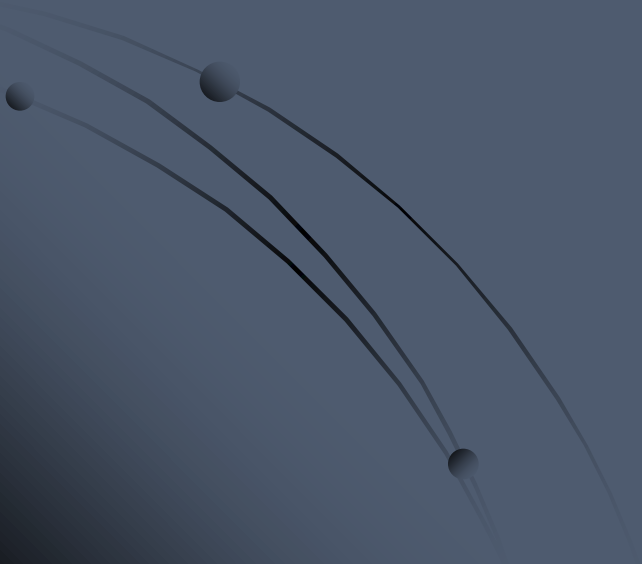
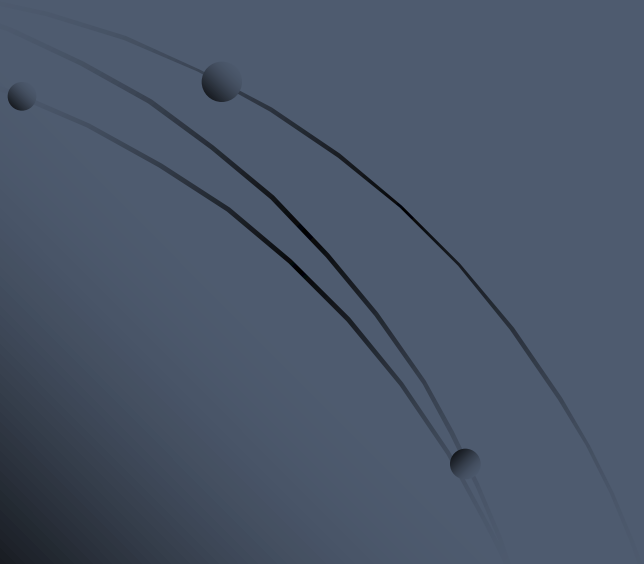


Matter



What is matter?

- Matter is anything that has mass and takes up space.
- Matter is made up of atoms.



Is it matter?

- Can you measure the object?
- Does it take up space?
- Does the object have a mass?

Come up with examples that are matter and are NOT matter with your shoulder partner.



QUICK VOCAB LESSON

Mass vs. Weight

- Matter is anything with mass which does NOT mean the same thing as weight.
- Mass is the amount of matter in an object.
- Weight is the amount of attraction between objects of matter.
 - Gravity anyone?

Density vs. Volume

- Density is the amount of matter in a given space.
 - How closely bound are the atoms?
- Volume is the amount of space an object takes up.



What is an atom?

- An atom is the smallest form of matter.
- Everything in the world is made up of atoms.
- Millions of atoms put together make up matter such as desks, pencils, keys, people, etc.
- They are **EXTREMELY** small
 - Average diameter is 0.00000003 cm

Inside an atom

- Nucleus
 - Made of positively charged protons and neutrally charged neutrons
 - Center of the atom
 - Contains most of the atom's mass
 - Small but dense

Atoms are 99% empty space because all the mass is in the nucleus.

