Force & Law of motion

1. Force

It is a push or pull on an object that produces an acceleration in the body on which it acts.
S.I. unit- Newton.

1.1 Balanced force

When balanced forces are applied to an object, there will be no net effective force acting on the object. Balanced forces do not cause a change in motion.

1.2 Unbalanced force

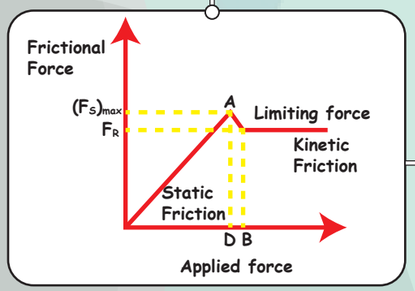
Unbalanced forces acting on an object change its speed and/or direction of motion. It moves in the direction of the force with the highest magnitude.

1.3 Frictional force

The force that opposes relative motion is called friction. It arises between the surfaces in contact.

1.3.1 Types of friction

- *Static friction*: Static friction is defined as the frictionalforce that acts between the surfaces when they are at rest with respect to each other.
- *Sliding friction*: Sliding friction is defined as the resistance that is created between any two objects when they are sliding against each other.
- *Rolling friction*: Rolling friction is defined as the force which resists the motion of a ball or wheel and is the weakest type of friction.
- *Fluid friction*: Fluid friction is defined as the friction that exists between the layers of the fluid when they are moving relative to each other.



1.4 Impulse

Impulse of a force is defined as the measurement of effect of force.

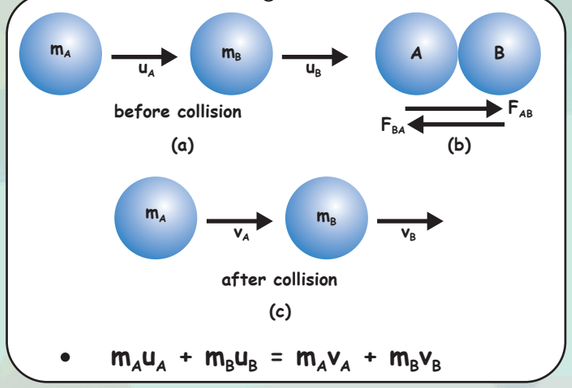
- I= Fxt
- SI unit- Newton second
- Vector quantity

1.5 Momentum

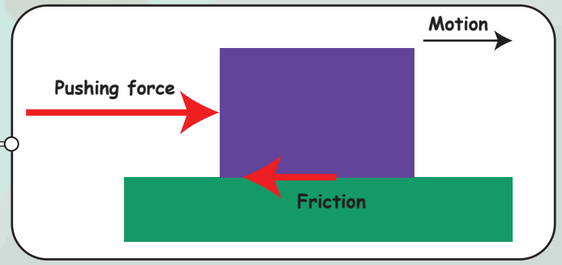
The momentum of an object is the product of its mass and velocity and has the same direction as that of the velocity.S.I.unit- kgm/s.

1.6 Conservation of momentum

If the external force on a system is zero, the momentum of the system remains constant i.e., in an isolated system, the total momentum remains conserved.



- $m_Au_A + m_Bu_B = m_Av_A + m_Bv_B$



2. Inertia

The natural tendency of an object to resist a change in their state of rest or of uniform motion is called inertia.

2.1 Inertia of rest

The natural tendency of an object to resist a change in their state of rest or of uniform motion is called inertia.

2.2 Inertia of Motion

An object will continue to be in motion until a force acts on it.

2.3 Inertia of Direction

The tendency of a body to oppose any change in its direction of motion is known as inertia of direction.

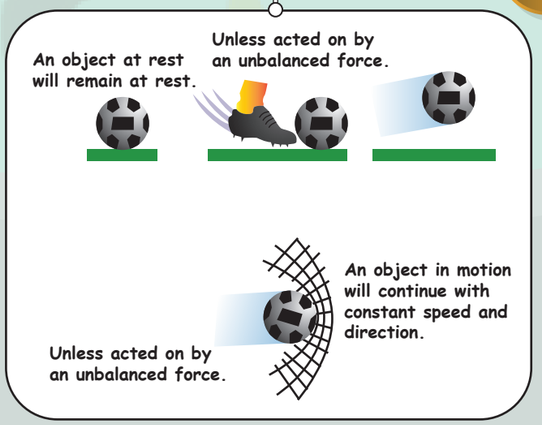
3. Newton's law of motion

Newton's laws of motion are three basic laws of classical mechanics that describe the relationship between the motion of an object and the forces acting on it.

3.1 First law of motion

An object remains in a state of rest or of uniform motion in a straight line unless acted upon by an external unbalanced force.

- If F_{net} = 0, then a=0.



3.2 Second law of motion

The rate of change of momentum of an object is proportional to the applied unbalanced force in the direction of the force.

- F=ma

3.3 Third law of motion

To every action, there is an equal and opposite reaction and they act on two different bodies.

- Action and reaction forces act simultaneously on different object but are equal and opposite