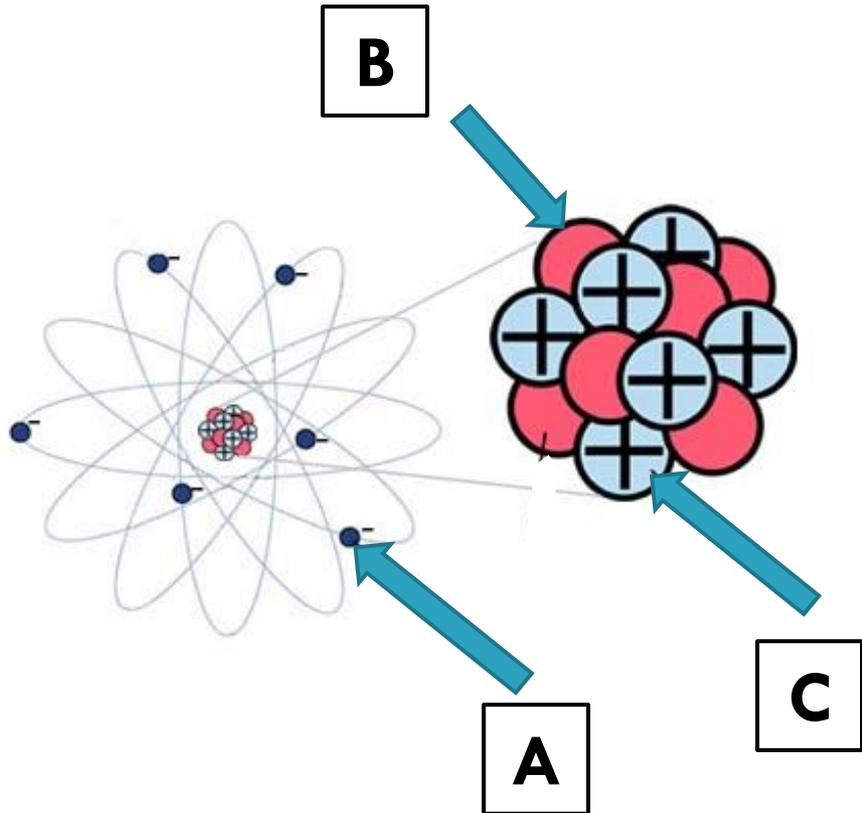


Bellwork: 2/6/2013

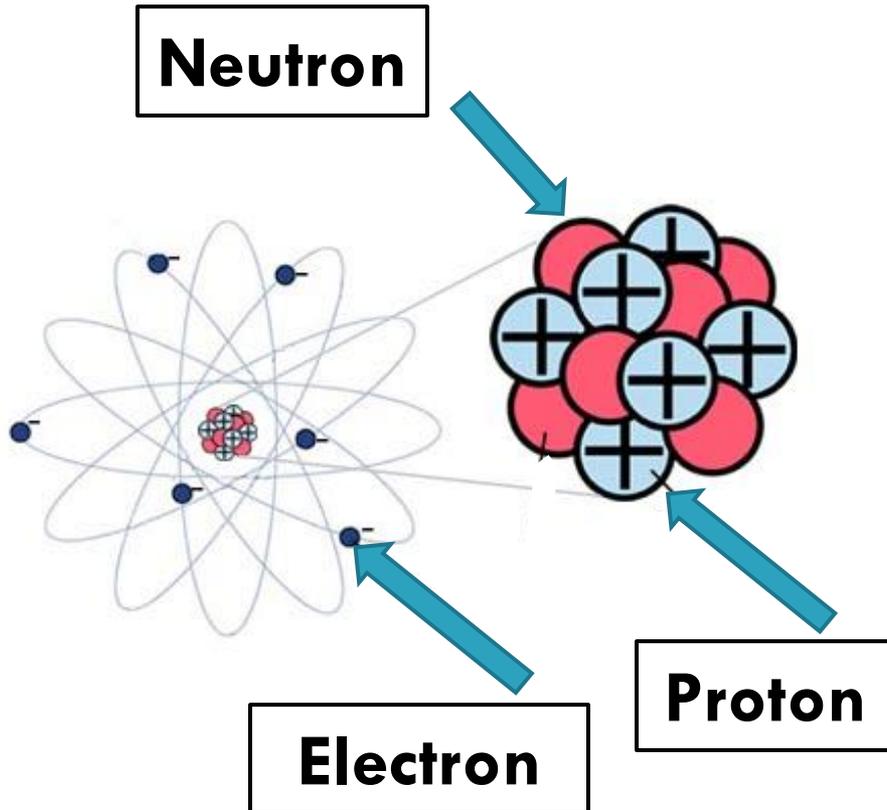
1. Label the parts of the atom below.