- Electrons

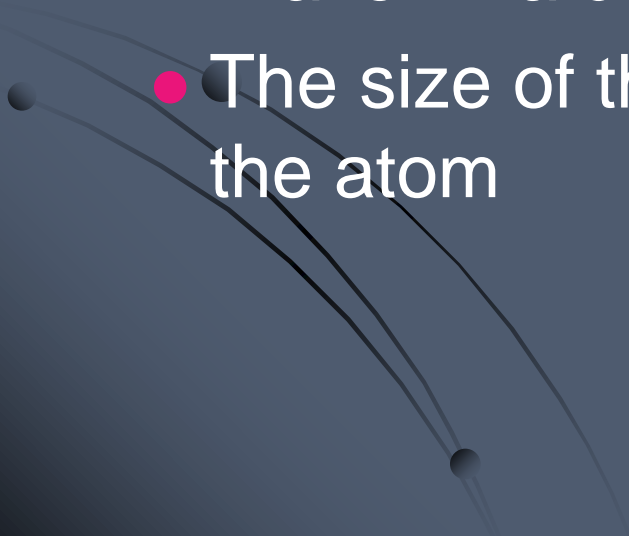
- Negatively charged

- Much smaller than protons and neutrons

- 1, 800 electrons equal the mass of 1 proton

- Travel in a cloud outside the nucleus

- The size of the cloud determines the size of the atom



Electron Cloud

- There are seven different levels in which the electrons can move
- Each level has a certain number of electrons it can contain
- The level must be full before electrons can move to the next level



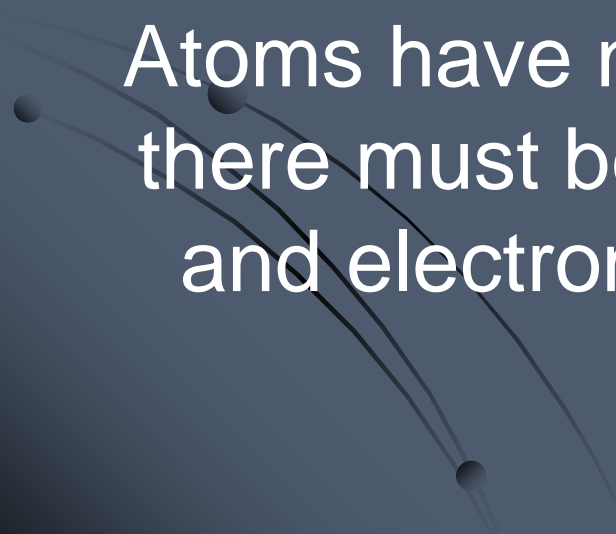
Cloud levels

- Level 1: 2 electrons
- Level 2: 8 electrons
- Level 3: 18 electrons
- Level 4: 32 electrons
- Level 5: 50 electrons
- Level 6: 72 electrons
- Level 7: 98 electrons

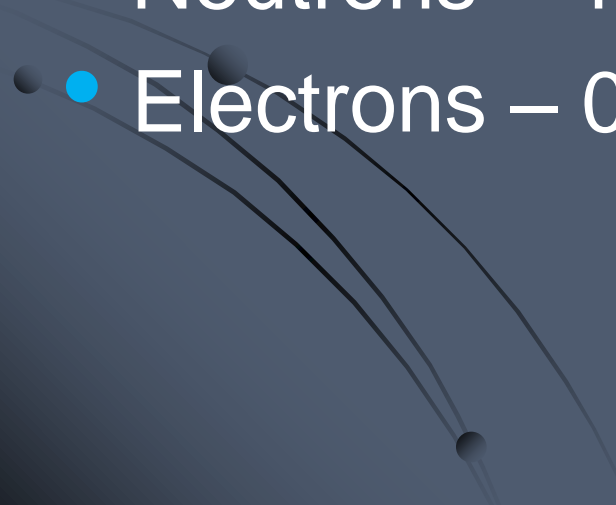
An atom's charge

- Electrons – negative charge
- Protons – positive charge
- Neutrons – no charge

Atoms have no charge, which means that there must be the same amount of protons and electrons to balance each other out.

A decorative graphic in the bottom-left corner of the slide depicts an atom's structure. It features a central nucleus, represented by a cluster of small black dots, with several concentric elliptical orbits or shells. Three larger black dots are positioned on these orbits, representing electrons. The lines for the orbits are thin and dark, curving around the nucleus.

