

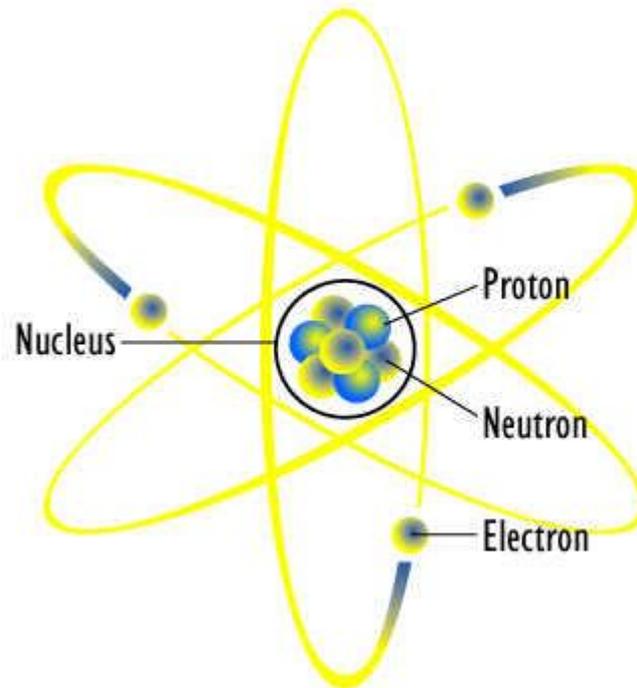
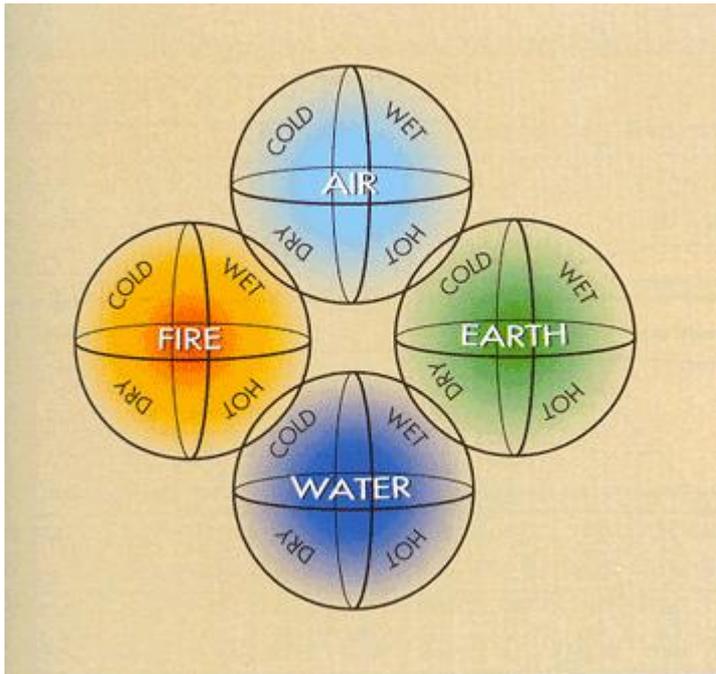
ATOMIC THEORY

Chapter 1.3

ATOMIC THEORY...

Chapter 1.3

...is the various descriptions of matter and how it behaves

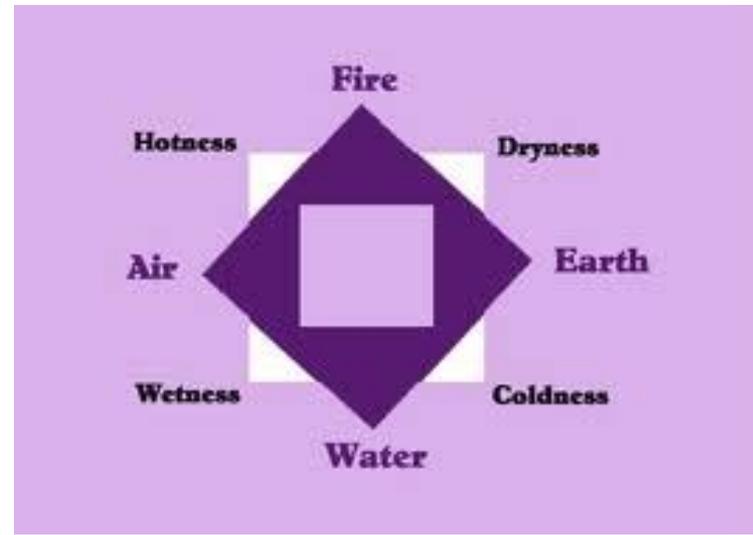


THEORY VS LAW

- The atomic theory is a THEORY, so it is an explanation of observations supported by reliable evidence
- As new facts become available, this theory is constantly changing
- The difference is:
 - Laws do NOT provide explanations, they simply state what happens (ex: Law of Gravity)
 - Theories do provide explanations for observations that are supported by reliable evidence