2. The smallest part of an atom is the _____.
3. The majority of the mass in an atom is found in the _____.
4. An atom is made up of mostly _____.

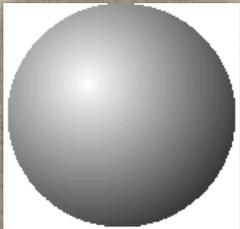
Bellwork: 2/6/2013

1. Label the parts of the atom below.

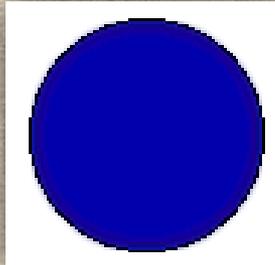


2. The smallest part of an atom is the electron.
3. The majority of the mass in an atom is found in the nucleus.
4. An atom is made up of mostly empty space.

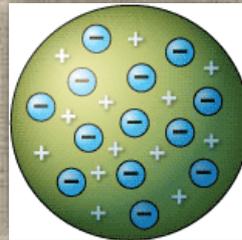
Evolution of the Atomic Model



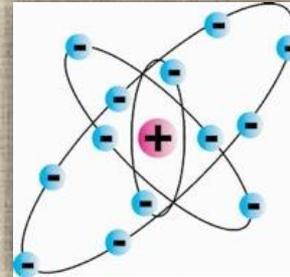
Democritus
(400 B.C.)



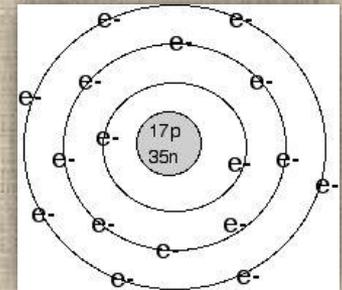
John Dalton
(1802)



J.J. Thomson
(1897)



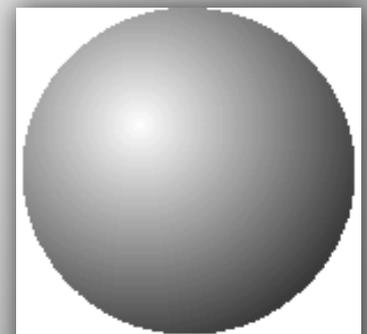
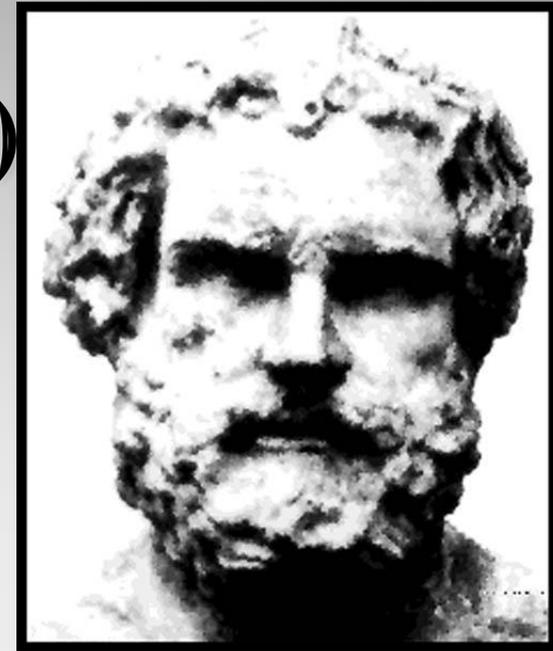
Ernest Rutherford
(1911)



Niels Bohr
(1913)

