

SNC1D1


History of the Atom

NEVER TRUST AN ATOM

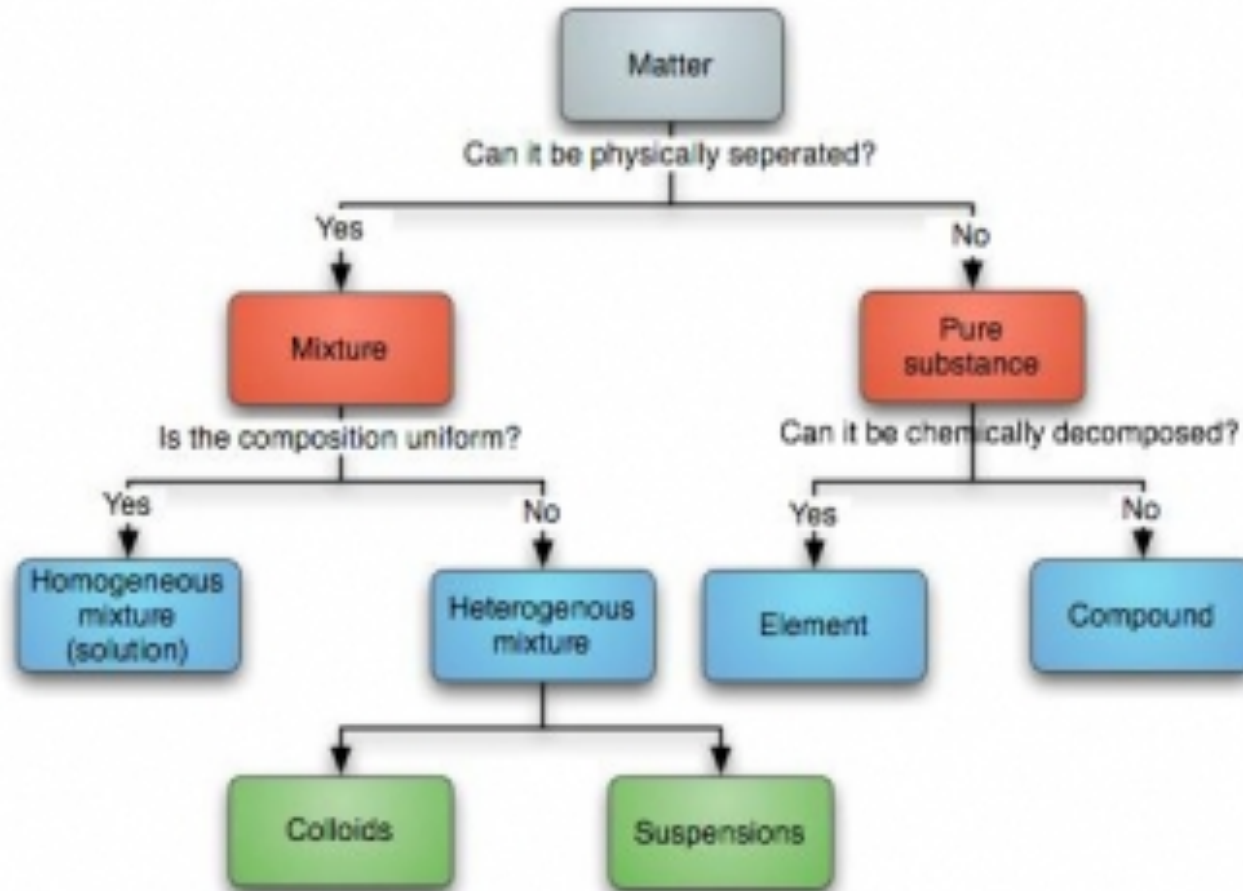


PHOTO: SHUTTERSTOCK

THEY MAKE UP EVERYTHING

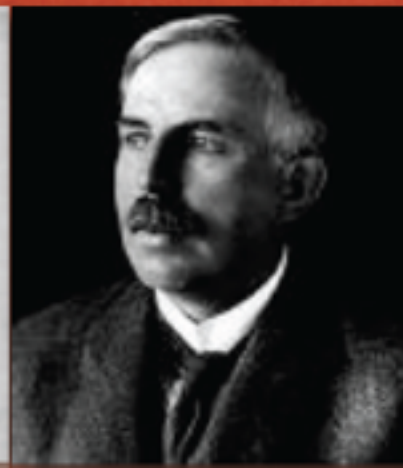
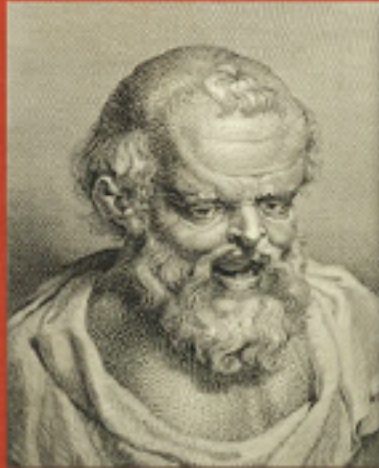
 9GAG is your best source of fun.

What is the atom?



Atoms are the building block for all matter:
Atoms make up elements!
Elements combine to make compounds!

ATOMIC MODEL TIMELINE



The man of science does not want to discover in order to know - he wants to know in order to discover.
- Alfred Whitehead

ATOMIC MODEL TIMELINE



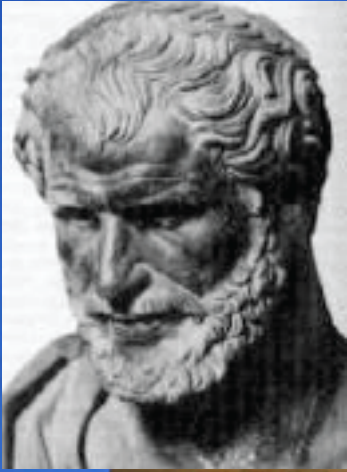
400 – 350 B.C

**ANCIENT
GREEK
THEORIES**



Democritus

460–370 BC



- Greek philosopher came up with the idea that all matter is made of small, unbreakable particles he called atoms (from the Greek “atomos” meaning unbreakable)

