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Chapter 8 learnkwniy Force And Pressure

FORCE – A PUSH OR A PULL

A push or pull on an object is called force. The direction in which the object is pushed or pulled is called the direction of force.

Forces are used in our everyday actions. Actions like picking, opening, shutting, kicking, hitting, lifting, flicking, pushing, pulling are often used to describe certain tasks. Each of these actions usually results in some kind of change in the state of motion of an object. A push or a pull on an object is called a force.

Forces are due to an Interaction

At least two objects must interact for a force to come into play. For example: A man is standing behind a stationary car. Will the car move due to his presence? Since there is no interaction between the man and the car, no force acts on the car and hence the car does not move. Suppose the man now begins to push the car, that is, he applies a force on it. The car may begin to move in the direction of the applied force.

Nature of Force or Force Has Magnitude as Well as Direction

The strength of a force is expressed by its magnitude. The magnitude of a force is expressed in the SI unit of force called 'newton' (whose abbreviation is N). 1 newton is the force which can make an object of 1 kilogram mass to move at a speed of 1 metre per second. Along with the magnitude of force, the direction in which a force acts is also to be specified (or taken into account). When two forces act on an object, then two cases arise either the forces act in the same direction or the forces act in opposite directions.

(i) If the two forces applied to an object act in the same direction, then the resultant force acting on the object is equal to the sum of the two forces.

If the two forces applied to an object act in the opposite directions, then the net force acting on the object is equal to the difference between the two forces.

(ii) If the two forces applied to an object are equal in magnitude and act in opposite directions, then the net force acting on the object is zero (or nil).

A Force can Change the State of Motion

A force applied on an object may change its speed. If the force applied on the object is in the direction of its motion, the speed of the object increases. If the force is applied in the direction opposite to the direction of motion, then it results in a decrease in the speed of the object.

EFFECTS OF FORCE

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

(i) A force can move a stationary object.

(i) A force can stop a moving object.

(iii) A force can change the speed of a moving object.

(iv) A force can change the direction of a moving object.

(v) A force can change the shape (and size) of an object.

CONTACT FORCES

A force which can be exerted by an object on another object only through physical touching is called a contact force. The examples of contact forces are to (i) Muscular force, and (ii) Frictional force (or Friction).

Muscular Force

It is the muscular force that enables us to perform all activities involving movement or bending of our body. This force is caused by the action of muscles in our body. The force resulting due to the action of muscles is known as the muscular force.

2. Frictional Force (or Friction)

A ball moving on the ground slows down gradually and stops after covering some distance. We know that a force is required to stop a moving body. This means that a force is exerted by the ground on the moving ball which opposes its motion and brings it to a stop. This force which opposes the motion of ball on the ground is known as frictional force. The force which always opposes the motion of one body over another body is called frictional force (or friction). The frictional force acts between the two surfaces which are in contact with each other.

NON-CONTACT FORCE

1. Magnetic Force

A magnet can exert a force on another magnet without being in contact with it. The force exerted by a magnet is an example of a non-contact force.

Similarly, the force exerted by a magnet on a piece of iron is also a non-contact force.

2. Electrostatic Force

The force exerted by an electrically charged object is called electrostatic force. An electrically charged object can exert an electrostatic force on an uncharged object (or another charged object). For example, a plastic comb (or plastic pen) which is electrically charged by rubbing in dry hair, exerts an electrostatic force on uncharged tiny pieces of paper and attracts them.

3. Gravitational Force

Newton said that every object in this universe pulls every other object with a certain force. The pull exerted by objects possessing mass is called gravitational force. The gravitational force is a force by which earth pulls a body towards its centre.

PRESSURE

The force acting on a unit area of a surface is called pressure.

$$\text{Pressure} = \frac{\text{Force}}{\text{area on which it acts}}$$

Eg. Cutting vegetables with a blunt knife and then with a sharp knife.

Upthrust or buoyant Force

The upward force exerted by a fluid on an object is known as upthrust or buoyant force.

Pressure Exerted by Liquids and Gases

A liquid exerts pressure on the walls of the container.

Gases, too, exert pressure on the walls of their container.

ATMOSPHERIC PRESSURE

There is air all around us. This envelop of air is known as the atmosphere. The atmospheric air extends up to many kilometres above the surface of the earth. The pressure exerted by this air is known as atmospheric pressure.

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