PHYSICS

CLASS NOTES FOR CBSE

Chapter 02. Force and Laws of Motion

A push or pull on a body is called force. Forces are used in our everyday actions like pushing, pulling, lifting, stretching, twisting and pressing.

01. Effects of Force

A force cannot be seen. A force can be judged only by the effects which it can produce in various bodies (or objects) around us. A force can produce the following effects :

(i) A force can *move* a stationary body.
(ii) A force can *stop* a moving body.
(iii) A force can *change the speed* of a moving body.
(iv) A force can *change the direction* of a moving body.
(v) A force can *change the shape (and size)* of a body.

The speed of a falling ball (or any other falling body) increases because the earth applies a pulling force on it which is called the force of gravity.

A force can change the direction of motion of a moving body. A force can change the shape and size of body (or object).

A force is an influence which tends to set a stationary body in motion or stop a moving body ; or which tends to change the speed and direction of a moving body ; or which tends to change the shape (and size) of a body.

02. Balanced and Unbalanced Forces

Forces are of two types : Balanced forces and Unbalanced forces. If the resultant of all the forces acting on a body is zero, the forces are called balanced forces.

If a number of balanced forces act on a stationary body, the body continues to remain in its stationary position. If a number of balanced forces act on a body in uniform motion, the body continues to be in its state of uniform motion.

Though balanced forces cannot produce motion in a stationary body or stop a moving body, they can, however, change the shape of the body.

Unbalanced Forces

If the resultant of all the forces acting on a body is not zero, the forces are called unbalanced forces. Unbalanced forces can move a stationary body or they can stop a moving body.

To move a stationary object, we have to push it with a force greater than the opposing force of friction.

If we release the suitcase from our hand, then the unbalanced force of gravity acts on it and the suitcase falls to the ground.

When an unbalanced for e acts on a body, it produces motion in the body. An unbalanced force can also stop a moving body.

If there were no unbalanced force of friction and no air resistance, a moving bicycle would go on moving for ever.

02. Newton's Laws of Motion

Newton's First Law of Motion

A body at rest will remain at rest, and body in motion will continue in motion in a straight line with a uniform speed, unless it is compelled by an external force to change its state of rest or of uniform motion.

Inertia is that property of a body due to which it resists a change in its state of rest or of uniform motion.

Mass is a measure of the inertia of a body. Objects have more inertia than lighter objects. A stone has more inertia than a football. A cricket ball has more inertia than a rubber ball of the same size. The inertia of a body depends on its mass. To overcome the inertia and make a body move form rest, we must apply an external force.

We will now consider the second part of the first law of motion which says that a body in uniform motion will continue to move unless a force compels it to change its state of uniform motion in a straight line.

If there were no air resistance and no friction to oppose the motion of a bicycle, then according to the first law of motion, a moving bicycle would go on moving for every. It would not stop by itself.

Some everyday observations which are based on the property of inertia of a body. When a tree (having flexible stem) is shaken vigorously, its fruits and leaves fall down. When a car or bus starts suddenly, the passengers fall backward.

03. Momentum

Momentum = mass × velocity

$p = m \times v$

where p = momentum

m = mass of the body

and v = velocity (or speed) of the body

If a body is at rest, its velocity is zero and hence its momentum is also zero. Momentum is a vector quantity. The SI unit of momentum is kilogram metres per second which is written as kg.m/s or kg.m s^{-1}. Every moving body possesses momentum.