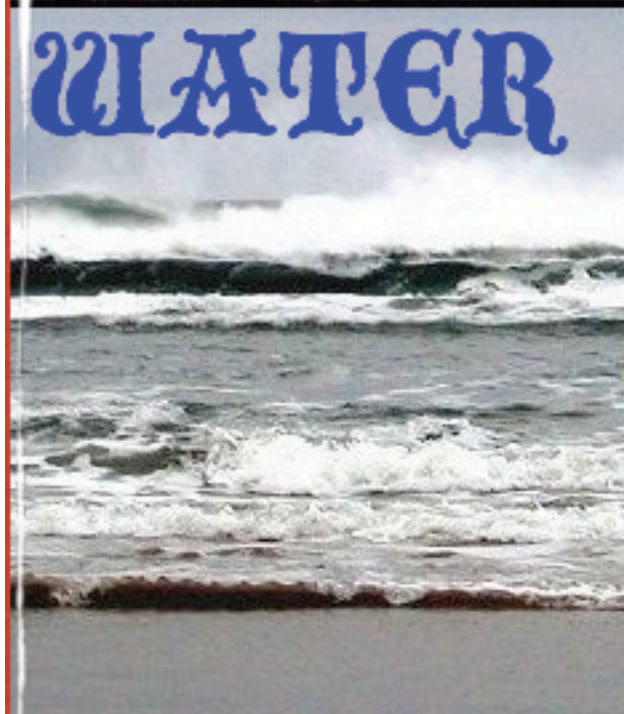
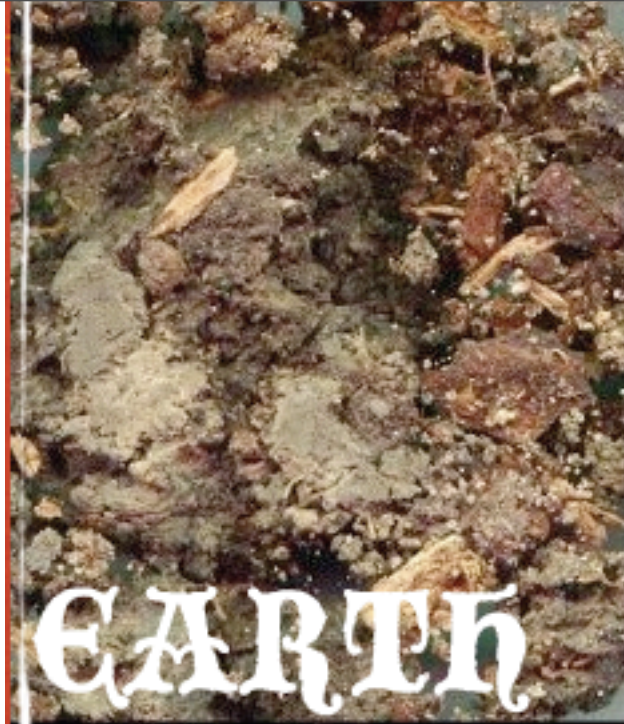
Democritus

Democritus used an example of a beach to support his theory.

From afar, the beach appears to be a solid mass. But up close one finds that a beach is made of small grains of sand too small to be seen from a distance.

Aristotle

- Everything is made of four elements : earth, water, air and fire...



Aristotle

The Essential **EARTH, WIND & FIRE**





Democritus

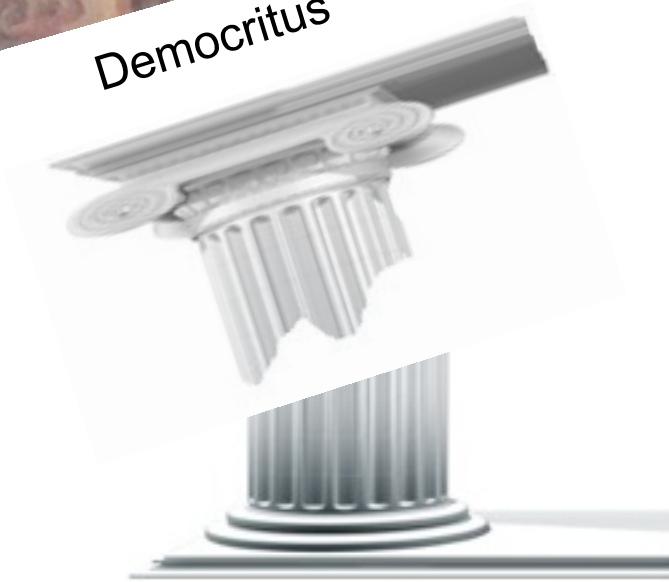


Aristotle





Democritus

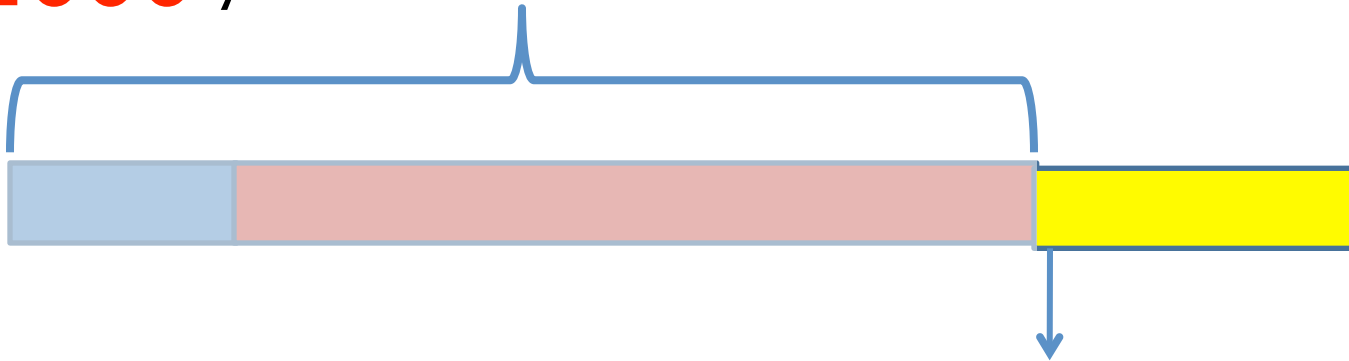


Aristotle



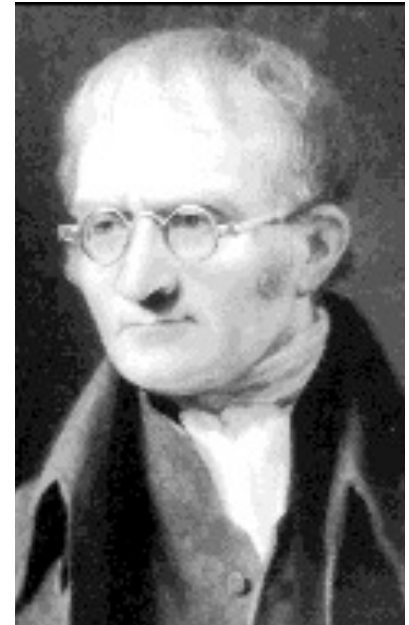
ATOMIC MODEL TIMELINE

2000 years later!!! We still believed in the four elements!!!



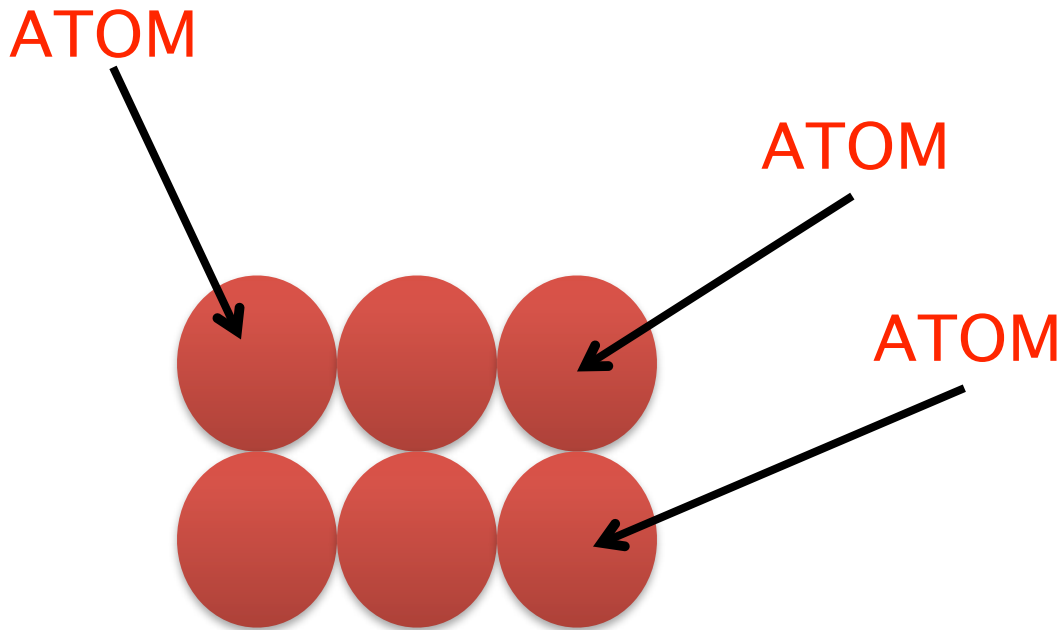
1800

John Dalton proposed a modern atomic model based on **experiments** and not on logic and **reason** like Aristotle & Democritus



Dalton Says...

