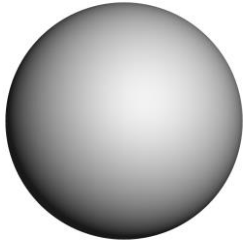


Atomic History & Atomic Structure

ATOMIC HISTORY- People who contributed to the structure of the ATOM:

1. Democritus (400 B.C.): Greek philosopher who first came up with the idea that all matter was composed of small, indivisible particles. He called these particles



-Everything is made up of it's own type of atoms or small indivisible particle. For example, sand is made up of sand particles, glass is made up of glass particles, aluminum is made up of aluminum particles, etc. Did NOT know about subatomic particles just yet.

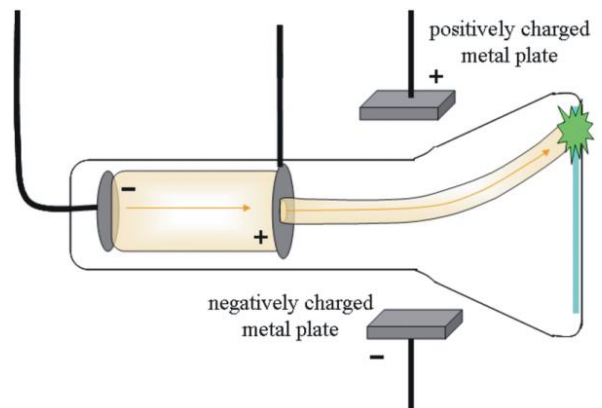
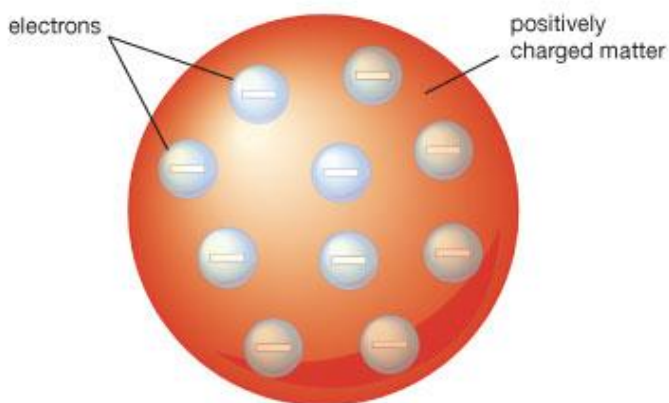
2. John Dalton: First scientist to bring back the idea of the atom. He proposed the Atomic Theory that describes the atom. Dalton's atomic theory was widely accepted because it successfully explained several laws and observations. His model was similar to Democritus' but instead stated that things are made up of atoms based on their elements.

ATOMIC THEORY

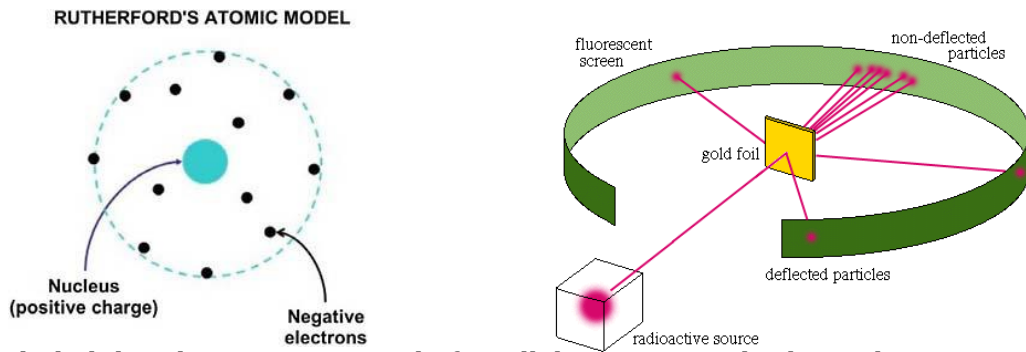
- i. All matter is made of atoms. Atoms are indivisible and indestructible. *
- ii. All atoms of a given element are identical in mass and properties. *
- iii. Compounds are formed by a combination of 2 or more different kinds of atoms.
- iv. A chemical reaction is a rearrangement of atoms.

*Not completely correct; later revised

3. J.J. Thomson: Discovered _____ subatomic particles using the cathode ray tube experiment. He called these negatively charged particles "corpuscles" but is known today as _____.

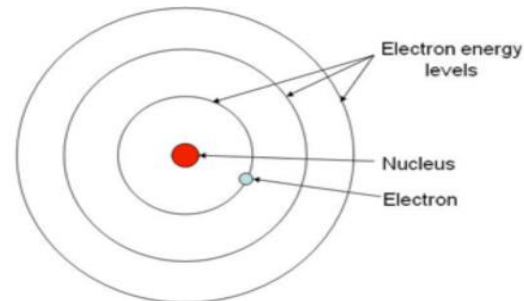


4. Ernest Rutherford: Physicist who wanted to prove that atoms are most empty space, so he fired positively charged alpha particles (+) at _____. Found out that most went straight through or were slightly deflected, while some bounced straight back!

