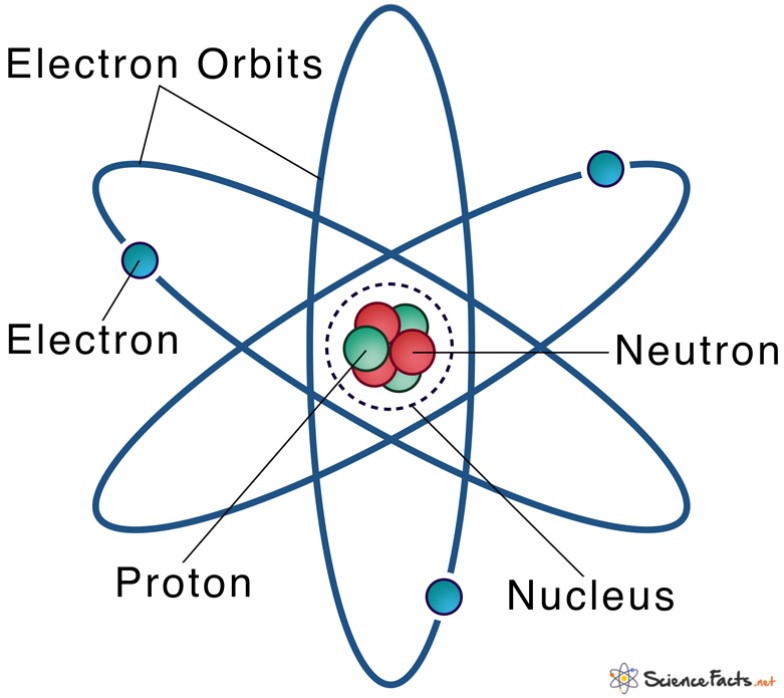
Particles and Matter

6.1 Structure of atoms and elements

Atomic Structure



Protons are positively charged.
Neutrons are neutrally charged/ they have no charge.
Electrons are negatively charged.

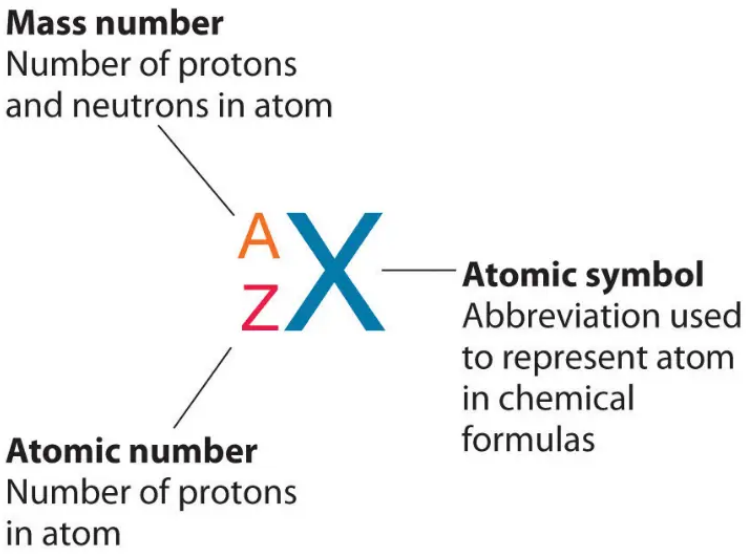
The 1st energy level/ electron orbit can only hold 2 electrons.
8 electrons are required in its outermost shell for the element to be stable.

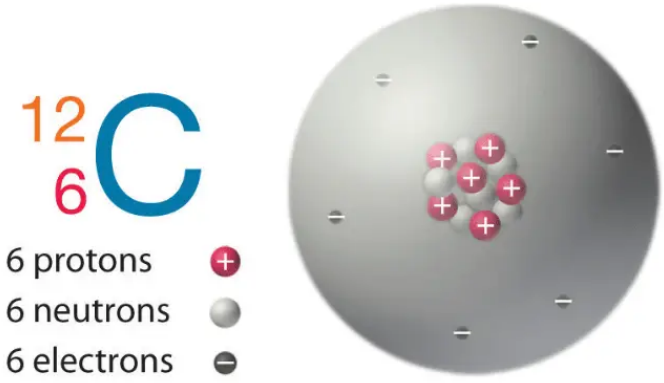
For example: Neon has 8 electrons in its outmost shell meaning it is stable while oxygen has 6 electrons in its outermost shell and is chemically reactive.

Particle	Relative mass	Relative charge	Location
Proton	1836	+1	In the Nucleus
Neutron	1839	+0	In the Nucleus
Electron	1	-1	Outside the Nucleus