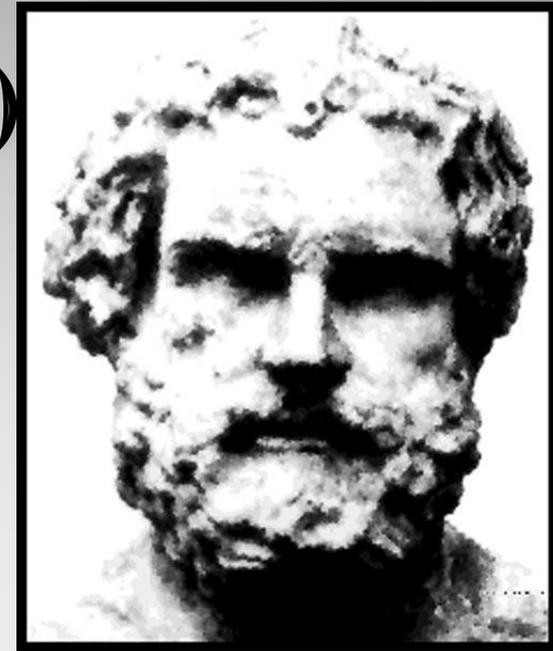
DEMOCRITUS (~440 BC)

- WHO WAS HE?
 - A Greek philosopher
- THEORIZED:
 - Everything in the world is made up small particles that we cannot see
 - The shape of these particles determine the properties of a substance

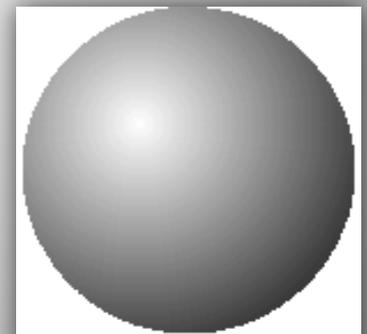


**Democritus
(400 B.C.)**

DEMOCRITUS (~440 BC)



- “DISCOVERY”:
 - matter can be cut into smaller and smaller pieces that eventually cannot be broken down anymore
 - *These* are the building blocks of all matter!
- MODEL:
 - “**Atomos**” – Greek for uncuttable
 - The atom is a **small, solid sphere**



Democritus
(400 B.C.)

John Dalton (1766-1844)

◊ *Who was he?*

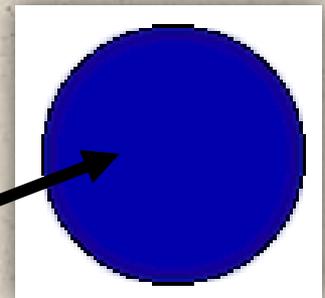
– A British schoolteacher and meteorologist

◊ *Experiment:*

– He studied the atmosphere and the behavior of gases, and decided that *all* forms of matter must be made up of small individual particles with different weights



*John Dalton's version of
"The Atom"*



John Dalton (1766-1844)

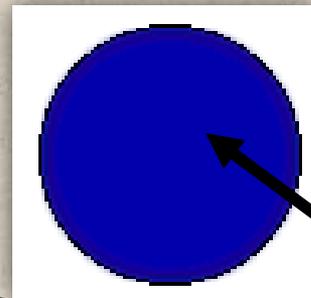
◊ *Discovery (1802): The Atomic Theory*

- All matter is made up of atoms.
- All atoms of an element are alike, but different from atoms of other elements.
- Compounds form when atoms of different elements combine.
- Chemical reactions involve rearranging atoms, not a change in the atom.



◊ *Model:*

- The **"Billiard Ball Model"**:
- The atom is a **small, solid sphere**



*John Dalton's
version of "The
Atom"*

J.J. THOMSON (1856-1940)

✗ Who was he?

