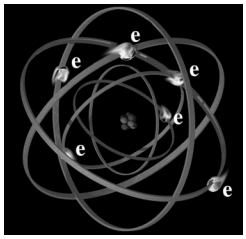
Atomic Structure



Early Theories of Matter

- Science as we know it did not exist several thousand years ago

Democritus (460-370 BC)

Democritus' Theory

1. Matter is composed of _____ through which atoms move
2. Atoms are solid, _____ , indestructible, and indivisible
3. Different atoms have different _____ and _____
4. The differing properties of matter are due to the size, shape, and movement of _____
5. Changes in matter result from changes in the _____ of atoms and not the atoms themselves

John Dalton

- John Dalton was the next scientist to propose a theory about the atom in the 19th century

Dalton's Atomic Theory

1. All matter is composed of extremely small particles called _____
2. All atoms of a given element are _____ , having the same size, mass, and chemical properties. Atoms of a specific element are _____ from other elements
3. Atoms cannot be _____ , _____ , or _____
4. Different atoms combine in simple whole number _____ to form compounds
5. In a _____ , atoms are separated, combined, or rearranged

Basic Definitions

- _____– smallest unit of an element that retains the properties of that element
- Atoms are made up of several _____ particles called _____ , _____ , and _____

Protons, Neutrons, & Electrons

- _____– have a _____ charge and are found in the nucleus of the atom
- _____– have _____ charge and are also found in the nucleus of an atom
- _____– have a _____ charge and are found on the outside of the nucleus
- _____– made up of protons and neutrons, has an overall _____ charge

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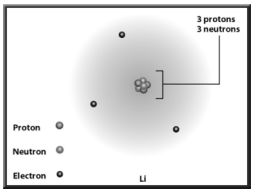


TABLE 2.1 · Comparison of the Proton, Neutron, and Electron ·

Particle	Charge	Mass (amu)
Proton	Positive (1+)	1.0073
Neutron	None (neutral)	1.0087
Electron	Negative (1−)	5.486×10^{-4}

JJ Thomson

- JJ Thomson used the _____ experiment to determine the _____ to _____ ratio of an electron.
- He identified the first subatomic particle, the _____
- He proposed the _____ model of the atom
- Credited for discovering the _____

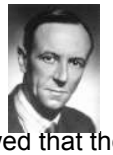
Robert Millikan

- Millikan is noted for his famous Millikan's _____
- This experiment determined the _____ and the _____ of an electron

Earnest Rutherford

- Rutherford's _____ Experiment helped to determine the existence of the _____
- Rutherford proposed that the nucleus was _____ , _____ and _____ charged
- Proposed the _____ model which stated that there was a nucleus with a positive charge and electrons around the outside

James Chadwick



- Chadwick showed that the nucleus also contained _____
- He is credited for the discovery of the _____

Atomic Numbers

- The _____ of an element is the number of _____ in the nucleus of an atom of that element.
- It is the number of _____ that determines the identity of an element.
- The number of protons for an element _____ be changed.

Atomic Numbers

- Because atoms are neutral, the number of _____ must equal the number of _____.
- So, the atomic number of an element also tells the number of _____ in a neutral atom of that element.
- The number of _____ can be changed when determining the charge of an _____ .

Masses

- The mass of a _____ is almost the same as the mass of a _____ .
- The sum of the protons and neutrons in the nucleus is the _____ of that particular atom.
- _____ have different numbers of neutrons, but they all have the same number of protons & electrons

Isotopes

- When writing isotopes, the _____ (or number of protons) will appear at the _____ of the formula
- The _____ (number of protons plus neutrons will appear at the _____ of the formula.
- The _____ will appear to the _____ of the numbers
- *NOTE*: The different number of neutrons has NO bearing on chemical reactivitv

$$\begin{matrix}\text{mass number}\\ \text{atomic number}\end{matrix}\ \mathbf{X}$$

Writing the Names of Isotopes

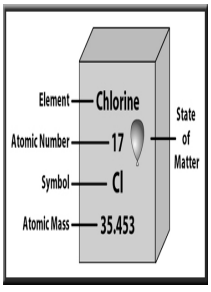
- When writing the name of an isotope, you will write the name of the _____ – the _____
- For example $^{12}_{6}$C would be named:

Try the following

Name	Symbol	# Protons	# Neutrons	# Electrons	Mass #
Carbon – 11					
	$^{197}_{79}$Au				
		1	2		
				25	55
Oxygen - 15					

Atomic Mass

- _____–the weighted _____ mass of all the naturally occurring isotopes of that element.
- The number is usually located at the _____ of the periodic table and has decimal places



Calculating Atomic Mass

Abundance and Mass Data for Copper		
	Isotope	
	Copper-63	Copper-65
Number of protons	29	29
Number of neutrons	34	36
Atomic mass	62.930 amu	64.928 amu
Abundance	69.17%	30.83%

Try this one…

Calculate the atomic mass of germanium.

Isotope	Abundance (%)	Atomic Mass (amu)
Geranium-70	21.23	69.924
Geranium-72	27.66	71.922
Geranium-73	7.73	72.923
Geranium-74	35.94	73.921
Geranium-76	7.44	75.921

You can tell many things from an isotope formula

- Hydrogen has three naturally occurring isotopes in nature: Hydrogen – 1, Hydrogen – 2, and Hydrogen – 3.
  - Which is the most abundant in nature?
  - _____
  - Which is the heaviest?
  - _____