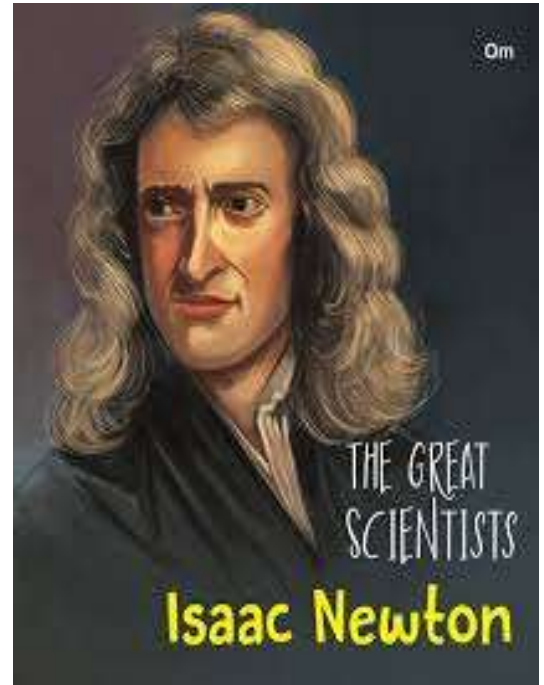


Grade 10 Science

Unit 4 Newton's Laws of Motion



Reading Material



Newton's Laws

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Newton's Laws

Sir Isaac Newton has formulated 3 laws of motion based on his studies about force and motion

Newton's first law: - Until an unbalanced force is applied on it, bodies at rest remain stationary and bodies in motion continue to move at uniform velocities

e.g.: - 1. Striking a carom disc.

- When strike a carom disk on a carom board with fingernail, the disc would move a short distance and come to rest.
- If apply some talcum powder on the carom board to make sure the surface smoother and then strike the carom disk, with the same force as before, the disc would move a much longer distance before coming to rest.



2. Seat belt prevents the driver being thrown forward when breaks are applied.

- As the seat belt exerts a force on the upper part of his body as well, the whole body remains at the velocity of the vehicle even when breaks are applied.



Newton's second law: - the acceleration of a body is directly proportional to the unbalanced force acting on it, while it is inversely proportional to its mass.

The acceleration is directly proportional to the unbalanced force

$$a \propto F$$

Similarly;

The acceleration is inversely proportional to the mass

$$a \propto 1/m$$

Newton's second law can be written as;

$$a \propto F \quad \text{and} \quad a \propto 1/m$$

or

$$a \propto F/m$$

$$K = \frac{F/m}{a} \quad \text{where K is a constant and K=1}$$

$$1 = \frac{F/m}{a}$$

$$F/m = a$$

$$F = ma$$

F = Force

m = mass

a = acceleration

The acceleration decreases with increasing mass if the force is constant

a ↓	m ↑
m ↑	a ↓

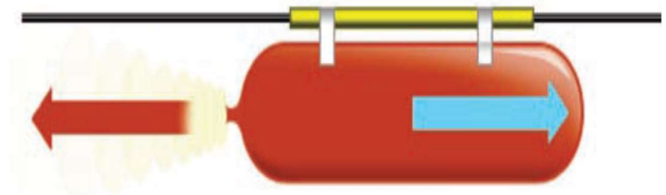
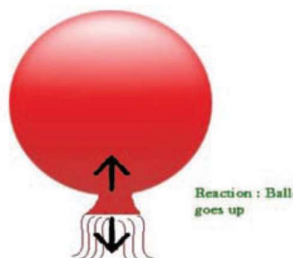
Newton's third Law: - For every action, there is an equal and opposite reaction.

Action: – The force exerted by an object on another object.

Reaction: - The force exerted on the first object by the second object.

Application of Newton's 3rd law: -

1. Expulsion of air from an inflated balloon.



- a. Air inside the balloon leaving it and the balloon moving upwards
- b. Air leaving the balloon and the balloon moving in the opposite direction

2. Two children being pushed in opposite directions when pushing other with the palm.



3. Force applied on the water by the oars and the reaction force acting on the boat.



4. Hands applying a force on water and an equal and opposite force exerted on the hands by water.