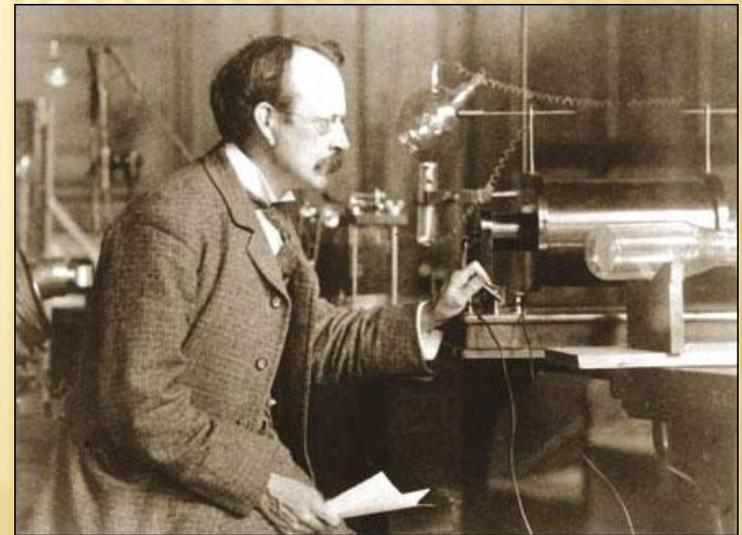
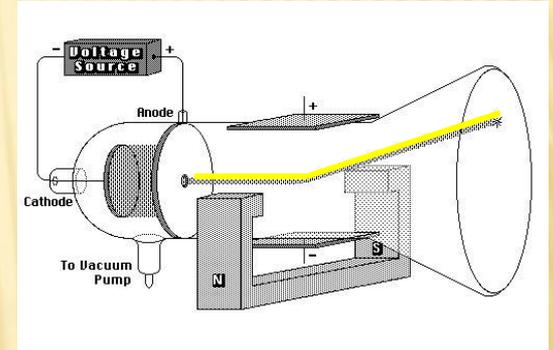
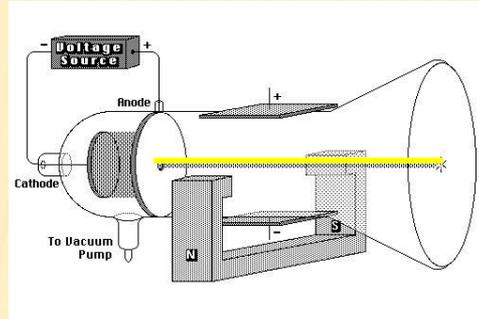
+ A British scientist

✗ Experiment:

+ Passed an electric current through a vacuum tube

+ Observed the electric current

- ✗ Discovered that mysterious glowing stream would bend *toward* a positively charged electric plate
- ✗ Determined the electric current must be made up of small particles that carried a *negative* charge!



✘ **Discovery** (~1897):

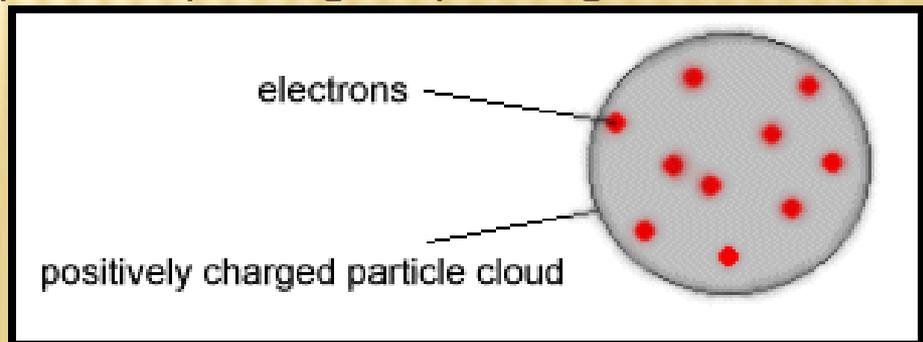
- + The negatively charged particle called the **electron**
- + It takes 2000 electrons to equal the mass of one proton

✘ **Model:**

+ The "**Plum-Pudding Model**"

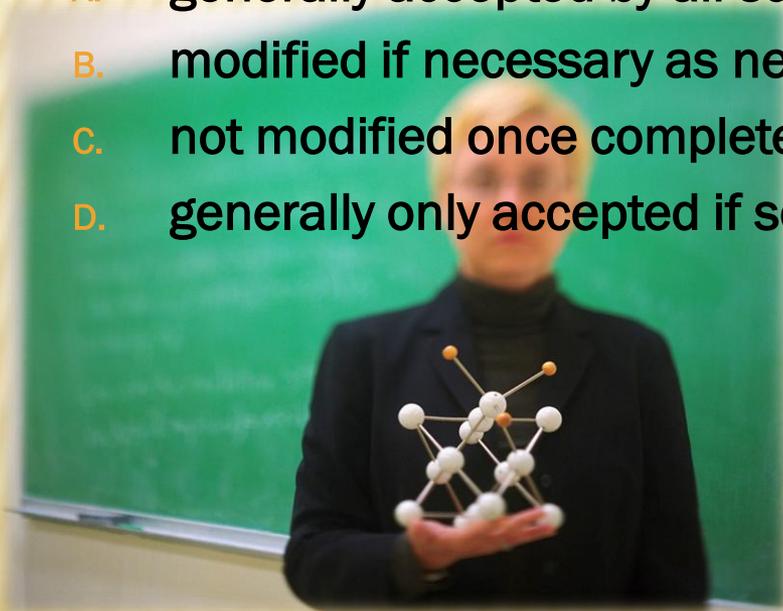
- + Each atom was like a sphere that was filled with a positively charged fluid