- 1. All matter is made of atoms

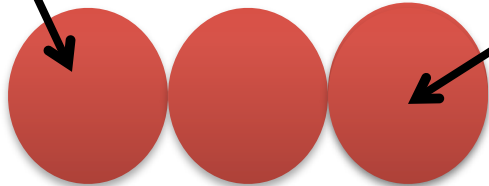
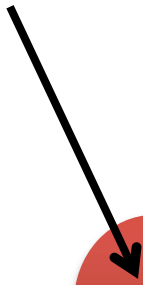


Dalton Says...

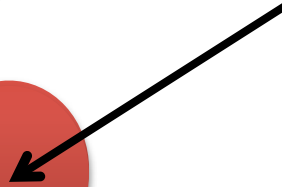
- 2. Atoms are solid spheres
- 3. Atoms are small indestructible, indivisible particles

THINK OF
BILLIARD
BALLS!!!

ATOM

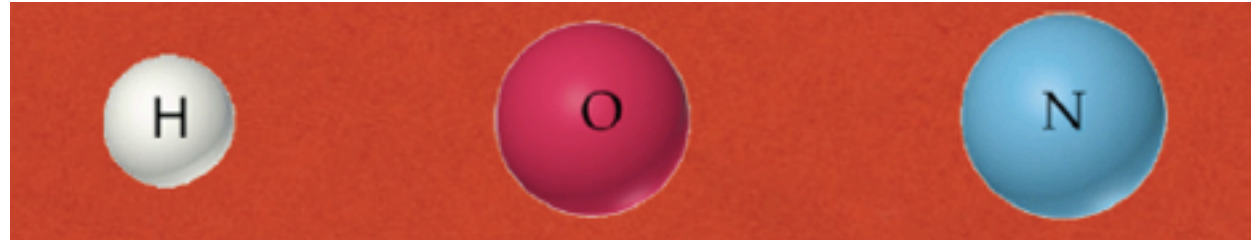


ATOM

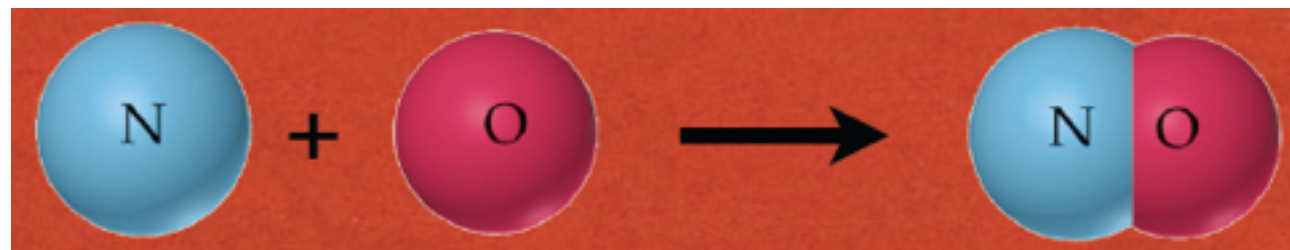


Dalton Says...

- 4. Atoms of different elements have different masses

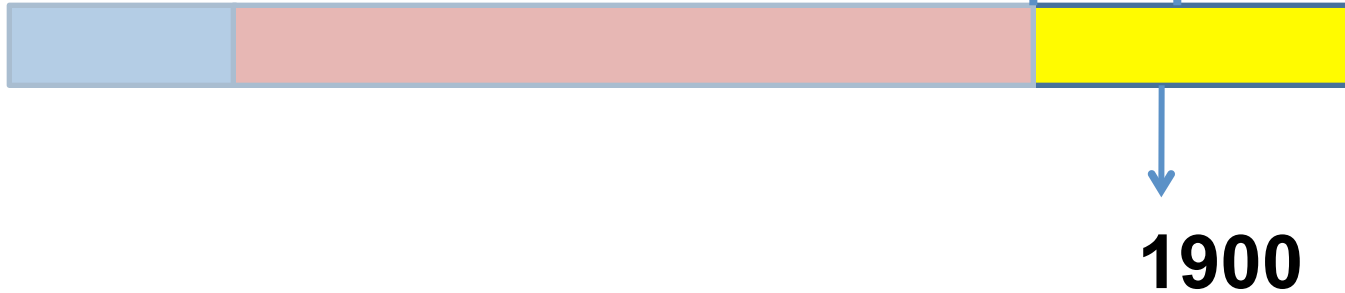


- 5. Atoms can combine to form compounds



ATOMIC MODEL TIMELINE

100 years later...



JJ Thompson came along and added the negatively charged **Electron** in the model Symbol: e^{-}

Crooke's Tube

- Tube with air removed, plates on opposite sides
- When electricity flows through it, blue ray appears





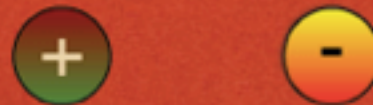
J.J. THOMSON

1856-1940

Nationality: English

Before you can understand Thomson's experiment, you need to understand 3 properties about electrical charges:

a) There are two types of electrical charge: positive and negative.



b) Opposite charges attract.



c) Like charges repel.





