

# FORCE AND PRESSURE



# CONTENTS

- DEFINITION AND UNIT OF FORCE
- FORCES ARE DUE TO AN INTERACTION
- EXPLORING FORCE
- EFFECTS OF FORCE
- TYPES OF FORCE
- DEFINITION AND UNIT OF PRESSURE
- PRESSURE EXERTED BY LIQUIDS AND GASES
- ATMOSPHERIC PRESSURE

# OBJECTIVES

At the end of this lesson, students will be able to :

- Define force.
- List the properties of force.
- Understand the effects of force.
- Distinguish contact and non-contact forces.
- List properties of pressure exerted by solids, liquids and gases.
- List the effects of pressure on human activities.
- Define atmospheric pressure.

# Previous Knowledge Test

1. How an object move ?
- 2. How you decide whether an object is moving faster or slower ?
  - 3. What does the distance moved by an object in unit time indicate ?
  - 4. What makes an object slow down or go faster or change its direction of motion ?



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**Push-** A force to move an object away from our body.  
**Pull-** A force to move an object towards our body .

# **FORCE:-**

**A force is a push or pull on an object.**



**examples:-A man pushing cart,**



**KICKING**



**BALL**





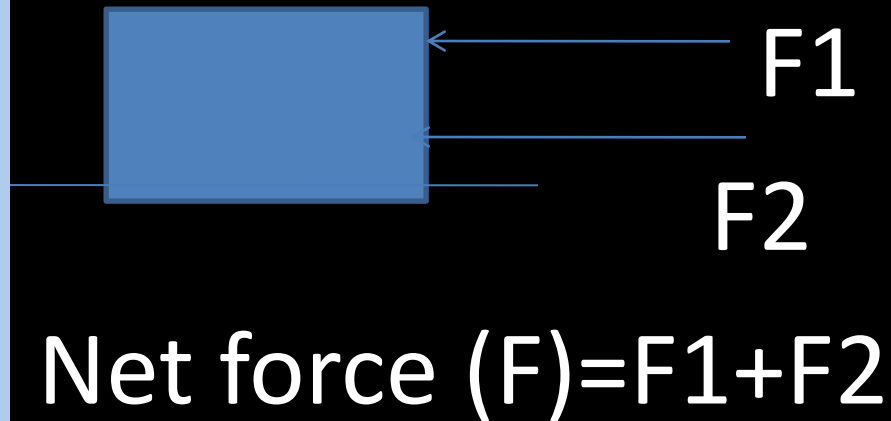


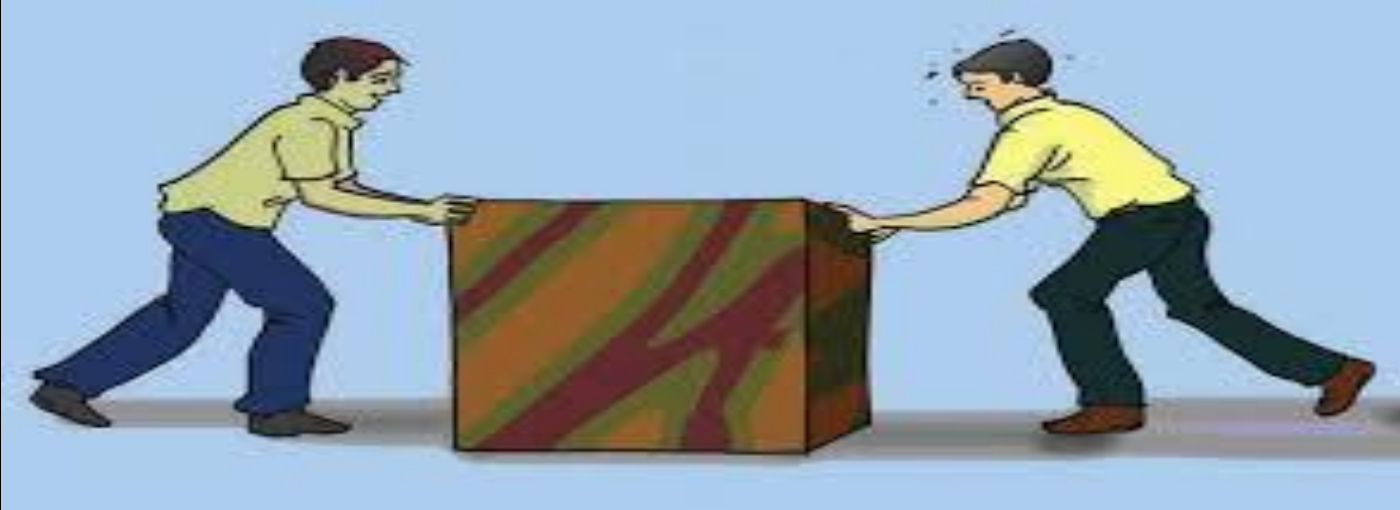


**FORCES ARE DUE TO AN INTERACTION**

# EXPLORING FORCE

- a) If two forces act on a body in same direction, the net force is the sum of two forces.





