

# Physics

Look up physics concepts and definitions right here to better understand scientific articles.

## Forces of Our Universe

- **Strong Nuclear Force:** Binds protons and neutrons in atomic nuclei
- **Weak Nuclear Force:** Responsible for radioactive decay and nuclear fusion in stars
- **Gravity:** Attraction between objects with mass; weakest but longest-range force
- **Electromagnetic Force:** Interaction between electrically charged particles; responsible for electricity, magnetism, and chemical bonds
  - Electric charges create electric fields
  - Moving electric charges create magnetic fields
  - Changing magnetic fields induce electric currents
  - Electromagnetic waves (light, radio, etc.) propagate through space without requiring a medium

## Atoms and Mass

- **Matter:** Substance which occupies space and possesses mass
- **Velocity:** The rate of change of matter's position with respect to time, which emerges from the interaction between matter and the four fundamental forces of our universe
- **Mass:** A measure of the amount of matter in an object, which resists changes to its velocity
- **Atom:** The basic unit of matter, consisting of a nucleus surrounded by an electron cloud
- **Proton:** Positively charged particle in the nucleus of an atom
- **Neutron:** Neutral particle (no charge) in the nucleus of an atom
- **Electron:** Negatively charged particle that orbits the nucleus of an atom
- **Element:** Substance made up of atoms with the same number of protons
- **Electric Charge:**
  - Fundamental property measured in coulombs:  $|\sim 1.6022 \times 10^{-19}| \text{ C}$
  - Electrons have negative charge; protons have positive charge
  - Like charges repel; opposite charges attract; charge cannot be created or destroyed

## States of Matter

- **Solid:**
  - Definite shape and volume; minimal compressibility
  - Particles arranged in fixed, orderly patterns (crystalline structure)
  - Particles vibrate but remain in fixed positions
- **Liquid:**
  - Definite volume but takes the shape of its container; low compressibility
  - Particles close together but free to move past one another
  - Flows and can be poured
- **Gas:**
  - No definite shape or volume (expands to fill container); highly compressible
  - Particles widely separated with minimal attractive forces
  - Particles move rapidly in random directions
  - Diffuses readily
- **Plasma:**
  - Substance containing roughly equal numbers of positively and negatively charged ions
  - Typically exists at extremely high temperatures
  - No definite shape or volume
  - Electrically conductive and responds to electromagnetic fields