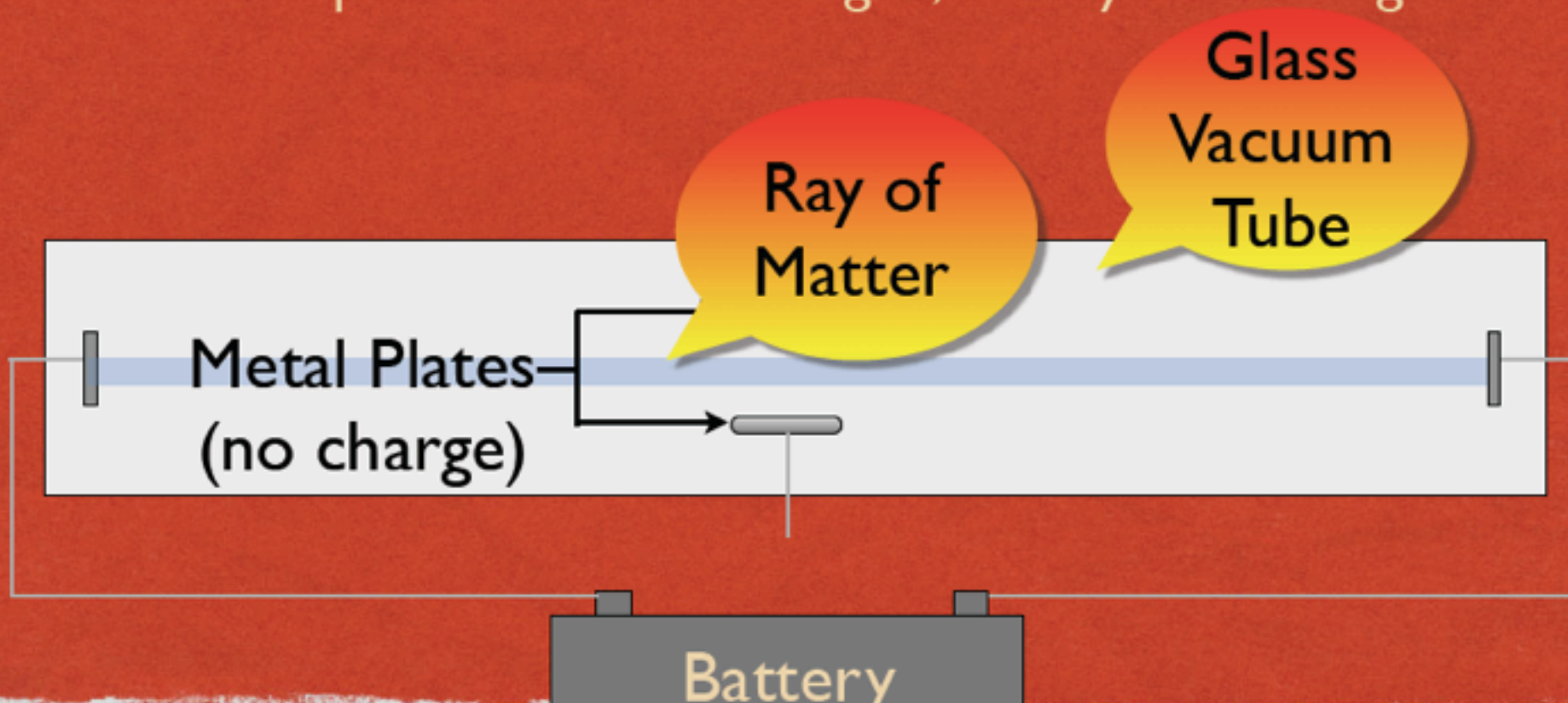
J.J. THOMSON

1856-1940

Nationality: English

Thomson took Crooke's tube and added two plates inside the tube and connected them with a wire.

When the plates were not charged, the ray shot straight.



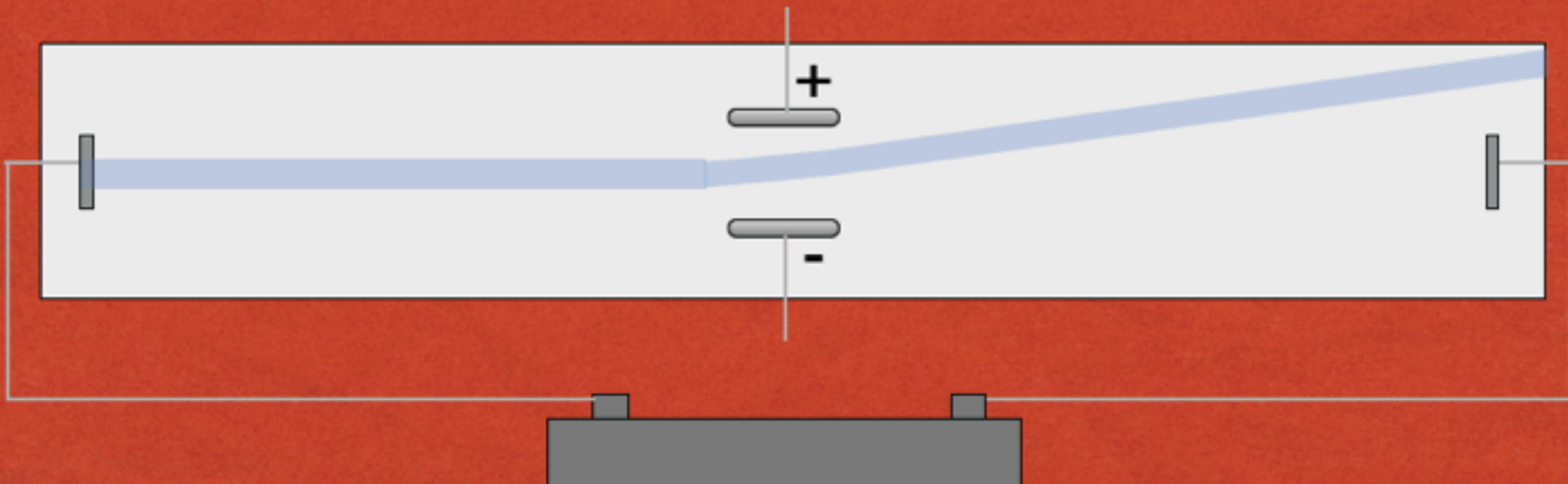


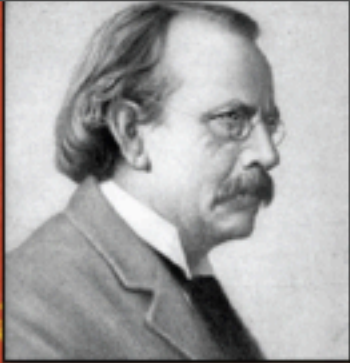
J.J. THOMSON

1856-1940

Nationality: English

But when he charged the plates a strange thing happened!

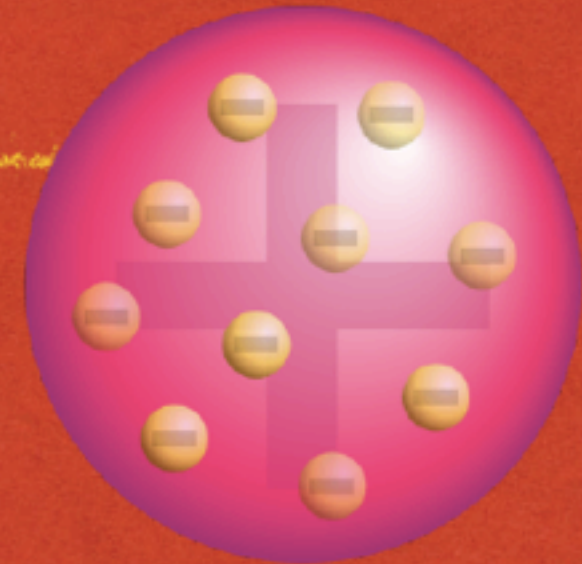




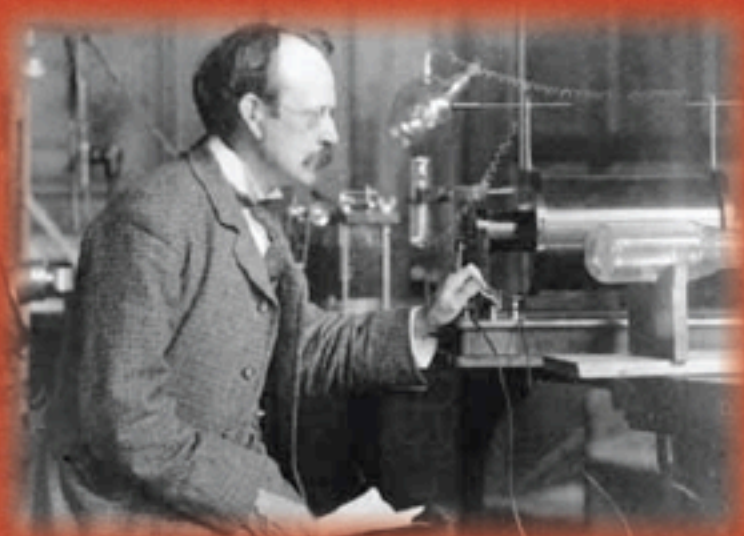
J.J. THOMSON

1856-1940
Nationality: English

Thomson's model was called the *Plum Pudding Model* was named after a popular dessert in England at that time. It was the first model to propose that smaller charged particles make up the atom.



