Force and Pressure

Newtons Laws of Motion

(A) Newton´s I law : A body cannot change its state of motion by itself. If the object is at rest it will remain at rest and if it is in uniform motion, it continues to be in motion unless some external force is applied on it.

Inertia :

(i) There is an inherent property of an object by virtue of which it cannot change its state of motion or rest by if self. This property is called 'inertia'.

(ii) Inertia is of two types– inertia of rest and inertia of motion.

(a) Inertia of rest: If the body is at rest, it will continue to be at rest unless some external force is applied on it. Examples are following.

(i) When a train at rest starts moving suddenly, a passenger standing inside the compartment tends to fall backward.

(ii) When a carpet is beaten up with a stick, the dust particles are detached.

(iii) When a bullet is fired into a glass pane, it pierces a hole only at the pt where the bullet hits the glass without breaking the entire glass pane into pieces.

(b) Inertia of motion : When a body is in uniform motion, it will continue to remain in its uniform motion, i.e. it resists any change in its state of motion due to inertia of motion.

(i) When a person jumps out of a moving bus, he should run in the direction in which bus is moving otherwise he will fall down.

(ii) A train moving with a uniform speed and if a ball is thrown upwards inside the train by a passenger, then the ball comes back to his hand.

Mass and Inertia :

(i) Larger the mass of the body, larger is the inertia.
eg. it is more difficult to stop a cricket ball than a tennis ball.

(B) Newton's second law of motion

Force F is equal to the product of mass, m of a body and acceleration, a produced in the body due to that force. i.e. F = ma

Acceleration: Acceleration is the rate of change of velocity.

$$a = \frac{v-u}{t} = \frac{\text{final velocity} - \text{initial velocity}}{\text{time}}$$

Newton's second law can be written as F = ma = ⌈ ⌉| |

Note: Newton's first law of motion gives a qualitative idea of force, while the second law provides us an idea to measure the force.