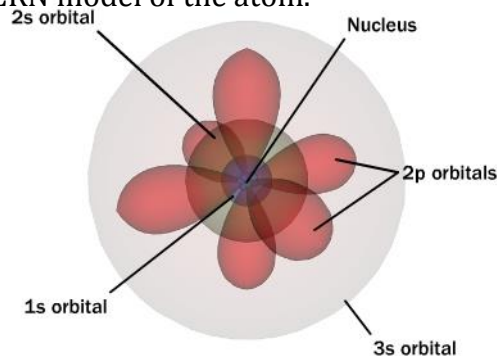


He concluded that the atom consisted of small dense positively charged _____ in the center of the atom with negatively charged _____ surrounding it.

5. Niels Bohr: Scientist who proposed that electrons are arranged in concentric _____ around the nucleus called _____. Electrons in an energy level do not lose energy and fall into the nucleus. Also known as the “planetary model.”



6. James Chadwick: English physicist who found the _____ by bombarding Beryllium with alpha particles. The radiation was emitted had the mass of a proton but had NO charge.
7. Erwin Schrodinger: Austrian scientist who stated that electrons are not in circular orbitals like Bohr predicted, instead they are likely to be found in a specific 3 Dimensional space around the nucleus. He predicted this model using quantum mechanics to calculate the likelihood of finding an electron. This is the MODERN model of the atom.



ATOMIC STRUCTURE:

The nucleus of the atom contains _____.
It is very small compared to the size of the atom, but contains practically all the mass!

The electron cloud- a nebulous region around the nucleus where the _____ are found. While miniscule in mass, the cloud makes up the bulk of the atom's size.

Composition of the Atom

Subatomic Particle	Symbols	Relative Charge	Mass Number (amu)	Location
Proton				
Neutron				
Electron				

Atomic Number (Z): This is what defines that element. It is equal to the number of _____.

Mass Number (A): The total number of _____ in the nucleus of an isotope. It is always a whole number and is NOT found on the periodic table.

Isotopes: Atoms of the same element with different numbers of _____, therefore different _____.

A
Z X

There are two methods of designating isotopes:

(Method 1)

Mass number is added with a hyphen to the name or symbol of the element.
Example: **uranium-235** or **U-235** has 92 protons and 143 neutrons.

(Method 2)

On the left side of the element symbol, the mass number is added as a superscript and the atomic number is added as a subscript.

Example: ${}_{92}^{238}\text{U}$ has 92 protons and 143 neutrons.

Ex:	Element	Z	A	# protons	# neutrons	# electrons	symbol
1.		23			21		
2.	Carbon				7		
3.	Iron		57				
4.		76	193				
5.	Sulfur		32				${}_{16}^{32}\text{S}$

Ions: Ions are _____ atoms.

When an atom gains or loses electrons, it forms a charged ION, and the number of p and e are not equal. The charge of the ion is written as a superscript after the symbol.
Remember: an atom does NOT gain or lose protons.

Cations: Positively charged ion. Ex: Na^{+1} = sodium ion, Mg^{+2} = Magnesium ion, Al^{+3} = aluminum ion

Anions: Negatively charged ion. Ex: F^{-1} = fluoride ion, O^{-2} = oxide ion, N^{-3} = nitride ion

****Memorize your polyatomic ions and diatomic elements****

Ex:	Element	Z	A	# protons	# neutrons	# electrons	symbol
1.							${}_{20}^{40}\text{Ca}^{+2}$
2.							${}_{16}^{32}\text{S}^{-2}$

HOMEWORK: Atomic History and Atomic Structure

Part 1. Atomic History

Match the following philosopher/ scientists with what they contributed to atom we know today.

Democritus

John Dalton

JJ Thomson

Ernest Rutherford

Niels Bohr

James Chadwick

Erwin Schrodinger

- _____ 1. Used quantum mechanics to describe the 3 dimensional region of electrons.
Modern model of the atom.
- _____ 2. Proposed the Atomic Theory to describe the atom.
- _____ 3. Used the gold foil experiment to discover a dense positively charged nucleus in the center of the atom
- _____ 4. The Greek philosopher who coined the term "atomos."
- _____ 5. Scientist who used the cathode ray tube experiment to prove the existence of electrons.
- _____ 6. Came up with the 2D planetary model of the atom. Stated that electrons orbit the nucleus in its energy levels.
- _____ 7. This scientist discovered the neutron of the atom.

Part 2. Atomic Structure. Fill in the blank boxes.

	Element	Z	A	# protons	# neutrons	# electrons	symbol
	oxygen	8	16	8	8	8	$^{16}_8\text{O}$
1.			40		20		
2.	carbon		12				
3.		19			20		
4.			4			2	
5.			27	13			
6.			9				^9_4Be
7.		7	14				
8.	ruthenium						$^{101}_{44}\text{Ru}$
9.		78			117		
10.	scandium						$^{45}_{21}\text{Sc}$
11.	sodium ion						$^{23}_{11}\text{Na}^{+1}$
12.	chloride (ion)						$^{35}_{17}\text{Cl}^{-1}$