✘ Negatively charged electrons, known as the "plums" were scattered throughout a positively charged "pudding"



BELLWORK: 2/7/2013

- ✘ Hypothesis and models are constructed to give the best explanation of a set of data. Models and hypothesis based on experimentation and research are:
 - A. generally accepted by all scientists who are experts.
 - B. modified if necessary as new data and observations are collected.
 - C. not modified once completed if based on careful experimentation.
 - D. generally only accepted if scientists agree with collected data.



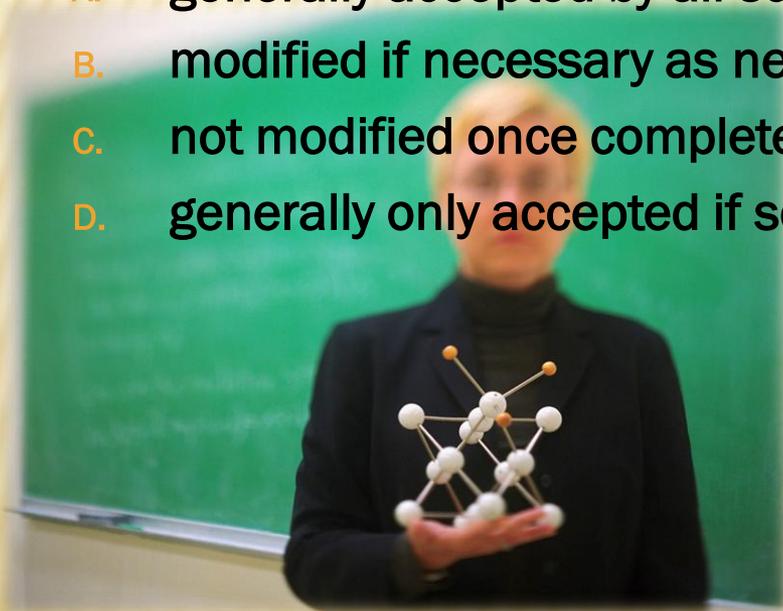
Question: Re-write the question in this section of your Bellwork page

