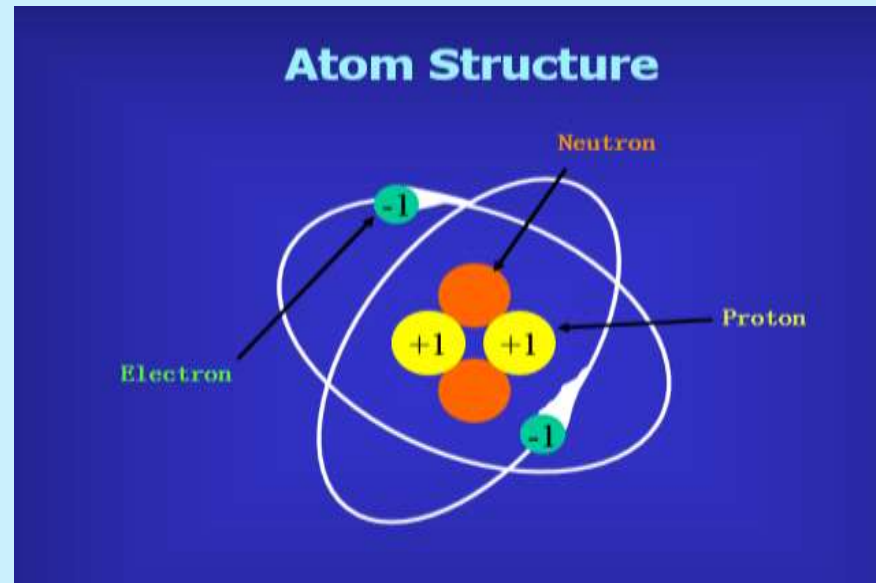


# ATOMS, ELEMENTS, MOLECULES, AND COMPOUNDS



# ATOMS

- Basic building block of all matter

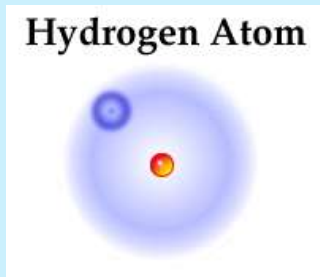


# ELEMENTS

Elements contain one or more of the same type of atom!



Examples include:



Hydrogen Atom

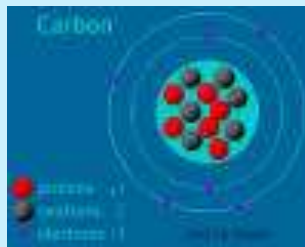
Hydrogen – 1 proton per atom

Carbon – 6 protons per atom

Oxygen – 8 protons per atom

Copper – 29 protons per atom

Gold – 79 protons per atom



Carbon



# MOLECULES

- Molecules of an element are composed of identical atoms
- For example, an oxygen molecule ( $O_2$ ) consists of two oxygen atoms and a nitrogen molecule ( $N_2$ ) consists of two nitrogen atoms
- $O_2$  and  $N_2$  are called diatomic molecules because both are composed of only two atoms
- There are 7 diatomic molecules:
  - Hydrogen ( $H_2$ )
  - Nitrogen ( $N_2$ )
  - Oxygen ( $O_2$ )
  - Fluorine ( $F_2$ )
  - Chlorine ( $Cl_2$ )
  - Iodine ( $I_2$ )
  - Bromine ( $Br_2$ )



# TO REMEMBER THE DIATOMIC MOLECULES

- Use the mnemonic device: **I Bring Clay For Our New Home:**
- **I** = Iodine
- **Bring** = Bromine
- **Clay** = Chlorine
- **For** = Fluorine
- **Our** = Oxygen
- **New** = Nitrogen
- **Home** = Hydrogen



# COMPOUND MOLECULES

- Compound molecules are formed when atoms of different elements combine chemically in specific proportions
- For example, carbon dioxide (CO<sub>2</sub>) consists of one carbon (C) atom and two oxygen (O) atoms.
- The ratio by number of atoms present in the compound molecule of carbon dioxide is C:O = 1:2



# SUBSCRIPT

- $\text{CO}_2$  (carbon dioxide)
  - The subscript tells us the number of atoms present in the molecule.
  - If there is only one atom of an element present in the compound, it is designated by the element's symbol without subscript (C)
  - The subscript 2 following the O tells us there are two oxygen molecules
- $\text{H}_2\text{O}$  (water)
  - Two hydrogen atoms and one oxygen
- $\text{NaCl}$  (table salt)
  - One atom of sodium (Na) and one atom of chlorine (Cl)
- $\text{C}_6\text{H}_{12}\text{O}_6$  (glucose/sugar)
  - Six atoms of carbon (C) twelve atoms of hydrogen (H) and six atoms of oxygen (O)



# ONE AND MORE THAN ONE MOLECULE OF A COMPOUND

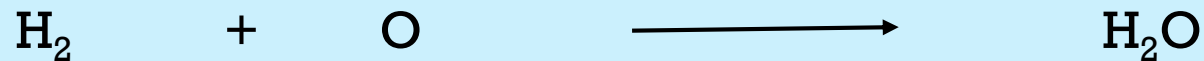
- If there is only one molecule of the compound no numbers are written before the symbolic representation.
  - $\text{H}_2\text{O}$  means there is only one molecule of water
- If there is a number before the symbolic representation, it shows you the number of molecules present
  - $2\text{H}_2\text{O}$  means there are two molecules of water
  - $5\text{H}_2\text{O}$  means there are five molecules of water
  - $12 \text{NaCl}$  means there are twelve molecules of salt





# WRITING CHEMICAL FORMULAS

- A chemical formula of a compound is the symbolic representation of the atoms of which the compound is made
- An arrow is used to show what new substance is formed
- To write a chemical formula you need to know the symbol and number of atoms in the chemical equation
- Water



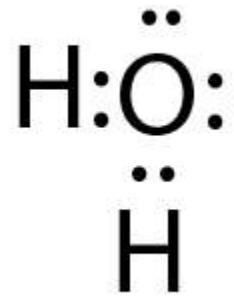
(two Hydrogens) + (one oxygen) yields(equals) one molecule of water

Written As:



# LEWIS DOT DIAGRAMS

Water



Carbon Dioxide



Hydrochloric Acid