ATOMIC THEORY TIMELINE

⦿ About 2000 years ago



- Greek Scientists thought matter was made of four elements: earth, air, wind and fire
- One Greek, Democritus, did propose a substance being cut would eventually result in a piece that could no longer be cut (called *atomos*)...
- The very influential Aristotle, however, believed the four elements theory, so that one prevailed!

ATOMIC THEORY TIMELINE

◉ Middle ages

- Alchemy is practiced
- Alchemists try to turn common metals into gold

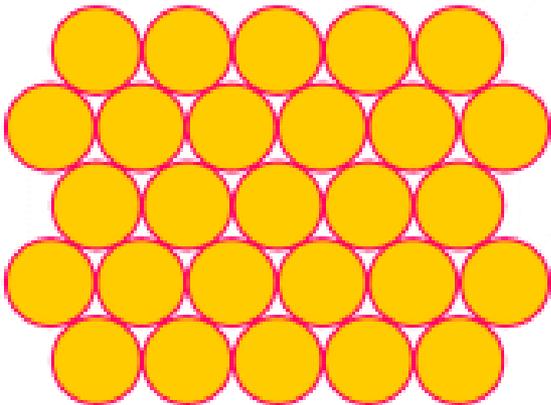


- This didn't work, but it did get many people doing experiments which questioned earlier views!

ATOMIC THEORY TIMELINE

⦿ Early 1800s

- John Dalton proposes the “Billiard Ball Model” where atoms are small, hard, solid spheres



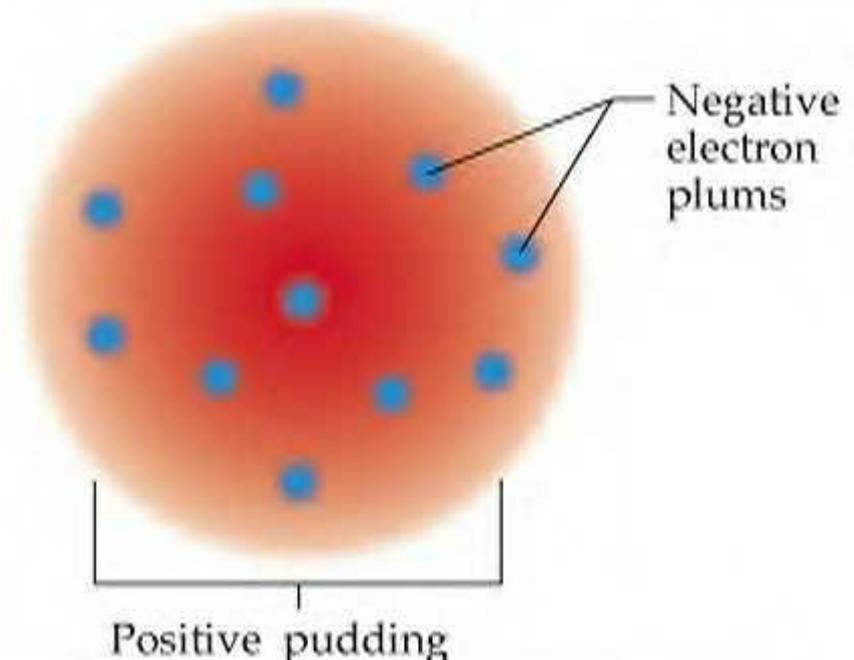
⦿ Dalton's Atomic Theory

- All matter is made of small particles called atoms
- Atoms cannot be created, destroyed or divided into smaller particles
- All atoms of the same element are identical in mass and size, but they are different from the atoms of other elements
- Compounds are created when atoms of different elements link together in definite proportions