Answer: Write the letter and response in this section

Prove: Describe your logic

BELLWORK: 2/7/2013

- ✘ Hypothesis and models are constructed to give the best explanation of a set of data. Models and hypothesis based on experimentation and research are:
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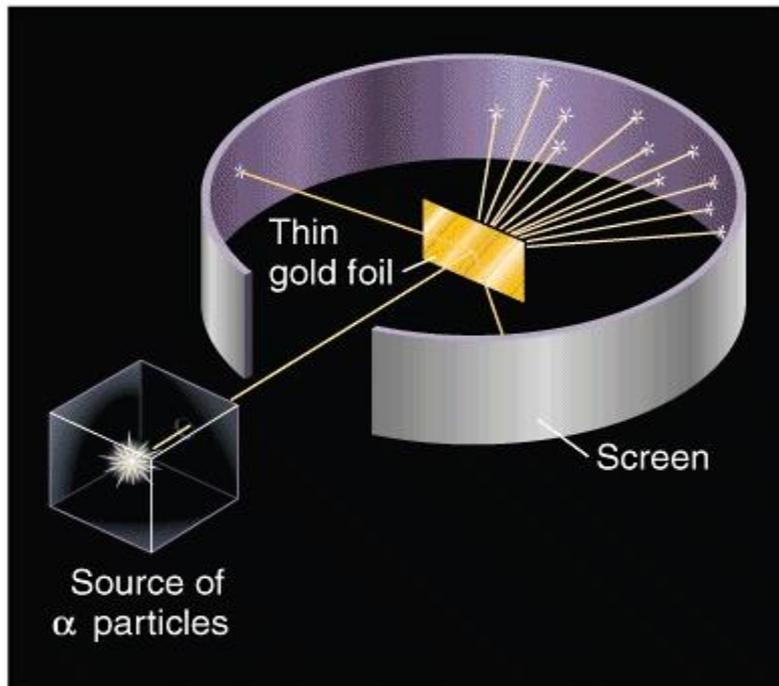
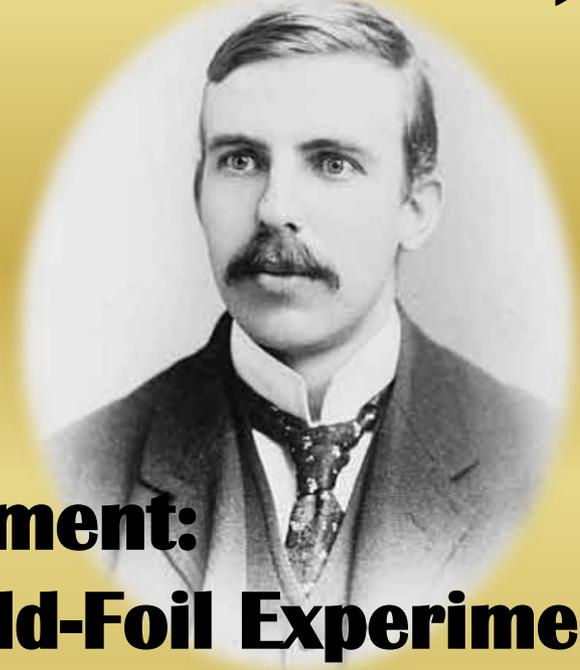


Scientists often make discoveries that change the way we think about things! This is a way of life in science...

Ernest Rutherford (1871-1937)

- **Who is he?**

- A New Zealand physicist who pioneered modern atomic science



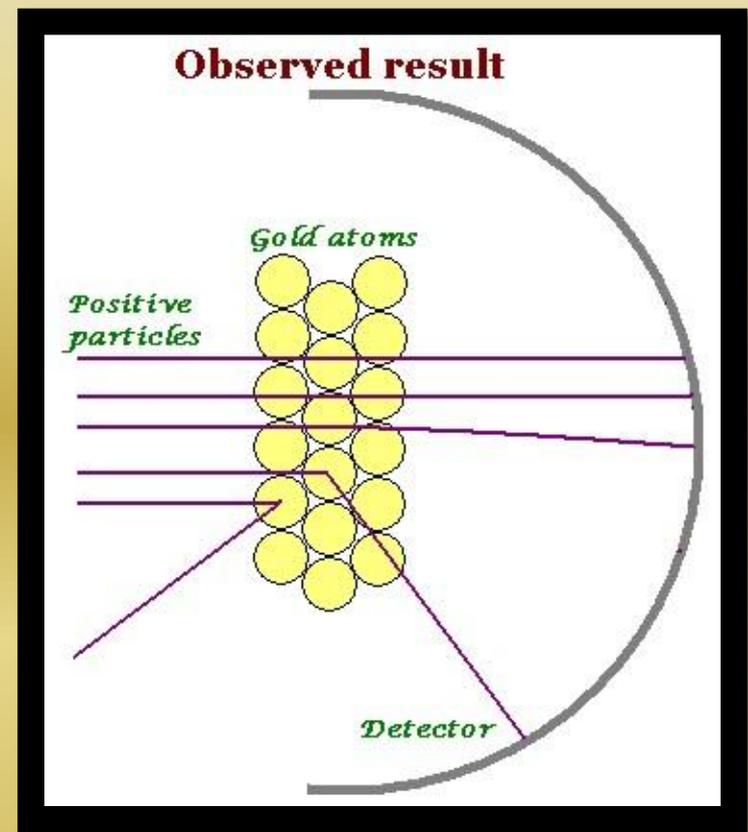
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- **Experiment:**
“The Gold-Foil Experiment”

- Fired positively charged particles (called alpha particles) at a thin sheet of gold foil
- Most particles went through, some bounced back, some were deflected