An atom's mass

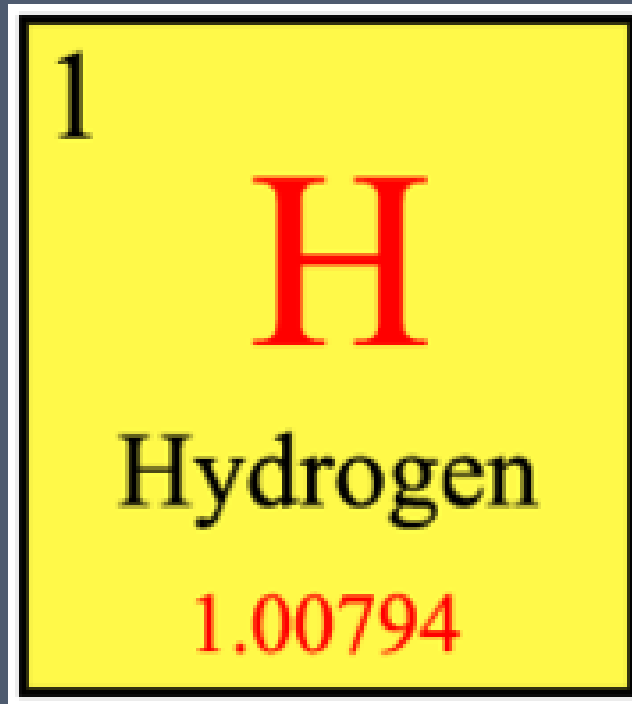
- AMU = Atomic Mass Unit
 - Mass of atoms is so small scientists came up with its own unit!
 - Protons – 1 AMU
 - Neutrons – 1 AMU
 - Electrons – 0.0018 AMU
- 



