

Physics

1-5a

As you proceed with your study of physics for the next two terms you will learn about the achievements of such scientific giants as Galileo, Copernicus, Newton, Maxwell and Einstein whose work among others forms the foundation of our present understanding of the physical world.

We begin in 8.01 our study of physics with the subject of mechanics — the study of motion and its causes. A natural starting point since everyday experience offers many examples of mechanical principles — more so than any other area of physics.

We will introduce the language of physics:

- measurement units / standards
- calculational techniques / calculus
- vector algebra

We start by developing a language for describing motion.

- An ideal particle moving along a straight line
- Motion in a plane,
 - parabolic motion / ballistics
 - circular path motion

1-5b

The big step will be to consider the relationship between motion and the forces that are always associated with it. Whenever a particle speeds up, slows down or changes the direction of its motion — there is always an associated force. The relationship between force and motion is contained in Newton's three laws of motion.

Physics is an experimental science. We will see the interplay between Theory and experiment. Every physical theory must ultimately be grounded in experimental observations of phenomena in the physical world.

I will try to teach you, along with my colleagues how to apply these laws to solving practical problems. To develop systematic problem solving procedures that help to set up problems and carry out solutions efficiently and accurately.

You will see some of the beauty and symmetry of physics when you see how the essential relationships of mechanics are all described in a neat and compact package, called "Newton's Laws of Motion".

Classical Mechanics

1-6

In the study of mechanics we shall concern ourselves with the motion of a particle. This motion is described by giving its position as a function of time.

Specific position + time \Rightarrow event
Position \Rightarrow velocity \Rightarrow acceleration

Ideal Particle

- classical physics concept
- pointlike object/no size
- mass

Measurements of position, time and mass completely describe this ideal classical particle

- elementary particles have charge, spin — Ignore!

Position :

If a particle moves along a:

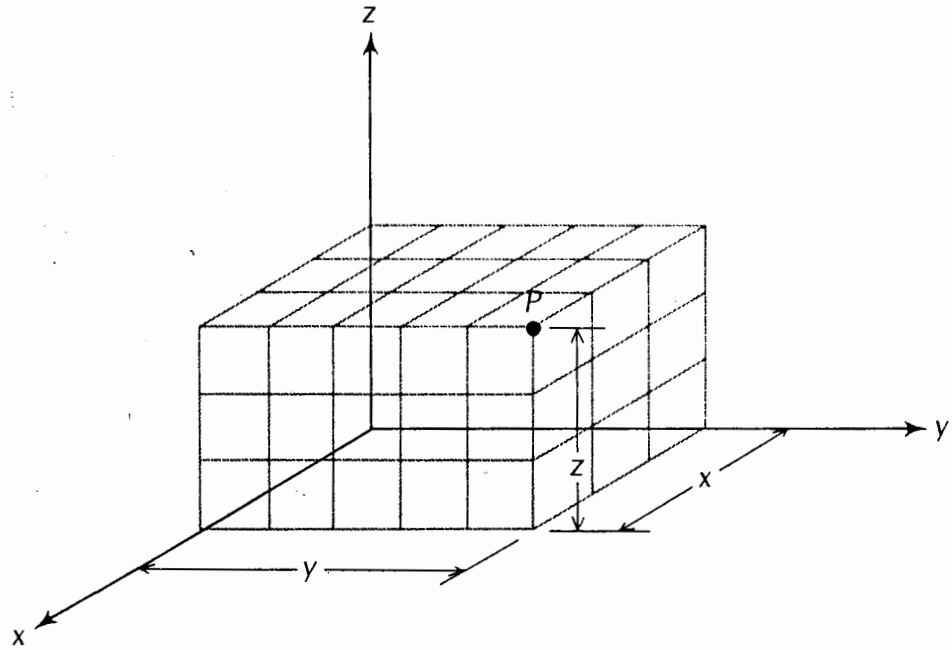
- curve \rightarrow 1-coordinate
- surface \rightarrow 2-coordinates
- volume \rightarrow 3-coordinates

General description requires a coordinate system with an origin.

- fixed reference point, origin
- a set of axes or directions
- instructions on labelling a point relative to origin+axes

Rectangular Coordinates

↳ 'Cartesian'



- simplest system
- easiest to visualize