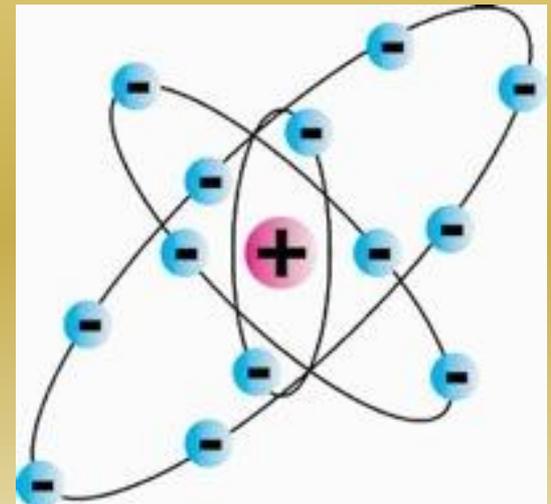
- **Discovery (1909-1911):**

- Most of atom is empty space!
- Positively charged **nucleus** exists at the center of the atom
- The nucleus is small compared to the total size of the atom



- **Model:**

- The “**Planetary Model**”
- Dense, positively charged nucleus surrounded by freely spinning electrons



Niels Bohr (1885-1962)

- **Who is he?**
 - A Danish physicist
- **Experiment:**
 - Tried to explain why electrons could orbit the nucleus without getting pulled into it
 - Suggested the electrons **orbit nucleus in fixed energy levels** (or shells)
 - Electrons could jump between levels, giving off light we can see

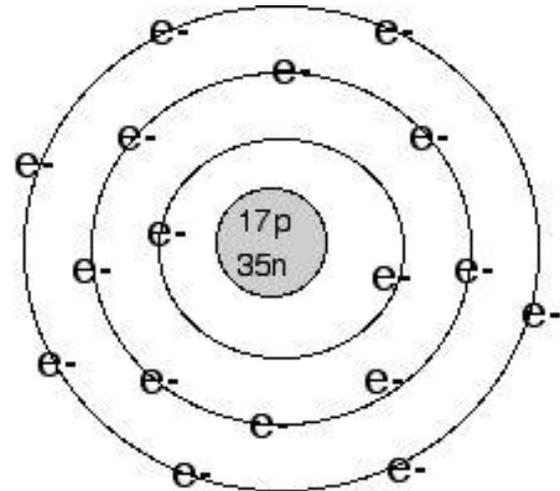


- **Discovery (1913):**

- The atom is much smaller than we thought!
- That electrons exist in distinct orbits (**orbitals**) around the nucleus
- Electrons absorb or give off energy when they move from one shell to another

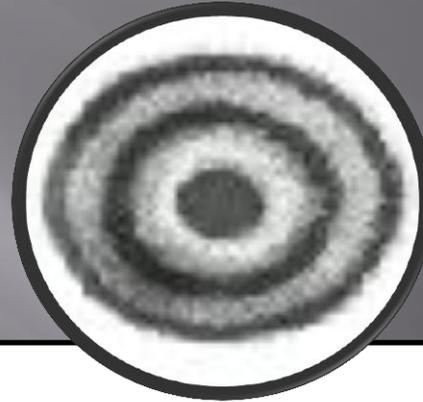
- **Model:**

- The “**Bohr Model**”
- An electron's energy levels (*also called electron shells*) can be imagined as concentric circles around the nucleus



Erwin Schrödinger & Louis de Broglie

(1920's through Present)



Who were they?

- Louis de Broglie was a French scientist
- Erwin Schrodinger was a Austrian physicist

Experiment/Observation:

- Studied the movement of the electron around the nucleus to try and figure out why it didn't fall into the nucleus
- Schrodinger created a mathematical formula supporting de Broglie's

Discovery (~1925):

- **Electrons travel in clouds** around the nucleus
 - It is **impossible** to know the **speed and exact location** of an electron
 - It is only possible to **calculate** the **probability of finding** an **electron** within a given space
- Electrons can **behave like waves or particles**

Model:

- The “**Electron Cloud Model**” (Also known as the “**Quantum Mechanical Model**”)
- There are no defined orbitals like Bohr thought, just areas where electrons *might* be

