

# Atomic Structure Worksheet

**Objectives:**

- Be able to explain the:
  - postulates of Dalton's atomic theory
  - laws of Multiple Proportions & Definite Composition
- Be able to list the subatomic particles for atoms and ions and relate them to the periodic chart

1. What are the 5 postulates of Dalton's Atomic Theory?
2. Fill out the chart for the 3 particles that comprise the atom.

Particle	Charge	Mass	Location

3. What is the Law of Definite Composition? What is the Law of Multiple Proportions? Use water and hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) to illustrate these laws.
4. Ions are formed by the loss or gain of \_\_\_\_\_ by an atom.

	Charge of ion	Name of this type of ion
Gain:		
Loss:		

5. Isotopes are atoms of an element that have same number of \_\_\_\_\_ and \_\_\_\_\_ but different number of \_\_\_\_\_.



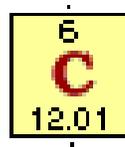
6. Label the Isotopic Notation

	What is it?	Equal to what (particles)?
E		
A		
Z		

7. Fill in the chart

Isotope	# protons	# neutrons	# electrons
Silicone-29			
Copper-63			
<sup>37</sup> <sub>17</sub> Cl			
<sup>235</sup> <sub>92</sub> U			

8. What is an atomic mass unit?
9. What is the meaning of the mass value given in the periodic chart?  
(what does 12.01 really mean?)



## Answers

- Dalton's Atomic Theory
  - Elements are composed of minute indivisible particles called atoms.
  - Atoms of the same element are alike in mass and size.
  - Atoms of different elements have different masses and sizes.
  - Chemical compounds are formed by the union of two or atoms of different elements.
  - Atoms of two elements may combine in different ratios to form more than one compound.

2.

Particle	Charge	Mass	Location
Proton	+1	1 amu	nucleus
Electron	-1	<<<1	outer
Neutron	neutral	1 amu	nucleus

- The Law of Definite Composition - A compound always contains two or more elements chemically combined in a definite proportion by mass.
  - The percent by mass of hydrogen in water is 11.2%.
  - The percent by mass of oxygen in water is 88.8%.
  - Water always has these percentages. If the percentages were different, the compound would not be water.

The Law of Multiple Proportions - Atoms of two or more elements may combine in different ratios to produce more than one compound.

- The formula for water is H<sub>2</sub>O, the formula for hydrogen peroxide is H<sub>2</sub>O<sub>2</sub>.
- Hydrogen peroxide has twice as many oxygens per hydrogen atom as does water.

$$\frac{\text{mass of oxygen in hydrogen peroxide}}{\text{mass of oxygen in water}} = \frac{16\text{g}}{8\text{g}} = \frac{2}{1}$$

- Ions are formed by the loss or gain of electrons by an atom.

	Charge of ion	Name of this type of ion
Gain:	negative	Anion
Loss:	positive	Cation

- Isotopes are atoms of an element that have same number of protons and electrons but different number of neutrons

- Isotopic Symbol  ${}^A_Z\text{E}$

	What is it?	Equal to what?
E	Element	
A	Mass #	Protons & neutrons
Z	Atomic #	Protons

- Fill in the chart

Isotope	# protons	# neutrons	# electrons
Silicone-29	14	15	14
Copper-63	29	34	29
${}^{37}_{17}\text{Cl}$	17	20	17
${}^{235}_{92}\text{U}$	92	143	92

- 1 amu is defined as exactly equal to 1/12 the mass of a carbon-12 atom
- The listed atomic mass of an element is the average relative mass of the isotopes of that element compared to the mass of carbon-12 (exactly 12.0000 amu).