HOW TO READ AN ELEMENT SQUARE

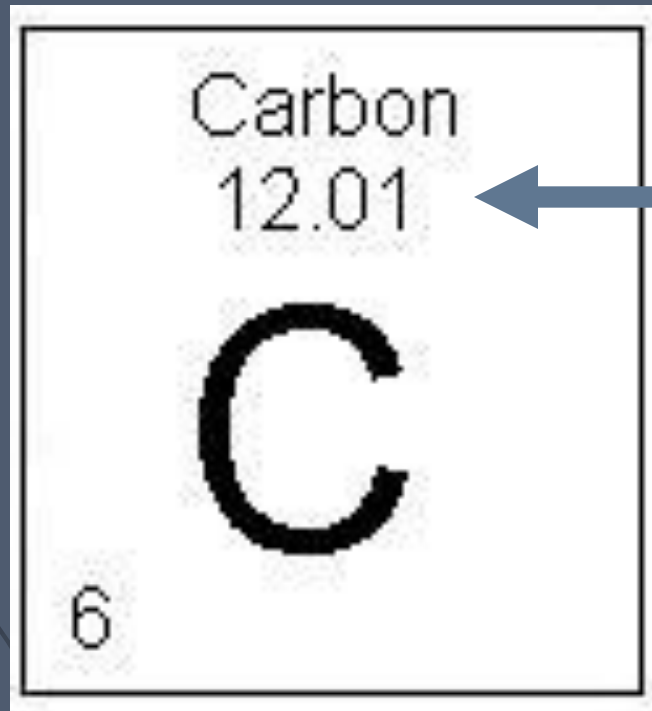
Atomic number

- The number of protons in the nucleus



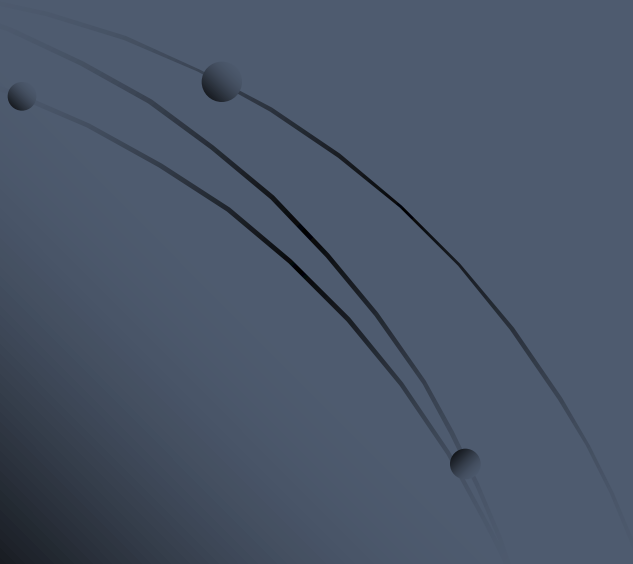
Atomic mass

- The mass of the protons + neutrons



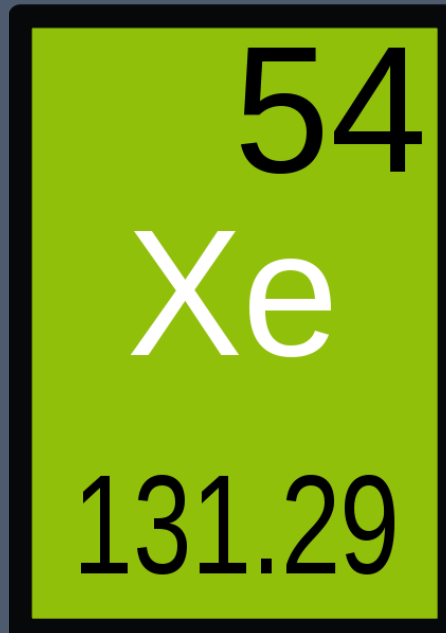
Math!!!!

- Number of protons = the atomic number
- Number of electrons = number of protons
- Number of neutrons = atomic mass - atomic number




Time to practice!

- Find the number of protons, electrons and neutrons of this element



FYI

- Element's atomic number will never change. If there is a different atomic number, then you have a different element
 - Atomic mass can vary from atom to atom of the same element because the number of neutrons can change
- 

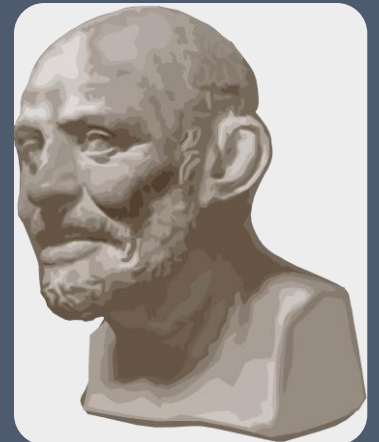


WHO CAME UP WITH ATOMS?

The short version

Democritus – 440 BC

- Greek philosopher.
- Proposed that all atoms are small, hard particles made of a single material formed into different shapes and sizes.
- Said that atoms are always moving and that they form different materials by joining together



Dalton - 1803

- Learned that elements combine in specific proportions based on mass to form compounds. Ex H_2O
- Proposed Atomic Theory to explain why this happened.



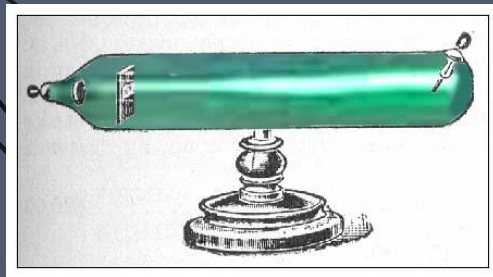
Dalton's Atomic Theory

- All substances are made of atoms. Atoms are small particles that cannot be created, divided, or destroyed.
- Atoms of the same element are exactly alike, and atoms of different elements are different.
- Atoms join with other atoms to make new substances.

This theory was very close but not quite right

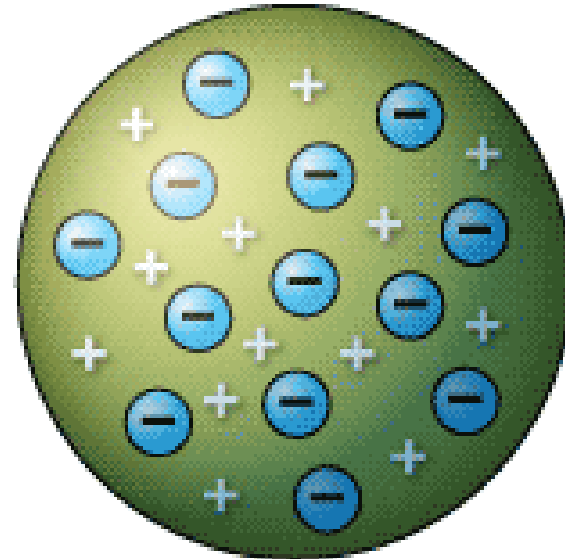
J.J. Thomson - 1897

- Discovered that there are small particles inside the atom, thus atoms can be divided into even smaller parts.
- Experimented with cathode-ray tube and discovered electrons – negatively charged particles.

