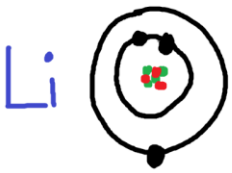
Date: _____ Name: _____

Introduction to Atomic Theory

Recall: draw a diagram of an atom with as much detail as possible



3 electrons (negatives) on outer shells; 4 neutrons (neutral) and 3 protons (positives) inside the nucleus (center of the atom)

atom: **smallest** particle of an element that retains the **chemical** identity of the element

Three laws giving elements of atoms:

1. Law of conservation of matter: **matter cannot be created or destroyed**
2. Law of constant composition: **the ratio must always be preserved (ex. H_2O→ 2 H's & 1 O)**
3. Law of multiple proportions: when different masses of one **element** combine with a specific **mass** of another **element,** the mass **ratios** of the first element are small, whole number ratios.

Early Models of the Atom

Describe the work of the following scientists. Use the following questions as a guide. *You may use your textbook or your phone/device to help you do your research.*

1. What are their main contributions to modern atomic theory?
2. What was their idea of the model of the atom? *Include diagrams as necessary.*
3. Did they have any particular discoveries? What were they?
4. What experiments did they perform that led to discoveries?

Scientist	**Contribution to the modern atomic theory**
John Dalton	- Introduced the first atomic theory - All atoms of a given element are identical - Elements are made up of tiny particles called atoms - No 2 elements have the same atoms - Billiard ball model (thought it was just a sphere) - Small dense solid atom

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William Crookes	- CRT – glass tube in vacuum, current produces beam (goes from negative to positive) cathode to anode, fluorescent glows - Crookes tube – two electric terminals connected to low and high voltages, fluorescence made from beam of particles, cathode rays defect away from negative and towards positive – these are electrons
J.J. Thomson	- Identified the cathode rays in CRT as electrons since they were negatively charged - "Raison bun model" (plum pudding model) of the atom – positive charges all around (the bun) and negative pieces inside (the raisons) – everything was floating around in one big ball
Marie and Pierre Curie	- Analyzed uranium to see Becquerel rays - Uranium was the source of the emission – later Marie gave these emissions the name radioactivity and defined it as the spontaneous emission of radiation of the nucleus of an atom - Discovered polonium and radium, amount of energy based on amount of starting material; Marie won two Nobel prizes - Marie died from radiation; curie = unit of radiation
James Chadwick	- proved the existence of neutrons – atomic nuclei had neutral particles as well - no electric charge and similar in size to proton - hard to detect because it has no charge – stable in the nucleus, unstable outside of the nucleus
Ernest Rutherford	- father of nuclear physics; founder of alpha, beta, and gamma - Direct positive beam of particles at a piece of gold foil, found that most particles went through the foil, some were deflected at an angle and some bounced straight back - Concluded that atom is mostly empty space and has a positive core – discovered the nucleus – came up with the planetary model of the atom – electrons were orbiting, nucleus full of mass (protons) - Named the positive particle the proton (equal and opposite to the electron but 1800 times heavier
Niels Bohr	- Organized the atom like a solar system - First one to make orbits and organized the orbits according to their energy levels - Won nobel prize - Made the Bohr model – neutrons and protons are in the center, different valence shells of electrons are orbiting around the nucleus