

# The Atomic Theory

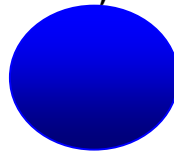
## **DEMOCRITUS**

- A philosopher in the year 400 B.C.
- He didn't do experiments and he wondered if atoms kept on being divided, that there would only be one undividable particle left.
- He discovered that this was true and he named the particle an atom to describe the smallest possible piece of matter. He got the name from the Greek work "*atomos*," which means "not able to be divided."
- Most people didn't believe him and they believed Aristotle, because Aristotle had more of an influence on people and Democritus didn't do experiments so his theories weren't proven.

## **DALTON**

- He proposed the first Atomic Theory in 1803
- He experimented with gasses to see how they interact with each other
- He tried to build upon Democritus' theory to see if he (Democritus) was right. He found out more to build on his theory and it was proven because he did experiments, which Democritus **didn't** do.
- **His theory stated the following:**
- **1) All matter is made of atoms. Atoms are indivisible and indestructible.**
- **2) All atoms of a given element are identical in mass and properties**
- **3) Compounds are formed by a combination of two or more different kinds of atoms.**
- **4) A chemical reaction is a rearrangement of atoms.**

- He thought that atoms were smooth, hard balls that could not be broken into smaller pieces.



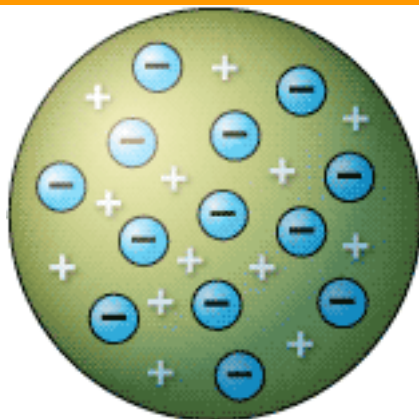
### Dalton's Atomic Model

- He discovered that all substances are made of atoms and different substances are made of different atoms.