Plum Pudding Model, 1897



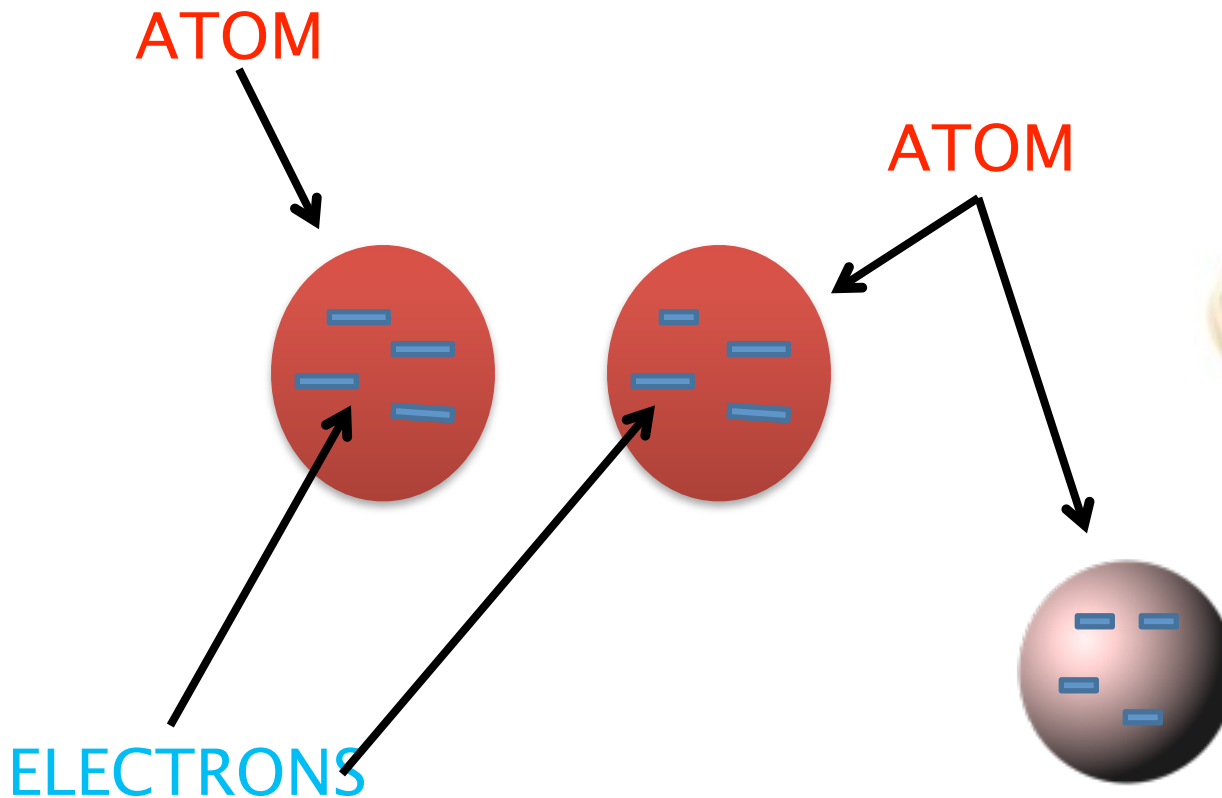
JJ Thomson with his cathode ray tube

Thomson's model lasted less than two decades but it was first to propose the existence of subatomic particles. In 1911 another scientist who worked in Thomson's lab improved on his atomic model.

CHANGE THE MODEL

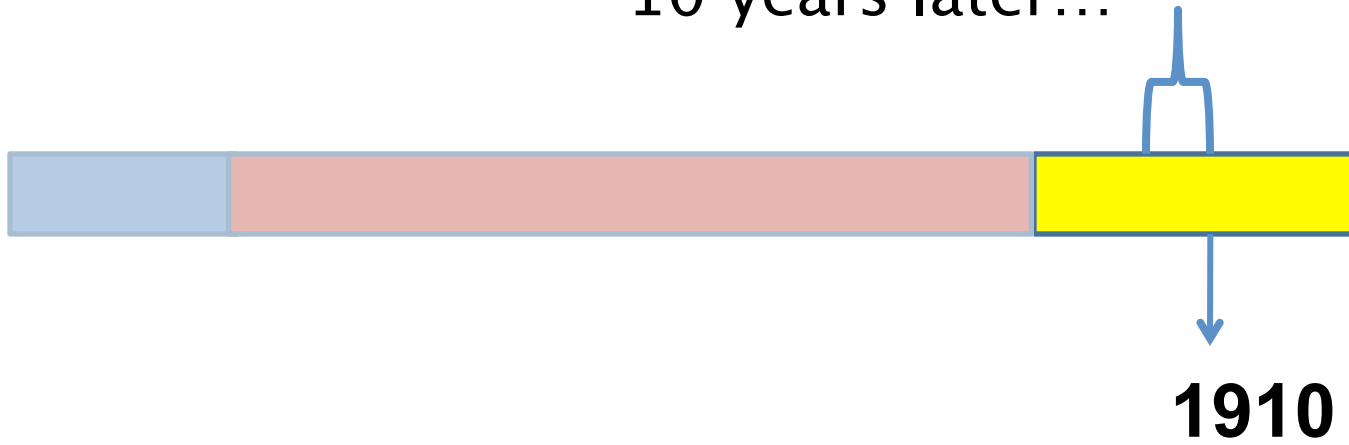


Thompson Plum Pudding Model



ATOMIC MODEL TIMELINE

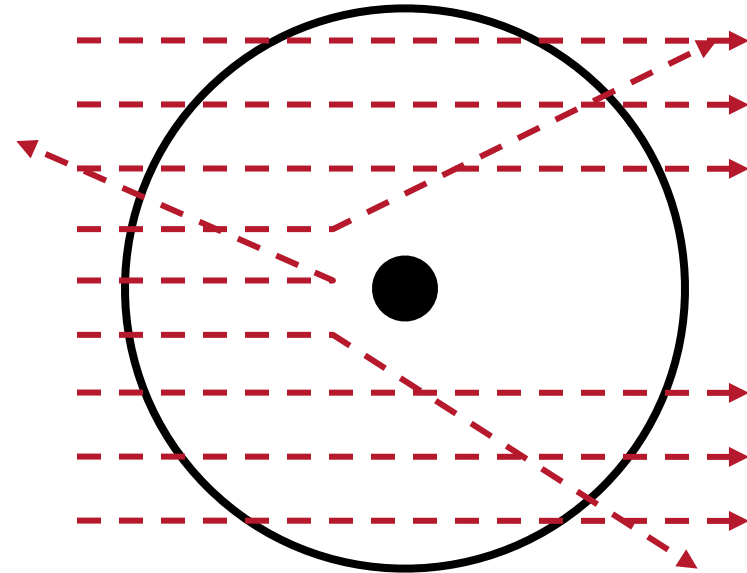
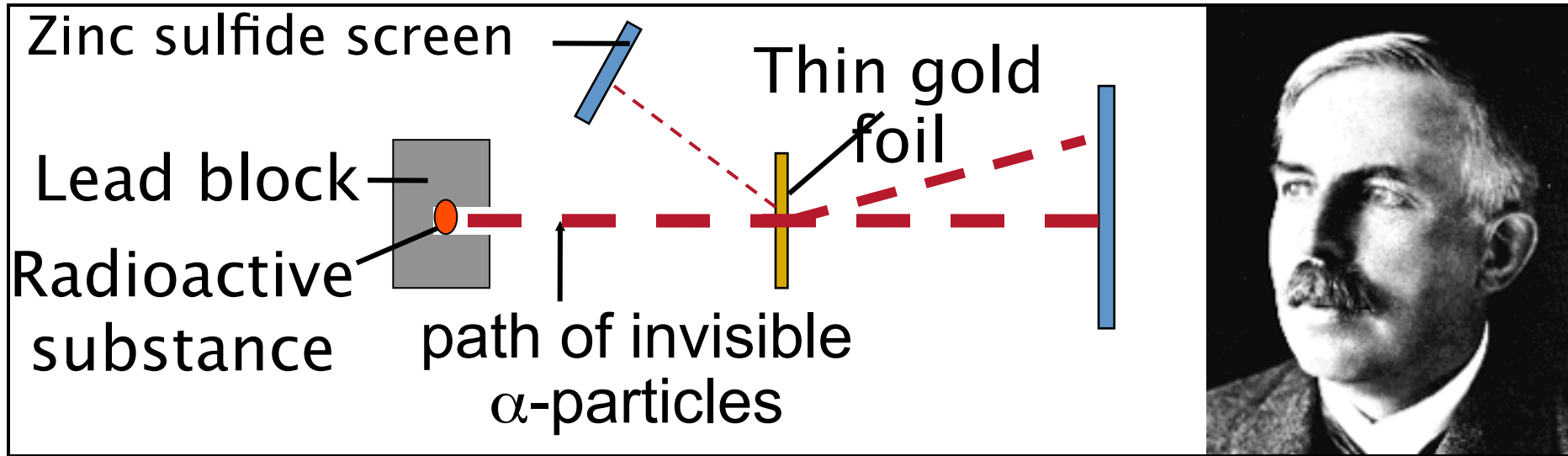
10 years later...