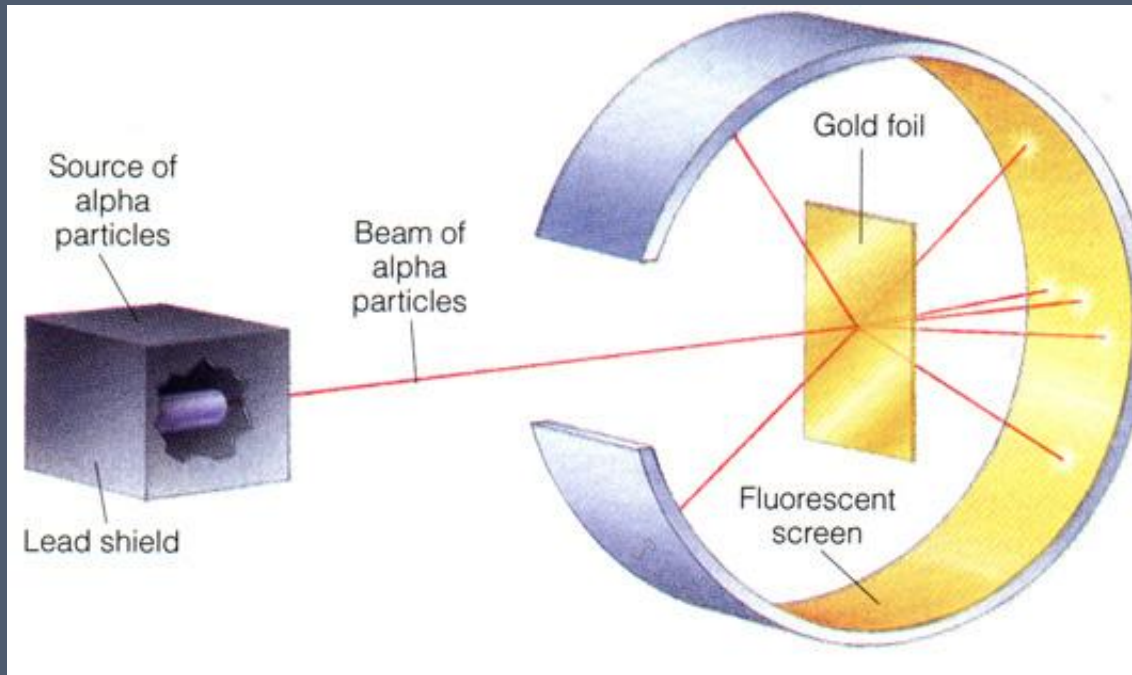


Thomson – *Plum Pudding Model*

- Atoms have no overall charge, so positive charges must also be present
- Plum-Pudding Model of atom



The 'Plum Pudding' model of the atom. Negatively charged electrons (the plums) are embedded in a sphere of uniform positive charge (the pudding).



