

**Instruction:-** Read the notes carefully and answer the following questions:-

## Force

- (i) Force is a push or a pull.
  - (ii) Living and non- living things can apply force.
  - (iii) To apply a force over an object interaction between object and source of force is necessary.
  - (iv) Whenever force act two object are involved. One which applied force, the other which receive force.
- Examples: To kick ball we need to push it, to pick the book we need to pull it, to hit the ball we need to push it and to lift the box we need to push it.



### **Direction and Magnitude of Force:**

- (i) The measurement of strength and amount of force is called magnitude of force.
- (ii) Two or more forces on the same object can be applied in the same direction and opposite direction.

#### **1. When two or more forces are applied over an object in the same direction:**

When two or more forces are applied in the same direction, then the total or net force is the addition of magnitude of both the forces.

Example: When two persons push the box in the same direction with the magnitude of forces of each 2N, then resultant force will be-

Net force:-  $2N + 2N = 4N$  (In the direction of applied force)



## 2. When two forces are applied over an object in the opposite direction:

When two forces are applied over an object in the opposite directions, the total effective or net force is the difference of magnitude of two forces.

Example:

(i) When two persons push the box in the opposite direction with the magnitude of forces of each 2 N, then resultant force will be-

Net force:-  $2\text{N} - 2\text{N} = 0\text{N}$  (Box will not move)

(ii) If one person is applying a force of 6 unit in one direction and another person is applying a force of 8 unit in opposite direction,

Then the resultant force:  $8\text{N} - 6\text{N} = 2\text{N}$  (In the direction of higher magnitude force)

In this case, force will act in the direction of higher magnitude of force.

### **Effect of Forces:-**

**1. Force can change the state of motion:** An Object can be in two states.

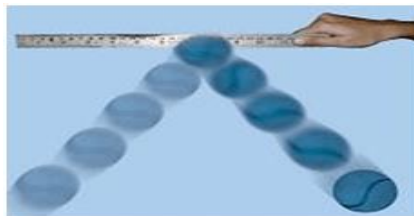
(a) *Rest State:* When an object is not moving. This means a stationary object is called in the state of rest. For example –A ball and book kept over the ground and not moving.

(b) *Motion State:* A moving object is called in the state of motion. For example – a moving car, a moving ball, etc.

A Force can move a stationary object. A force can speed up, decrease the speed and change the direction of a moving object. Force can stop a moving object. Finally we can say that force can change the state of motion.

Some examples:

(i) A boy want to move a tyre faster it has to be pushed repeatedly.



(ii) Change in the direction of moving ball after it strikes the ruler placed in its path.

(iii) In the Football game, a goalkeeper stops the football going towards the goal post by applying a force by his hand.

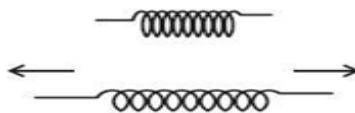
(iv) In the cricket game, a batsman can push a fast moving ball in the same direction or opposite direction or change the direction of the movement of ball. Because of force being applied from his bat.

## 2. Force can change the shape of an object:

(i) When you apply force on an inflated balloon by pressing it using your hand from both sides, then the force of pressure changes the shape of balloon.



(ii) You can change the shape of rubber band and spring by stretching it in opposite direction.



(iii) You can change the shape of dough into bread by applying force with a rolling pin.

So we can say that forces can change the shape of an object.

### **Types of Force**

#### **1. Contact Force:**

(i) For contact force, interaction between objects is necessary. Force that comes into action after the

interaction between objects is called contact force. Contact force works on the point of contact. Example; pushing a car, hitting the ball, kicking a ball, etc.

(ii) Muscular force, friction force are types of contact force.

### (i.) Muscular force:

(a) Force due to the action of muscles is called muscular force. We can say force resulting because of action of muscle is called muscular force.

(b) Muscular force is applied only after interaction with the object.

Examples:

(i) When we push the object like school bag or lift the bucket of water we use the muscular force.

(ii) Animals also use of muscular force to carry out their task.