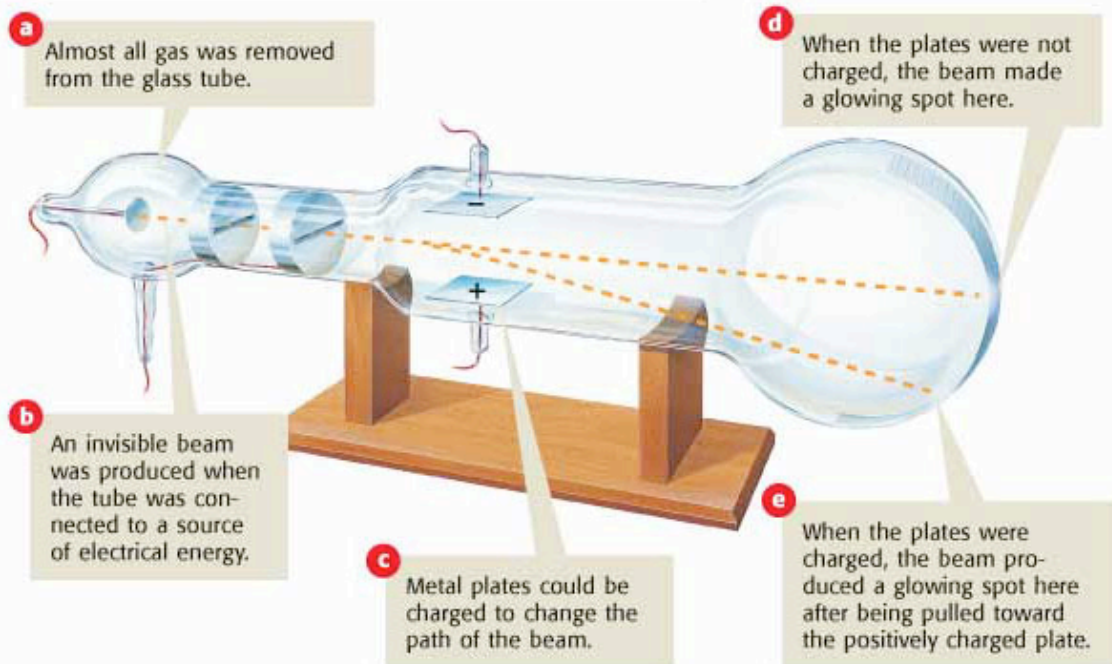
### THOMSON

- J.J. Thomson discovered the electron in 1897
- He discovered that the electron was outside of the nucleus (which didn't exist when Thomson discovered the electron) and was negatively charged. The magnetic needle in a compass points north because of it.
- The word electron comes from *electron*, which means "beam," which he used for his Cathode ray tube experiment.
- He experimented by taking an electric beam and a positively charged electric plate. The name for this was a Cathode ray tube.
- He was trying to find out if Dalton was right, because he thought Dalton had a hole in his theory and he wanted to build on it.
- His experiment proved that atoms could be divided.
- His experiment also proved that atoms had negatively charged electrons embedded in a positive sphere. He named his model the plum pudding model, which shows that atoms can be divided like plum pudding. The plums are the negatively charged electrons and the pudding is the sphere of positive charges.

### PLUM PUDDING MODEL



**Figure 3 Thomson's Cathode-Ray Tube Experiment**



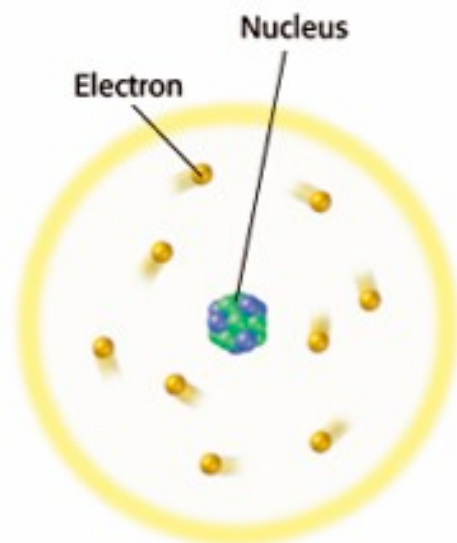
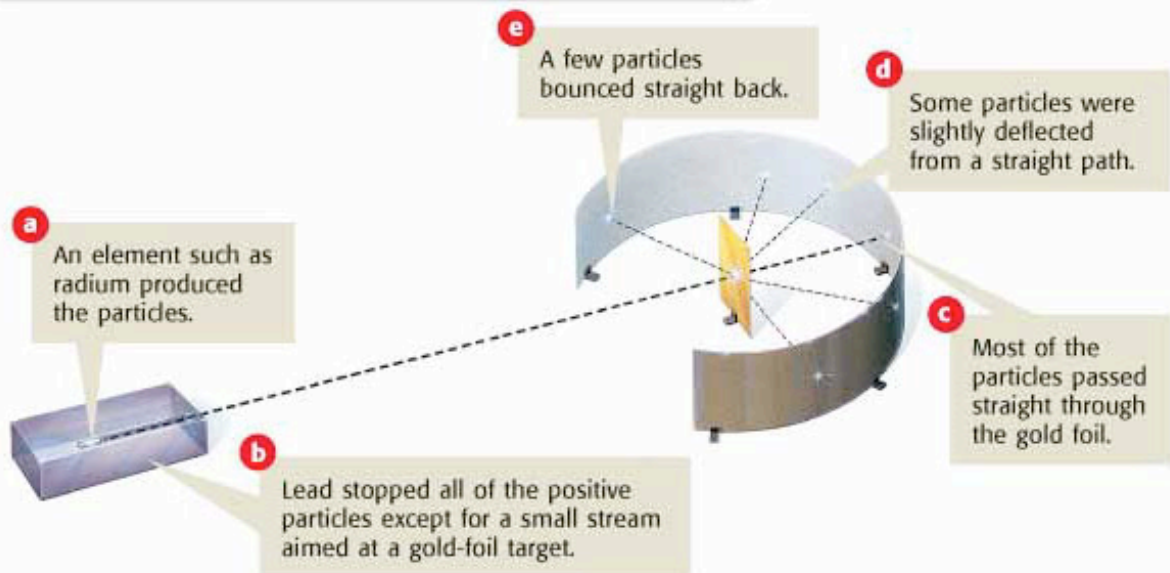
## **RUTHERFORD**