ATOMIC THEORY TIMELINE

○ Late 1800s

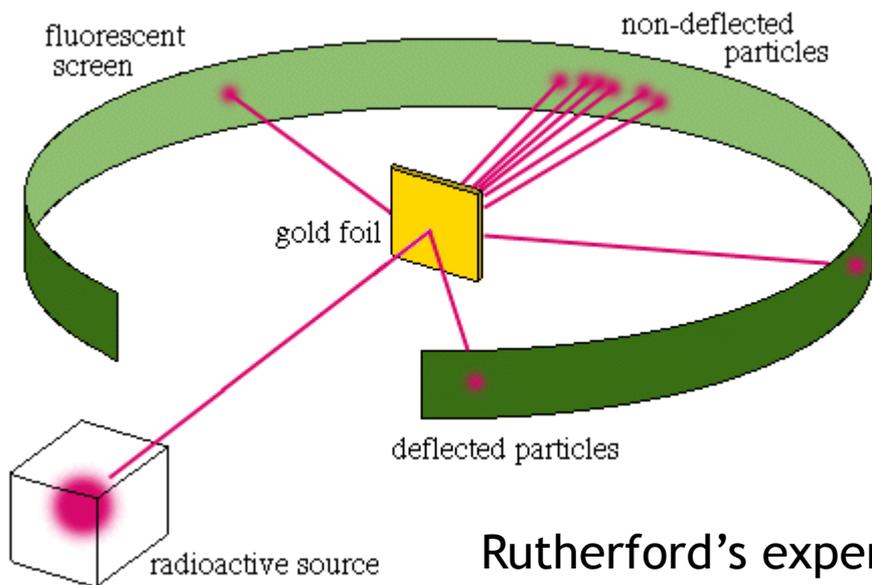
- J.J. Thomson proposes the “Raisin bun” model and suggests atoms are NOT indivisible but have smaller particles in them
- His model pictured a positively charged ball like a bun with negatively charged particles embedded like raisins



ATOMIC THEORY TIMELINE

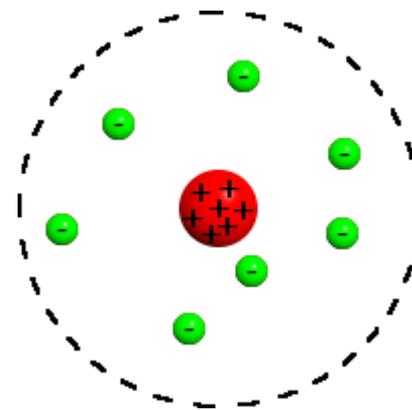
Early 1900s

- Ernest Rutherford performs experiments where he sends a stream of alpha particles at a thin sheet of gold foil (most go through, some bounce back!)
- He discovers atoms have a tiny dense nucleus with electrons moving around it



