Handout on Atomic Models keep in your notes

Democritus: philosopher who thought up the idea of the atom approximately 2400 years ago. He had no concept of elements combining into compounds or sub atomic particles. Good thinker but not a scientist. His ideas remain important even today, although most high school students understand much more chemistry (even in October) than he could imagine.

Dalton: a scientist who finally started to experiment with the idea about atoms as the basic building blocks of matter. His thoughts led to first real atomic theory, which included:

A. All matter is made of atoms. Atoms are indivisible and indestructible.
B. All atoms of a given element are identical in mass and properties
C. Compounds are formed by a combination of two or more different kinds of atoms.
D. A chemical reaction is a ***rearrangement*** of atoms.

Thompson: the scientist credited with the discovery of the electron, which was the first sub atomic particle described. Using a special tube with a positively charged cathode and a negatively charged anode (electricity was used) he measured negatively charged particles, which he named electrons. It placed these electrons into his plum pudding model of the atom. He was wrong about this, but he led others to discover the nucleus with his work.

Rutherford: another amazing scientist. He discovered that the nucleus of an atom was central, surrounded by mostly empty space. He postulated that the nucleus was a positively charged dense mass of protons (which would have been able to deflect the alpha particles) with the electrons flying around this nucleus. He correctly imagined that the electrons flew around the nucleus and were much smaller than the protons. He could not explain how electrons would not collapse into the nucleus.

Chadwick: In 1932, James Chadwick discovered a third type of sub-atomic particle which he named the neutron. Neutrons help stabilize the protons in the atom's nucleus. Because the nucleus is so tightly packed together, the positively charged protons would tend to repel each other normally. Neutrons help to reduce the repulsion between protons and stabilize the atom's nucleus. Neutrons always reside in the nucleus of atoms and they are about the same size as protons. However, neutrons do not have any electrical charge, they are electrically neutral. This is added here to show how work builds over time.

Bohr: determined that the electrons which are flying around the central nucleus must be in up to 7 special orbits or energy levels. Although closest to the modern concept of the atom, it lacked an explanation of electrons in elements larger than Hydrogen. He also explained electons being able to move up into higher energy orbits, if given proper amounts of energy. This exact amount of energy is returned when electrons return to the ground state, and it’s called spectra.

The Modern Atomic Theory: Erwin Schrodinger's most important contribution to the modern atomic theory was his development of the mathematical description that described the paths electrons would most likely follow around nucleus. The formulas that Schrodinger developed in 1926 would be later called the basis of quantum mechanics, and awarded him a Nobel Prize. Eventually, Schrodinger determined that instead of Bohr's orbits, electrons were actually in orbitals. Instead of the idea of the electrons following a pre-determined path, the electrons would be moving around in an area. These ideas, including the quantum mechanical formulas, were presented in his "Wave Mechanical formula." This model eventually became the basic modern atomic theory.

The modern model of the atom has come from the work of many scientists (many more than the few above) over a long period of time.