- **Ernest Rutherford, a student of J.J. Thomson tried to find out more about atoms.**
- **He tested particles going through gold atoms (gold foil) \***
- **He was surprised to find that a few particles were deflected strongly, and this led him to propose an atomic theory with a positively charged nucleus.**
- **He was trying to find out what an atom is.**
- **He found out that atoms have a center that contains protons and neutrons called the nucleus. The nucleus is a small part of the atom, which is equivalent of a marble in a large stadium.**
- **The nucleus had a positive charge and outside of it are the electrons, which are negatively charged. Most of the particles passed directly through the foil with little or no deflection. These particles didn't go through the area called the nucleus.**
- **The particles that hit the nucleus deflected and sometimes went back to where it came from.**

- He proved that Thomson's theory was wrong even that he was trying to support it. He was surprised that the particles passed through the foil with some deflection and he was mostly surprised about some particles not going through the foil and deflected it.
- He said:

*"It was quite the most incredible event that has ever happened to me in my life. It was almost as if you fired a fifteen-inch shell into a piece of tissue paper and it came back and hit you."*

**Figure 5 Rutherford's Gold-Foil Experiment**

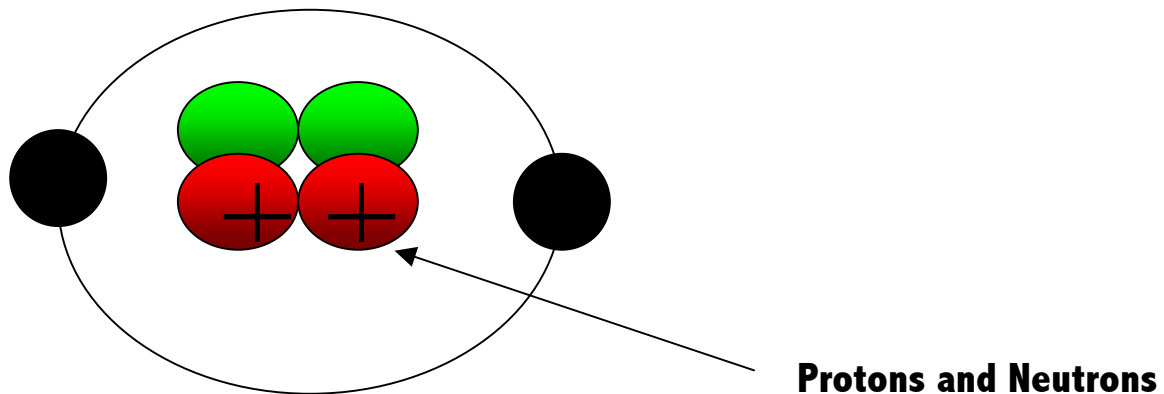


**Rutherford's Atomic Model**

## **BOHR**

- In 1913, Niels Bohr proposed that electrons travel in a specific path.
- He experimented with the electron.
- He was trying to find out if Rutherford was wrong and why electrons move in a certain path.
- He discovered that they move in this path because of the attraction with the positively charged nucleus.
- Positive Nucleus (+) and Negative Electrons (-)
- They are rings around the nucleus.
- He found out Rutherford was wrong because there is a purpose for the electrons to orbit.
- Bohr worked with Rutherford

### **Bohr's Atomic Model**



## **Schrödinger**

- Erwin Schrödinger agreed with Bohr and the way electrons traveled, but he wanted to find the exact path in which electrons moved.
- He created the wave model to show that electrons are constantly moving in a wavelike path, not a circular path like Bohr thought. It is based on wave mechanics
- He made an equation to find the exact energy level of atoms and the probable location of electrons is based on how much energy the electron has.
- He found out that electrons travel in no definite path.

## **Schrödinger's Atomic Model**

