

Chapter One: PHYSICAL WORLD

Physics is a branch of Science which is devoted to the study of nature.

The method involved is as follows:

1. Taking a large number of systematic observations through controlled experiments.
2. Studying these observations and looking for logical behavior.
3. Mathematical Modeling.
4. Prediction based on the model.
5. Fine tuning the model.

Physics consists of two parts (a) Classical Physics and (b) Modern Physics

Classical Physics consists of the following sub-topics.

1. **Mechanics** deals with the study of general system of particles, rigid bodies, deformable bodies, liquids etc, propulsion of rockets, propagation of waves etc.
2. **Thermodynamics** deals with changes in temperature, internal energy and entropy of the system. Modes of transfer of heat, efficiency of heat engines and refrigerators.
3. **Electrodynamics** deals with the study of electric and magnetic phenomena associated with charged particles and magnetic materials.
4. **Optics deals** with the study of phenomena associated with light and optical instruments.

Modern Physics deals with Quantum Theory. Quantum Theory is the physics of particles of atomic size.

FUNDAMENTAL FORCES IN NATURE

The fundamental forces in nature are Gravitational Force, Electromagnetic Force, Strong Nuclear Force and Weak Nuclear Force. Their nature is discussed below.

(a) Gravitational Force

The gravitational force is a force of mutual attraction between any two objects by virtue of their masses. It's important properties are :

1. They are universally attractive forces.
2. They are the weakest forces in nature.
3. They operate over long distances.
4. Gravitational Forces obey inverse square law ($F \propto \frac{1}{r^2}$)
5. They are central forces as they act along the line joining the centre's of two bodies.
6. Are conservative forces.

(b) Electromagnetic Force

Forces between charged particles. It's important properties are :

1. The forces may be attractive or repulsive.
2. Electromagnetic Forces are governed by Coulomb's Law.
3. Obey Inverse square Law ($F \propto \frac{1}{r^2}$).
4. They are 10^{36} times stronger than the gravitations forces.
5. Operate over moderate distances.
6. Electromagnetic Forces are both conservative and central in nature.

(c) Strong Nuclear Force

The forces that bind the neutrons and protons together in a nucleus are called strong nuclear forces. It's important properties are :

1. Strongest forces in nature.
2. Short ranged force up to 10^{-14} meters.
3. Nuclear force does not depend on charge of the nucleon.
4. Do **not** obey inverse square law.
5. Basically attractive forces which are non-central or non-conservative forces.

(d) Weak Nuclear Force

The force is seen during beta decay. The weak nuclear forces are the forces of interaction between elementary particles of short live times. It's important properties are is that it's a weak force but is 10^{25} times that of the gravitation force.