LAWS OF MOTION

NEWTON'S SECOND LAW OF MOTION

SECOND LAW OF MOTION

According to this law, the rate of change of momentum of a body is proportional to the impressed force and it takes place in the direction of the force.

Mathematically

$$\vec{F} \propto \frac{d\vec{p}}{dt}$$
$$\vec{F} = k \frac{d\vec{p}}{dt} = \frac{d\vec{p}}{dt} (k = 1)$$
$$\vec{F} = \frac{d}{dt} (m\vec{v}) = m \frac{dv}{dt}$$
$$\vec{F} = m\vec{a}$$

In scalar form,F = ma

1. Force is a vector quantity, whose unit is Newton

or
$$\frac{\text{Kg.m}}{\text{sec}^2}$$
 (In MKS) and Dyne or $\frac{\text{gm} \times \text{cm}}{\text{sec}^2}$ (In C. G. S.)

- **2.** The dimension of force is [MLT⁻²]
- **3.** The second law of motion gives the magnitude and unit of force.
- 4. If m is not constant $\vec{F} = \frac{d}{dt}(m\vec{v}) = m\frac{d\vec{v}}{dt} + \vec{v}\frac{dm}{dt}$ As in case of rocket propulsion, the mass of the fuel varies with respect to time.