Rutherford's experiment

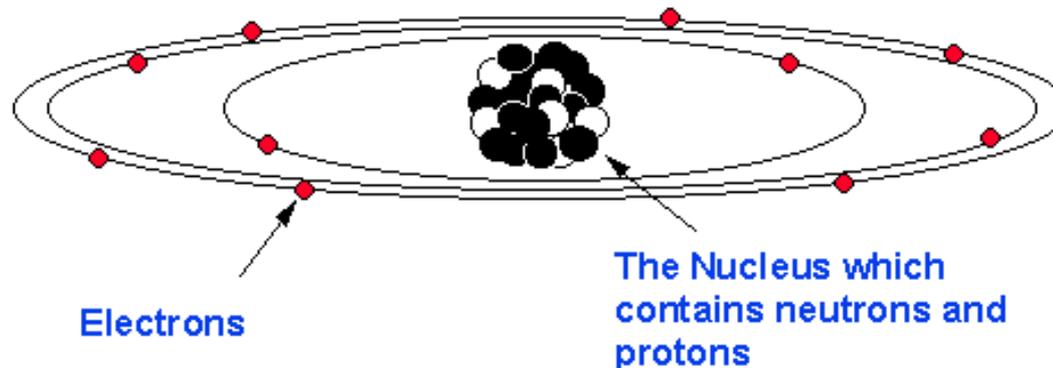
Rutherford's atom



ATOMIC THEORY TIMELINE

○ 1920s

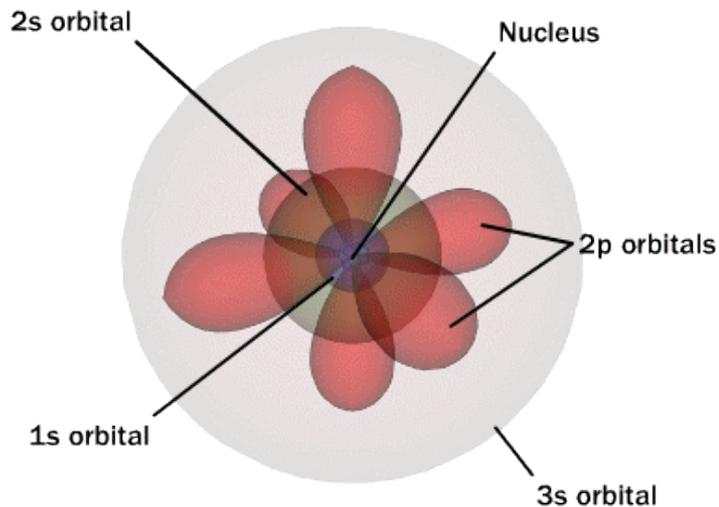
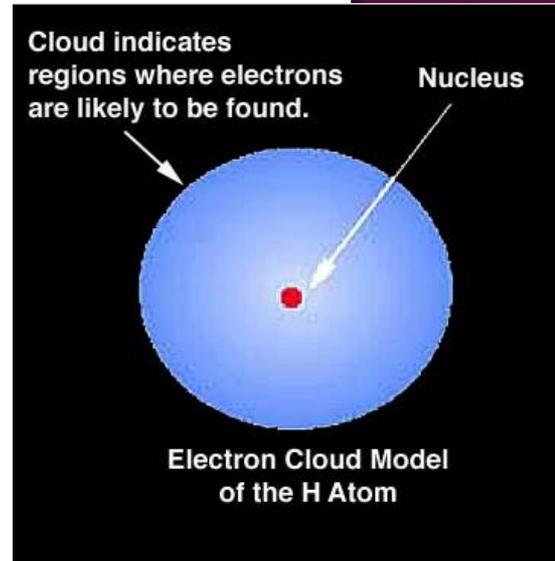
- Neils Bohr experimented on gaseous samples of atoms and how they release light when electricity is added
- Bohr proposed the concept of electrons being in specific energy levels or shells and having particular amounts of energy



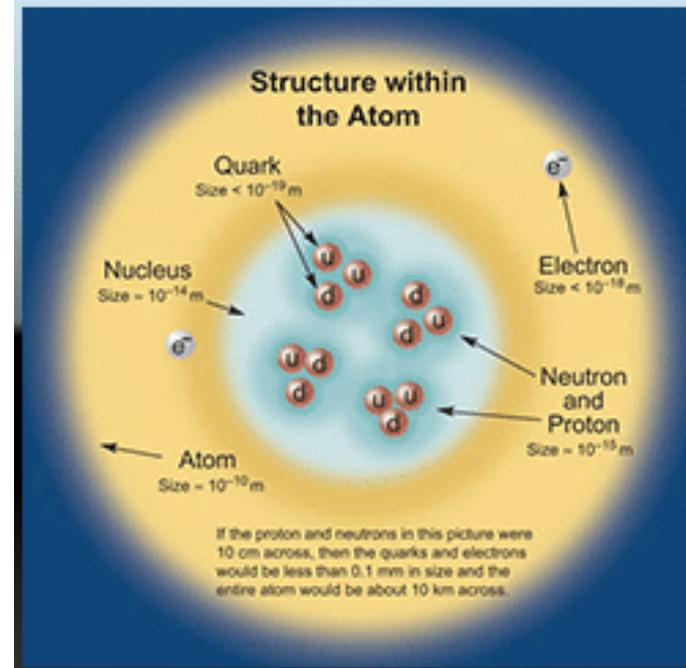
ATOMIC THEORY TIMELINE

Present Day

- New technologies are constantly being developed
- Research then produces new evidence and allows the model to be developed even further!