Nucleon number= proton+ neutrons

Credit: nuclear-power.com





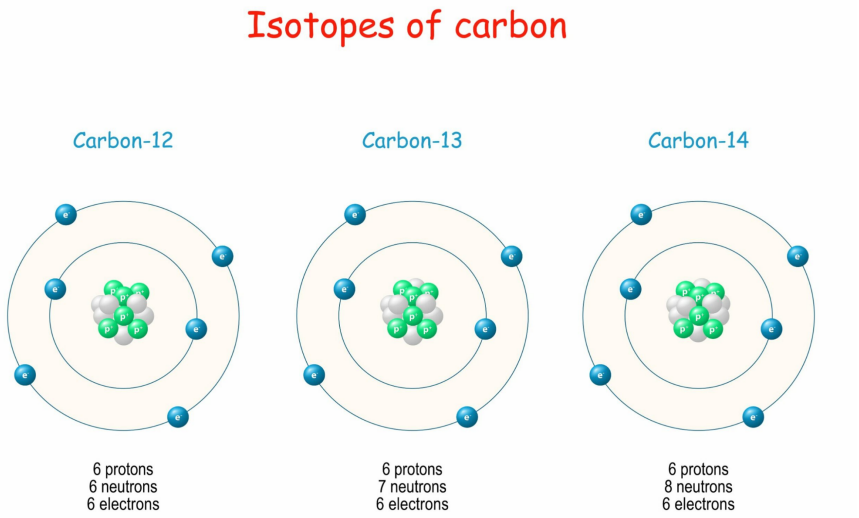
Isotopes

Isotopes: Atoms have the same number of protons but different numbers of neutrons and the same element.

For example:

Carbon 12, and Carbon 13

Credit:
online-learning-college.com

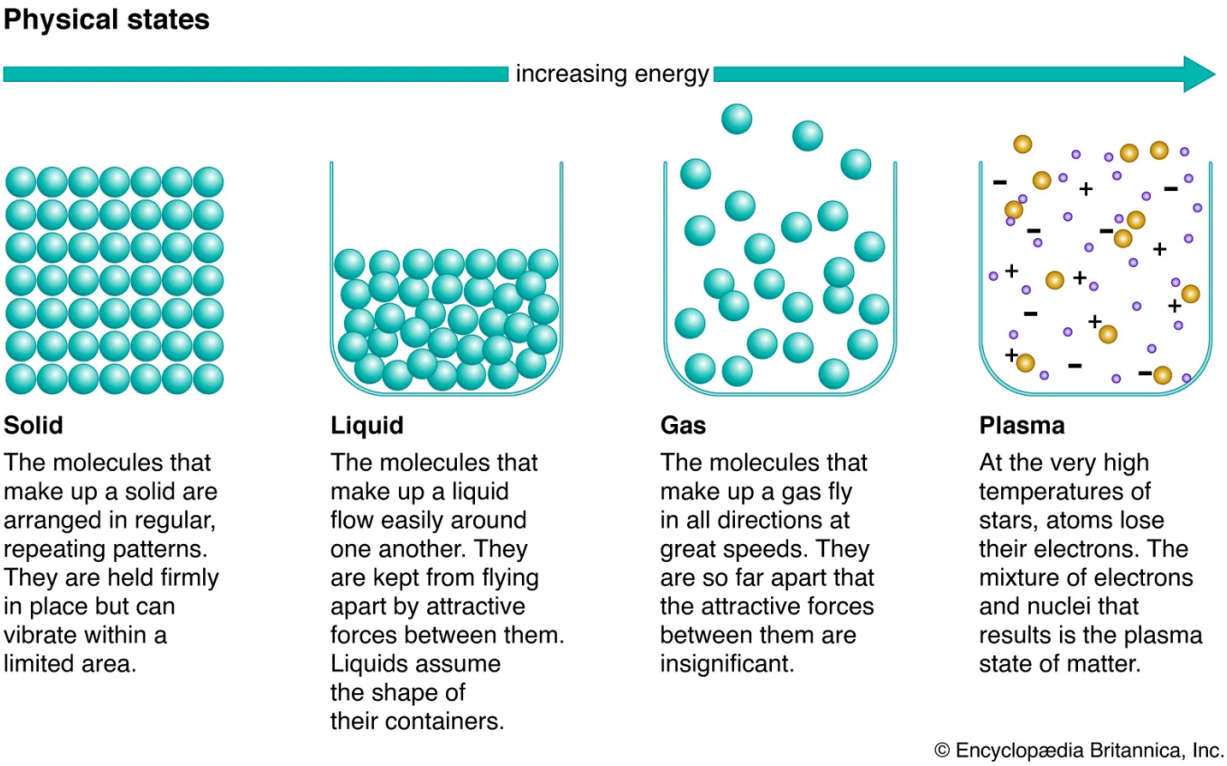


Nuclear Fission

Nuclear fission is a reaction in which the nucleus of an atom splits into two or more smaller nuclei. The fission process releases a very large amount of energy.
Nuclear fusion reactions power the sun and other stars.
Two light nuclei combine to generate a single heavy nucleus.
The process releases energy because the overall mass of the resulting single nucleus is less than the mass of the two initial nuclei. The remaining mass is converted into energy.

Fusion can only occur if the reacting nuclei have enough energy to overcome their mutual electrostatic repulsion.
This can only happen if they are raised in a very high temperature (over 100million^{o}C) so that they collide at high speeds.
Since heat is required, it is called a **thermonuclear fusion**.

6.2 States of Matter



6.3 Changes of State

When a solid is turning into a liquid, the process is called **melting**.
This happens when heat is applied to the solid or can be gained from the surroundings.
As the temperature increases, the particles start to vibrate as they gain kinetic energy weakening intermolecular forces. This gives them greater freedom to move freely forming a liquid state.

When a liquid is turning into a solid, the process is called **freezing**.
This happens when the temperature decreases the kinetic energy of the particles also decreases causing particles to slow down. At this position, the particles have less energy to overcome the attractive forces.

When a liquid turns into gas, a process called **evaporation** takes place.
When a gas turns into liquid, it is **condensation**.
When a solid turns into gas, the process is called **sublimation**.
When a gas turns into a solid, the process is called **deposition**.