Chapter 3: Atoms & the Periodic Table

3.1: Atomic Structure

- **Atoms** are all around you. **Atoms** are the tiny units (*building blocks*) that **determine** the **properties of** all **matter**.
- In the 4th century BC, the **Greek philosopher Democritus** suggested that the **universe** was **made of invisible units** called **atoms**. (*Atom is Greek for unable to be divided.*)
- **Democritus** was **unable** to **provide** the **evidence** that was needed **to convince people** of the existence of atoms.
- Other theory were proposed and as the science of chemistry developed during the 1700's more emphasis was placed on making careful measurements in experiments.
- In **1808**, English **Chemist** and **Teacher John Dalton proposed** his heavily supported **atomic theory of matter**.

Dalton's Atomic Theory

Remember, atoms: _____

- Less than **100 years after Dalton's atomic theory** was published, scientists determined that the **atoms could be split**, broken down further.
- There are several different sub atomic particles, **only three** are involved in the **everyday chemistry**.

SUBATOMIC PARTICLES

Particle	Charge	Mass (kg)	Mass (AMU)	Location in atom

Nucleus: _____

- **Atoms have no overall charge**. They contain an equal number of protons and electrons.

Models of the Atom

- **Early scientists did not believe** that the **atoms could be divided** (*Democritus & Dalton*), later **that theory was modified when** it was **discovered** that the **atoms** are **made** of **protons, neutrons, and electrons**.

Models	Year	Features
Bohr		
Wave		

- In **Bohr's atomic model**, a **specific # of electrons** will be **found in** the atom's **energy levels.**

1st Energy level: _____ 2nd Energy level: _____ 3rd Energy Level: _____

- **Where electrons are** in an atom **is a probability statement based on the energy** an atom has.
- The **electrons** are **moving around the atom in the energy levels so fast** that it is nearly impossible **to know the exact location** of an **electron** in the atom.

Valence Electrons: _____

3.2: Guided Tour of the Periodic Table

- Objects in the grocery store are organized in a specific way so it is easy to find what you need efficiently. The **periodic table** of the elements is **organized** in a **similar way**.
- The periodic table **groups similar elements together** so it is easy to **predict the properties** of an element **based on its location** on the periodic table.
- The **elements** are **represented by** their **symbols** and the **symbols** are **arranged by the number of protons** the elements has in its nucleus.

Periodic Law: _____

Arrangement of the Periodic Table

Name	Also Called…	Electron Arrangement	Properties
Horizontal Rows			
Vertical Groups			

Ions

- In general, the **elements on the far-left side of the table are reactive** because they tend to _____ their valence electrons. The **elements on the far right hand side of the table are also reactive** because they tend to _____ valence electrons.
- These **atoms gain and lose valence electrons** in order **to become stable**.
- **To be stable**, they must have a full last/outer energy level. The atom will either lose or gain valence electrons to have the last energy level full and become stable.

Ion: _____

- Elements from groups 1 & 2 tend to lose electrons, they form _____ ions

Why? _____

- Elements from groups 16 & 17 tend to gain electrons, they form _____ ions

Why? _____

How Structures are Different

	Symbol	What it Tells You	Examples
Atomic Number			
Mass Number			

Isotopes: _____

- If you **know the atomic number** of an atom **and the mass number** of an atom, you can **calculate** the **number of neutrons** in the nucleus of the atom.

# of neutrons = Mass # - Atomic #
$\#n^0 = A - Z$

- The **mass of a single atom is very small**. A single atom of Fluorine has a mass of less than one trillionth of a billionth of a gram.
- Atomic masses are usually expressed in **atomic mass units** (*AMUs*).

Atomic Mass Unit: _____

- On the periodic table, the **atomic mass listed** is **an average atomic mass**.
- The average **atomic mass is a weighted average**. The **more commonly found isotopes** of an element **have a greater effect on the average** than the rare isotopes.