



# **General Physics**

## **Lecture 1: standard unit measurements**

**first stage**

**by**

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## What is Physics?

The science of everything!

Broadly, physics involves the study of everything in physical existence, from the smallest subatomic particles to the entire universe .

Physics is often described as the study of matter and energy. It is concerned with how matter and energy relate to each other, and how they affect each other over time and through space .

It is also useful to distinguish classical physics and modern physics. Classical physics has its origins approximately four hundred years ago in the studies of Galileo and Newton on mechanics, and similarly in the work of Ampere, Faraday, Maxwell and Oersted one hundred fifty years ago in the fields of electricity and magnetism. This physics handles objects which are neither too large nor too small, which move at relatively slow speeds (at least compared to the speed of light: 186,282 miles/second or 299,792 kilometers/second). The emergence of modern physics at the beginning of the twentieth century was marked by three achievements. The first, in 1905, was Einstein's brilliant model of light as a stream of particles (photons). The second, which followed a few months later, was his revolutionary theory of relativity which described objects moving at speeds close to the speed of light. The third breakthrough came in 1910 with Rutherford's discovery of the

nucleus of the atom. Rutherford's work was followed by Bohr's model of the atom, which in turn stimulated the work of de Broglie, Heisenberg, Schroedinger, Born, Pauli, Dirac and others on the quantum theory. The avalanche of exciting discoveries in modern physics continues today.

Given these distinctions within the field of physics (experimental and theoretical, classical and modern) it is useful to further subdivide physics into various disciplines, including astrophysics, atomic and molecular physics, biophysics, solid state physics, optical and laser physics, fluid and plasma physics, nuclear physics, and particle physics. This variety is what makes physics one of the most interesting of the sciences in many different technical fields.

**The major fields of physics are:**

- Classical mechanics is the study the motion of bodies according to Newton's Laws of motion.
- Electricity and magnetism are two closely related phenomena that are together considered a single field of physics.
- Quantum mechanics describes the peculiar motion of very small bodies (atomic sizes and smaller.)
- Optics is the study of light.
- Acoustics is the study of sound.

- Thermodynamics and statistical mechanics are closely related fields that study the nature of heat.
- Solid-state physics is the study of solids most often crystalline metals.
- Atomic, nuclear, and particle physics study of the atom....

## **1. Measurement**

Physics is a science based upon exact measurement of physical quantities. Therefore it is essential that student first becomes familiar with the various methods of measurement and the units in which these measurements are expressed.

**A unit** is a value quantity or magnitude in terms of which other values, quantities or magnitudes are expressed.

## **2. Fundamental Quantities And Units**

A **fundamental quantity** also known as **base quantity** is a quantity which cannot be expressed in terms of any other physical quantity. The units in which the fundamental quantities are measured are called fundamental units. In mechanics (study of the effects of external forces on bodies at rest or in motion), the quantities **length, mass** and **time** are chosen as fundamental quantities.

Fundamental Quantity	Symbol	Unit
Length	L	m, cm, mm
Mass	M	Kg, g
Time	t	h, min, s
Current	I	A
Resistance	R	$\Omega$
Voltages	V	v

### 3. Force

Force is that which changes the velocity of an object. Force is a vector quantity. An external force is one which lies outside of the system being considered.

### 4. Types of Forces

**Contact Force** : is that in which one object has to be in contact with another to exert a force on it. A push or pull on an object are examples of contact force.

**Tension**  $T$  : is the force on a string or chain tending to stretch it.

**Weight**  $W$  : of an object is the force with which gravity pulls downward upon it. It is given as  $W = mg$  . It is equal to the gravitational force on the body.

**Frictional force**  $f$  : is the force on a body when the body when the body slides or attempts to slide along a surface and is always parallel to the surface and directed so as to oppose the motion of the body.

Other important forces include **gravitational force** or simply **gravity**, **electromagnetic force**, **nuclear force**.