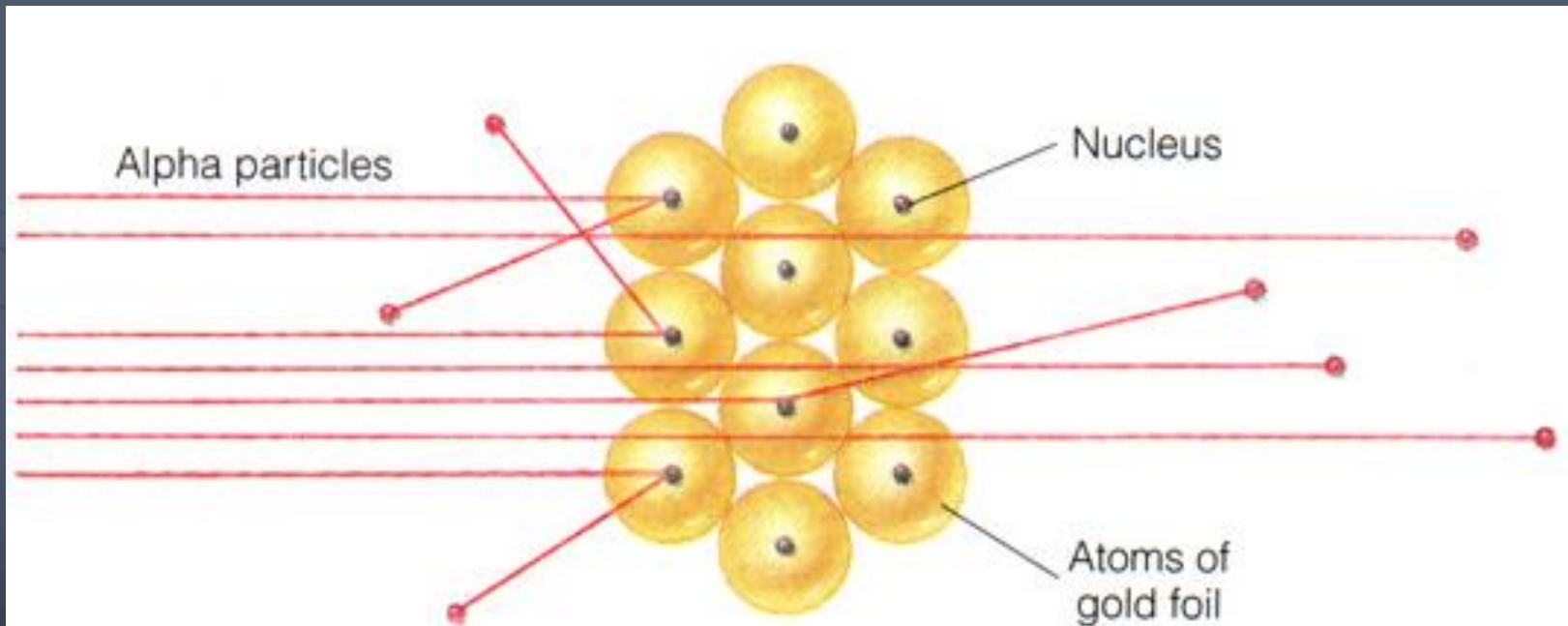
Rutherford 1909



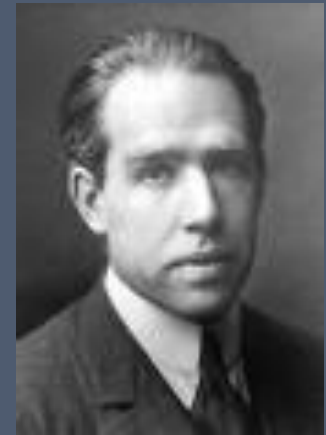
Ernest Rutherford established that atoms have nuclei.

Rutherford

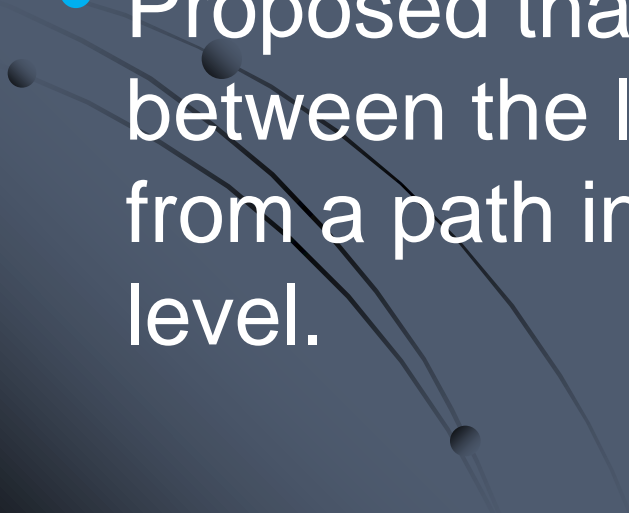
- Gold Foil experiment – aimed a beam of small, positively charged particles at a thin sheet of gold foil



Bohr - 1913



- Suggested that electrons travel around the nucleus in definite paths
- Paths are located in levels at certain distances from the nucleus
- Proposed that no paths are located between the levels, but electrons can jump from a path in 1 level to a path in another level.



Modern Theory 1925-1927

- Erwin Schrodinger and Werner Heisenberg
- Concluded that electrons do NOT travel in definite paths instead they are found in regions called electron clouds.