Ernest Rutherford came along and discovered how **empty** the space is in all atoms and the centre (**nucleus**) is **positive**.

Ernest Rutherford

- Rutherford shot alpha (α) particles at gold foil.



Rutherford's Findings

Results	Meaning
Most particles passed through the foil	Atoms are mostly empty space
A few positive α -particles bounced back	A nucleus must have a positive centre, the nucleus

Rutherford



Size of the atom

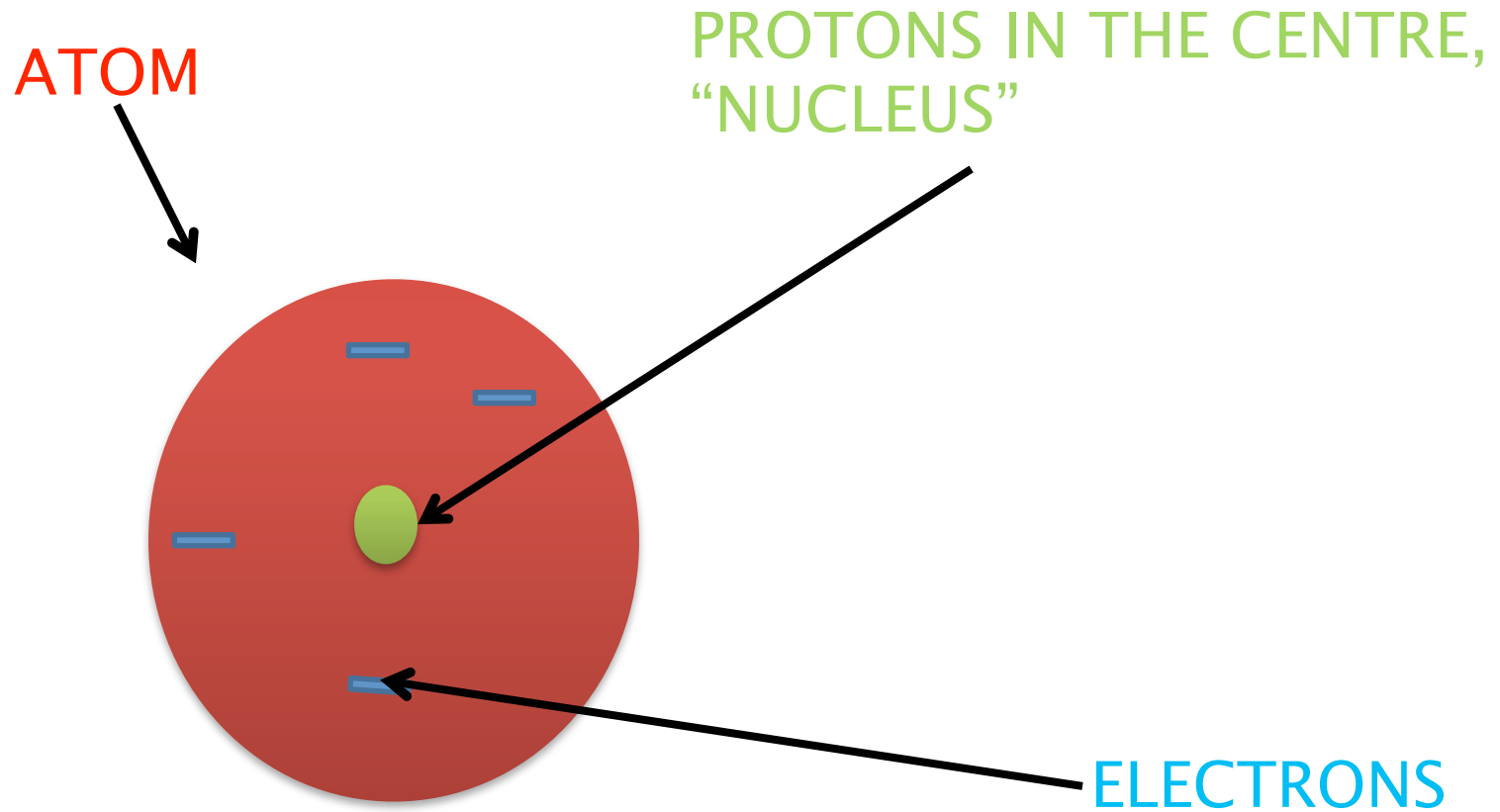