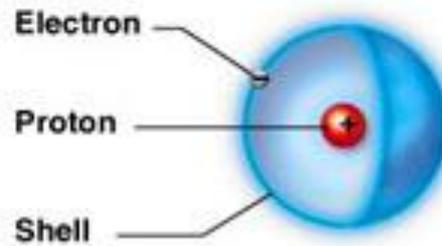


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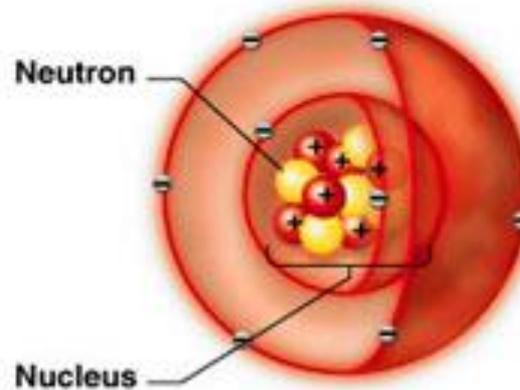


INSIDE THE ATOM

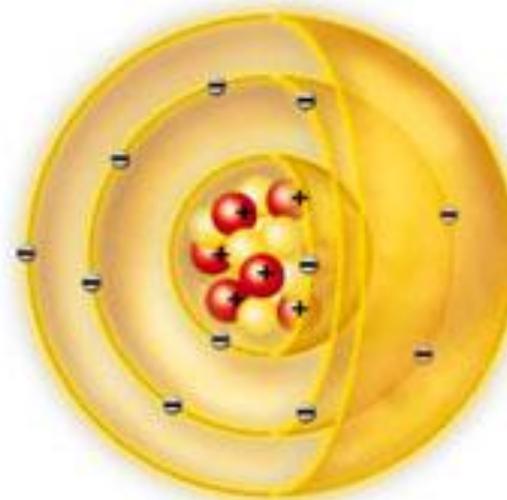
- ⦿ An atom is the smallest particle of an element that still retains the properties of that element.



(a) Hydrogen
1 proton



(b) Oxygen
8 protons
8 neutrons
8 electrons
in 2 shells



(c) Sodium
11 protons
11 neutrons
11 electrons
in 3 shells

INSIDE THE ATOM

An atom is made up of three *subatomic* particles:

■ Proton

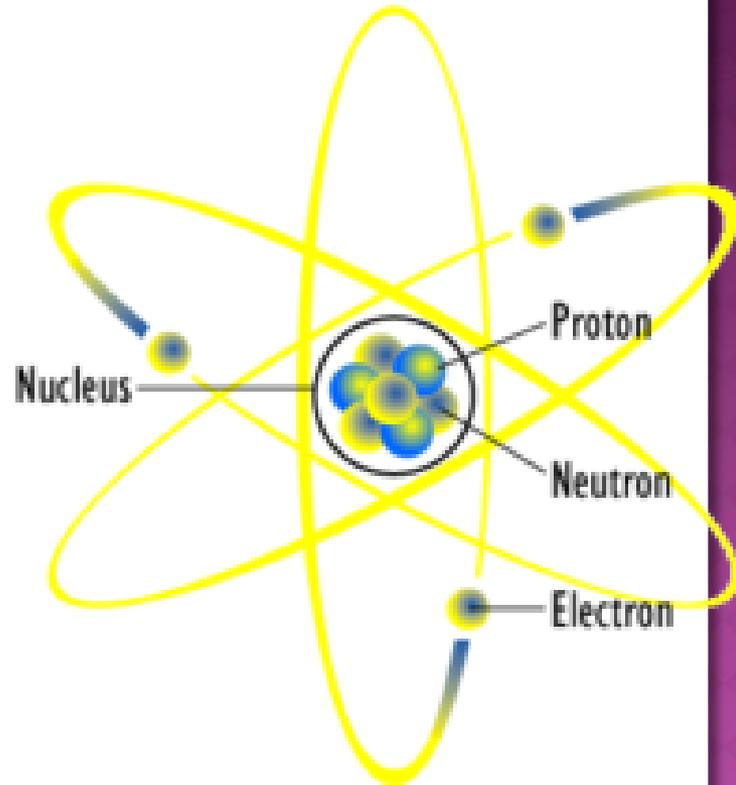
- Symbol is p
- Has a +1 charge (p for positive!)
- Located in the nucleus

■ Neutron

- Symbol is n
- Has NO charge (n for neutral!)
- Located in the nucleus

■ Electron

- Symbol is e (or e⁻)
- Has a -1 charge (negative)
- Located in energy levels surrounding the nucleus



INSIDE THE ATOM

⦿ A note about size:

- Protons and neutrons are A LOT more massive than electrons (more than 1800 times as massive!!) so the nucleus of an atom is the most massive part, but...
- The nucleus is VERY dense and takes up only about 0.001% of the volume
- Analogy of a hockey rink:
 - Nucleus is the puck at centre ice
 - Whole atom (with electron energy shells) includes the entire arena and surrounding parking lot.