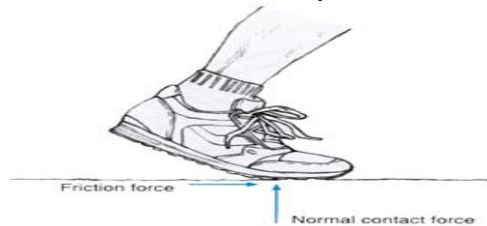
Some Examples of Muscular Force

### (ii.) Friction Force:

(a) The forces of friction arises between the surfaces of two objects

(b) The force of friction always acts on all moving object and its direction is always opposite to the direction of motion.

(c) Force of friction comes into action only after interaction between two objects, thus, it is a type of contact



force.

Examples:

(i) Due to force of friction between the surface of the ball and the ground that brings the moving ball to rest.

(ii) When we stop pedalling a bicycle, it gradually slow down and finally comes to a stop due to force of friction.

## 2. Non- Contacting Force:

(i) Force due to without interaction between two objects is called non-contact force. For example; a magnet can pull an iron nail from a distance.

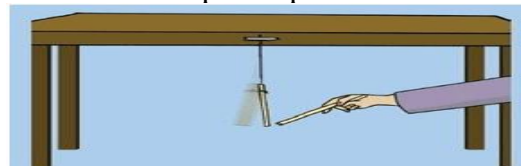
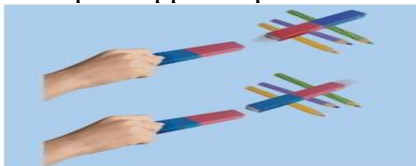
(ii) Magnetic force, Electrostatic force and Gravitational force are examples of non-contact force.

### (a) Magnetic Force:

(i) A magnet can exert a force on another magnet without being in contact with it.

(ii) The force exerted by a magnet is an example of a non-contact force.

Example: Opposite pole of two magnets attract each other and same pole repel each other.



**(b) Electrostatic Force:**

- (i) When a charged body exerts a force on another charged or uncharged body is called electrostatic force. A charged body attracts an uncharged body.
- (ii) A positively charged body attracts a negatively charged body and repels a positively charged body without coming in contact, thus it is a non-contact force.

**(c) Gravitational Force:**

- (i) Gravitational force is exerted by earth, moon, sun and other planets to others.
  - (ii) Earth and other planets attract all objects towards them. Since, earth attracts all objects even without coming in contact, thus gravitational force is a non-contact force.
- Example: When we release an object from a height, it falls over the ground because of gravitational attraction of earth.

**(Questions)**

Q1- Tick the correct option-

- (a) What is the cause of change in motion or change in the state of motion?  
(i) Pressure                      (ii) Friction                      (iii) Atmospheric pressure                      (iv) Force
- (b) In a tug - of - war, two teams pulling a rope does not move towards any team, it implies that  
(i) An equal force is being applied in the same direction.  
(ii) An equal force is being applied in the opposite direction.  
(iii) No force is applied in any directions.  
(iv) Cannot be explained.
- (c) The force between two charged bodies is called  
(i) Muscular force                      (ii) gravitational force                      (iii) magnetic force                      (iv) electrostatic force
- (d) Leaves or fruits fall on the ground due to  
(i) Magnetic force                      (ii) gravitational force                      (iii) electrostatic force (iv) muscular force

Q2-What happens when two forces act in same direction?

Q3-What is electrostatic force? Why is it called non-contact force?

Q4-A ball is in rest. When it is pushed, why it starts moving?

Q5-Differentiate between contact and non-contact forces.

Q6-Why do you think a ball rolling along the ground gradually slows down and come to rest?

Q7-Define muscular forces with an example.

Q8-Describe an activity to show that a force can change the state of motion.

Q9-Give two examples of situation in which applied force causes a change in the shape of an object.

Q10-An archer stretches her bow while taking aim at the target. She then releases the arrow, which begins to move towards the target. Based on this information fill up the gaps in the following statements using the following terms.

muscular, contact, non-contact, gravity, friction, shape, attraction

- (a) To stretch the bow, the archer applies a force that causes a change in its \_\_\_\_\_.
- (b) The force applied by the archer to stretch the bow is an example of \_\_\_\_\_ force.
- (c) The type of force responsible for a change in the state of motion of the arrow is an example of a \_\_\_\_\_ force.
- (d) While the arrow moves towards its target, the forces acting on it are due to \_\_\_\_\_ and that due to \_\_\_\_\_ of air

Q11-A blacksmith hammers a hot piece of iron while making a tool. How does the force due to hammering affect the piece of iron?