Size of the positive nucleus



CHANGE THE MODEL



Rutherford Model



ATOMIC MODEL TIMELINE

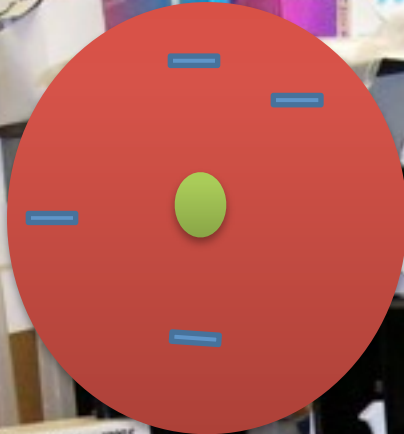
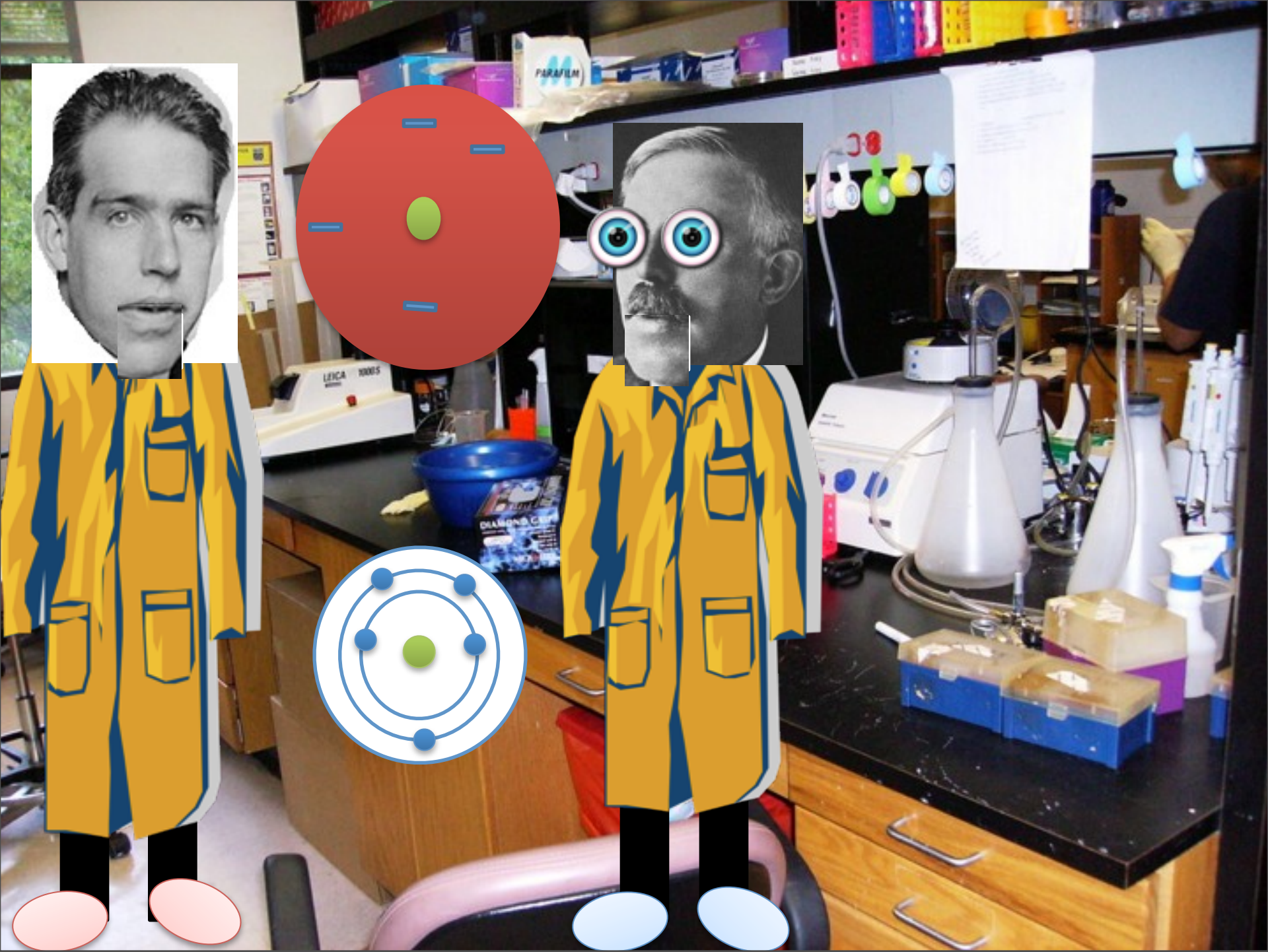
3 years later...



1913

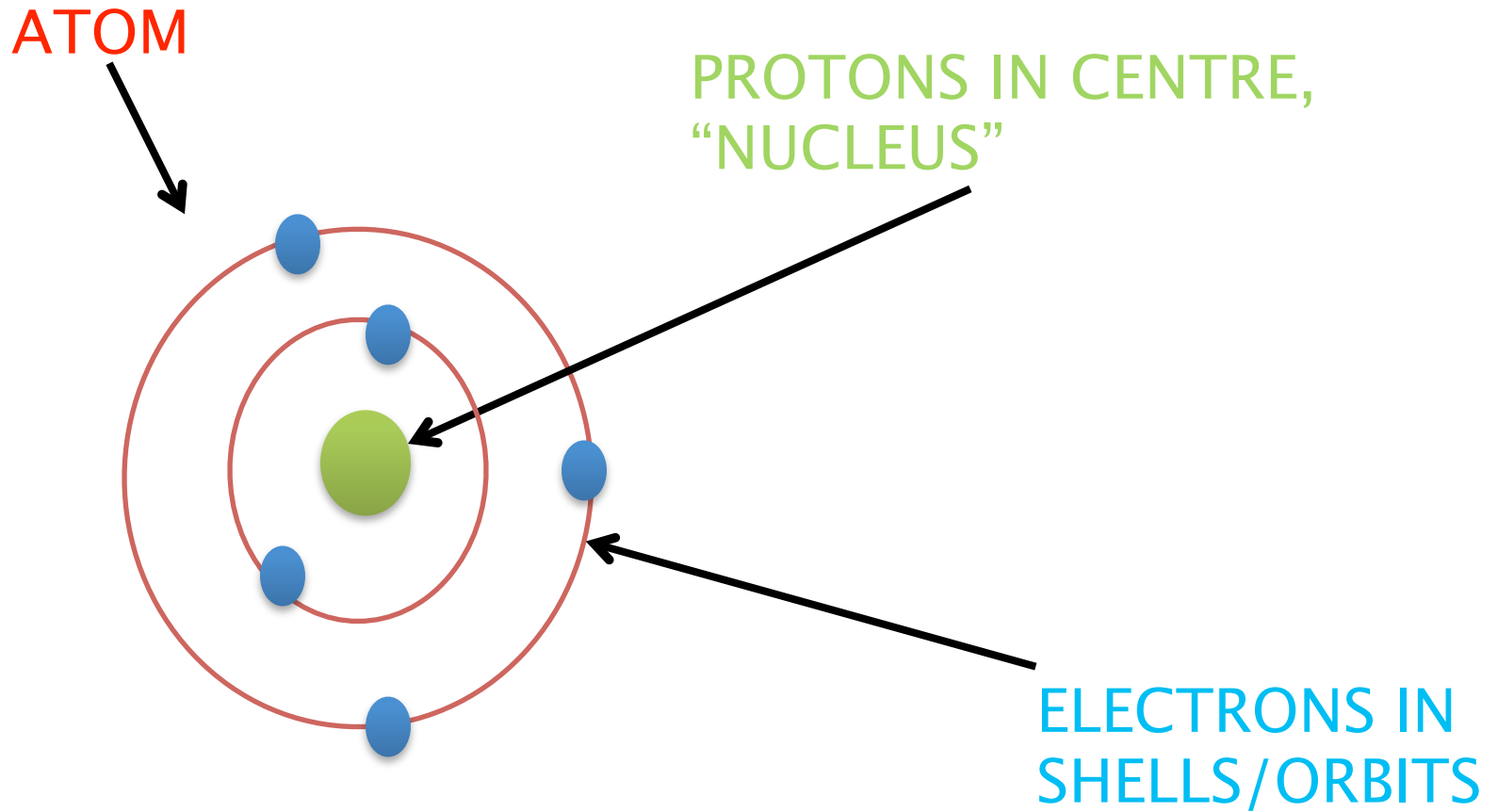
Niels Bohr while working under Rutherford, published his model that the electrons orbits the nucleus in **energy shells!**





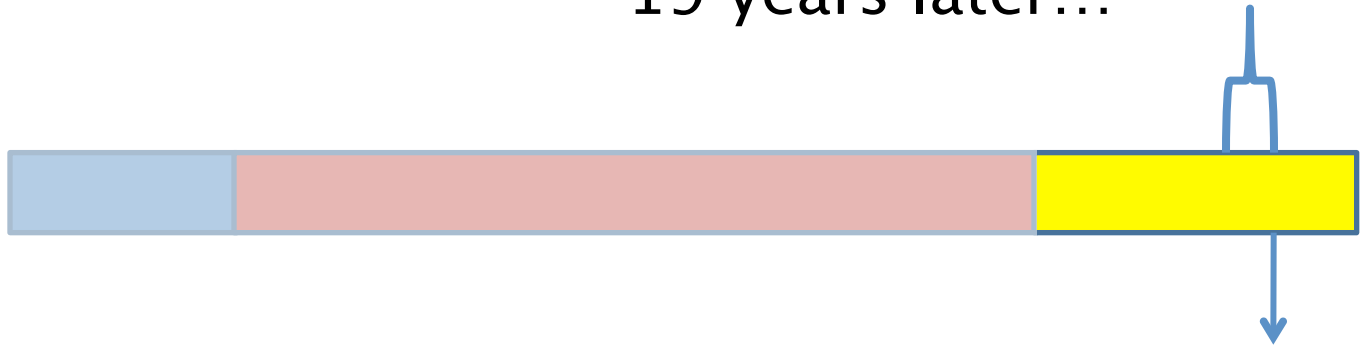
Wednesday, March 5, 2014

Bohr Rutherford Model



ATOMIC MODEL TIMELINE

19 years later...



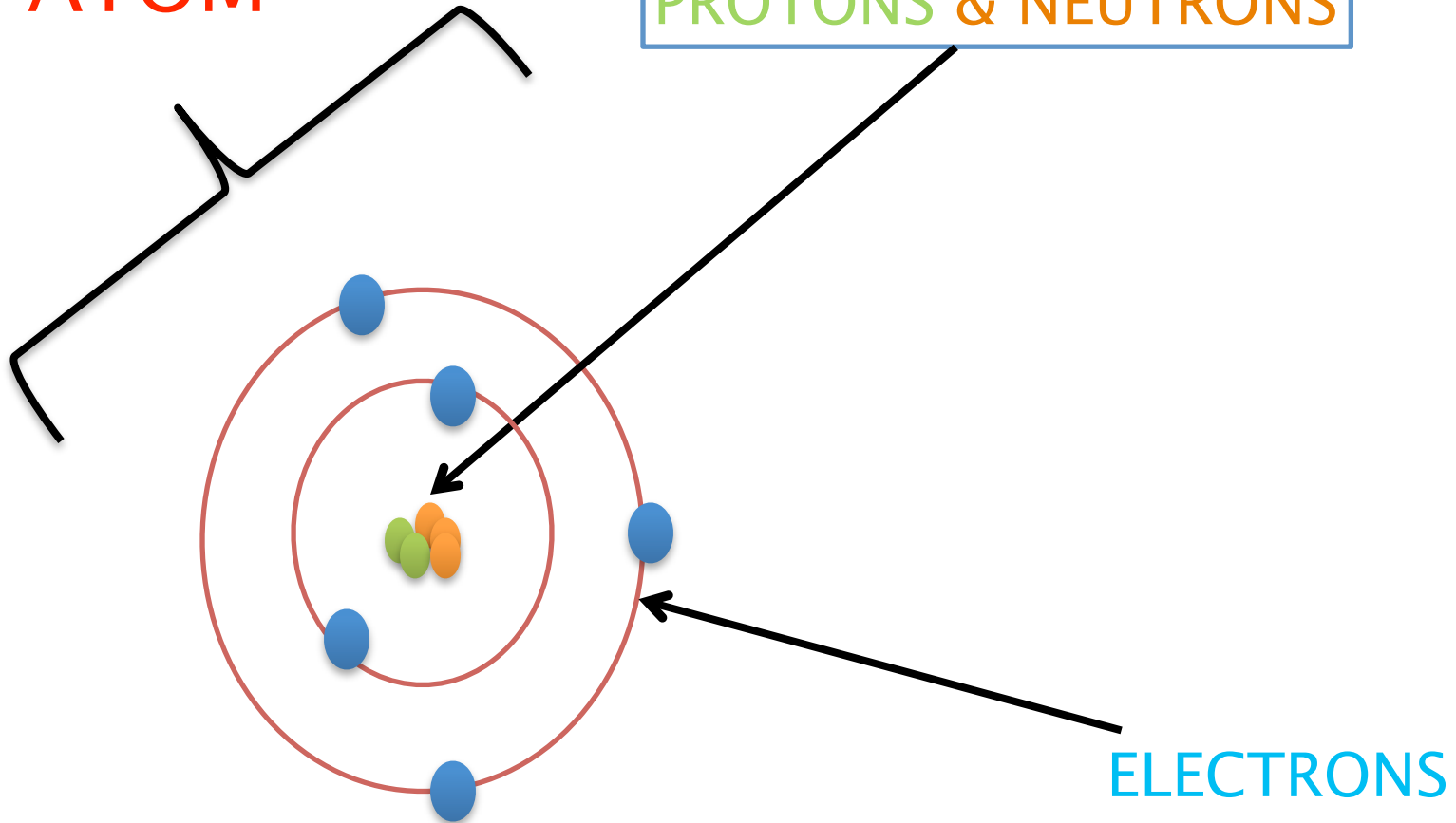
1932

Chadwick in 1932, ran experiments to prove the existence of **neutrons**.

Still... Bohr Rutherford Model

ATOM

PROTONS & NEUTRONS



ELECTRONS

Learning Check!

Dalton's atomic theory was one of the most important theories in chemistry. In this theory, atoms were considered to be

- (a) tiny indivisible spheres.
- (b) the same for all elements.
- (c) made up of smaller particles.
- (d) positively charged.

Learning Check!

Which of the following statements is not part of Dalton's atomic theory?

- (a) All substances are composed of small, indivisible particles called atoms.
- (b) The atoms of a given element are identical in every respect.
- (c) The three main particles in atoms are protons, neutrons, and electrons.
- (d) In chemical reactions, atoms combine in simple, whole-number ratios.

Learning Check!

The atomic model has been modified many times over the years. This happened because

- (a) scientists have become smarter with time.
- (b) new evidence became available to scientists.
- (c) the actual nature of the atom has changed with time.
- (d) more elements were discovered.

Learning Check!

Which scientist first proposed the existence of the nucleus in atoms?

- (a) Rutherford
- (b) Bohr
- (c) Thomson
- (d) Dalton

Learning Check!

In a famous experiment, Rutherford bombarded a thin sheet of gold with high-speed, positively charged particles. Based on the behaviour of these particles, Rutherford proposed that atoms had

- (a) a very small, positively charged, dense region in the centre of the atom.
- (b) a very small, negatively charged, dense region in the centre of the atom.
- (c) very small, positively charged particles that moved at high speed.
- (d) equal numbers of positive and negative particles.

Learning Check!

In Rutherford's famous experiment, what surprising observation did Rutherford make?

- (a) All of the alpha particles went straight through the foil.
- (b) Most of the alpha particles bounced back from the foil.
- (c) A few alpha particles bounced back from the foil.
- (d) None of the alpha particles went straight through the foil.

Learning Check!

According to the Rutherford model of the atom, most of the space that an atom takes up consists of

- (a) protons.
- (b) a nucleus.
- (c) neutrons.
- (d) empty space.

Learning Check!

Several models of the atom have been suggested by scientists. What is the correct chronological order (earliest to latest) of the models proposed by the scientists listed below?

- (a) Dalton, Bohr, Thomson, Rutherford
- (b) Dalton, Thomson, Rutherford, Bohr
- (c) Thomson, Dalton, Rutherford, Bohr
- (d) Dalton, Rutherford, Thomson, Bohr

Learning Check!

The "raisin bun" or "plum pudding" model of the atom was proposed by

- (a) Dalton
- (b) Thomson
- (c) Rutherford
- (d) Bohr

Learning Check!

One model of the atom is sometimes referred to as the "raisin bun" model. In this model, the raisins represent the

- (a) protons
- (b) neutrons
- (c) nucleus
- (d) electrons

How did you do?