If two forces act on a body in opposite direction, the net force is the difference between two forces



$$\text{Net force} = F2 - F1 \quad (F2 > F1)$$

The effect of force on the object depends on the net force acting on it.

Force has Magnitude as  
well as Direction.

S.I. Unit of Force - Newton (N)

C.G.S. Unit of Force – Dyne (Dyn)



You cannot see a force but you can see what it does. You can also feel the effect of a force on your body.



A force can make  
**a moving object stop.**



A force can  
**make an object move.**





A force can  
**change the  
direction**  
of a moving  
object.

# State of Motion

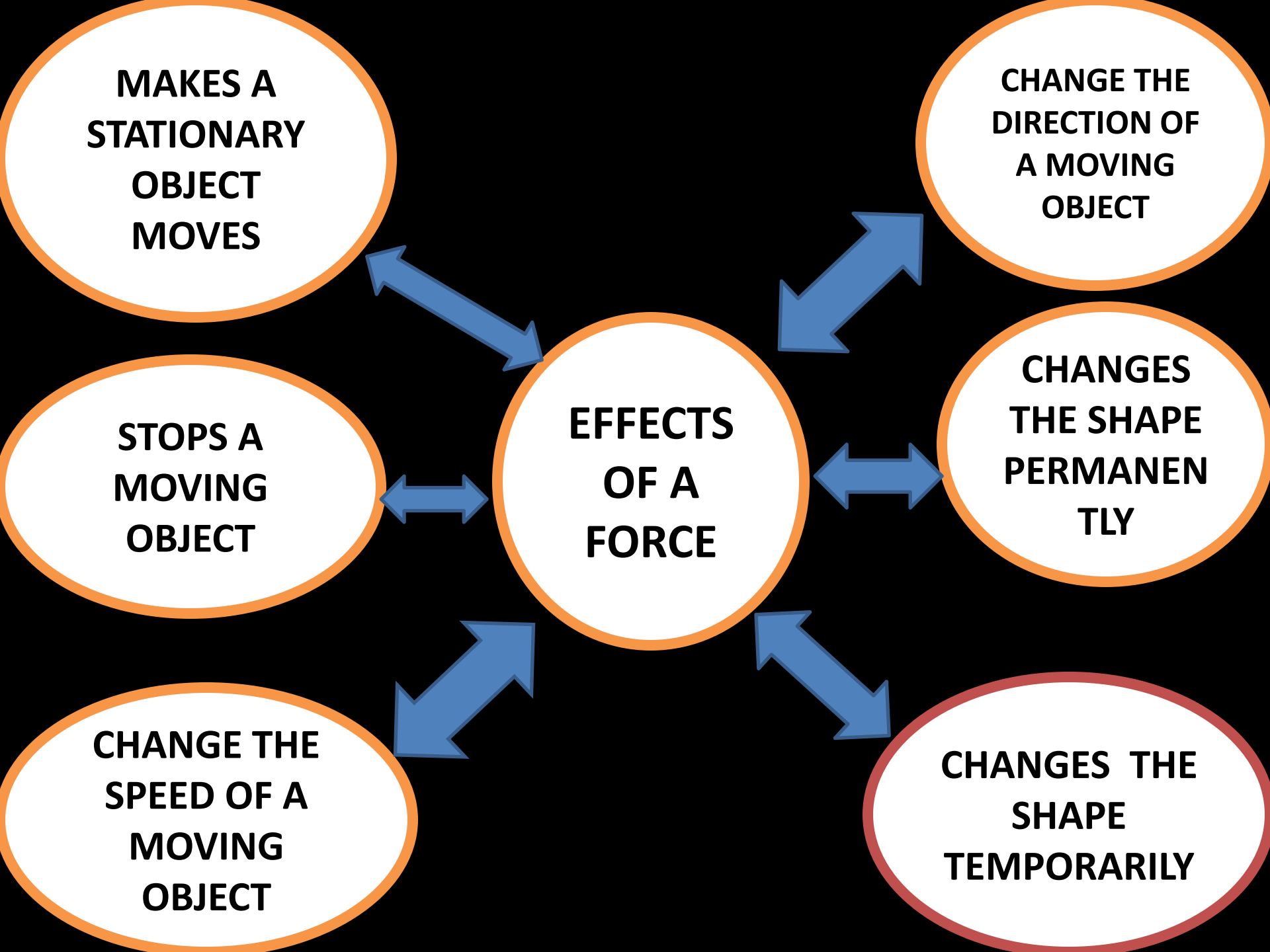
A change in either the speed of an object , or its direction of motion , or both is described as a change in its state of motion.

An object may be at rest or in motion ; both are its state of motion.

Thus , a force may bring a change in the state of motion of an object.

A close-up photograph of a hand squeezing a slice of a yellow lemon. The lemon slice is being compressed, and a stream of clear water is being forced out from the center, splashing against a dark blue background. The text is overlaid on the right side of the image.

A force can  
**change the**  
**shape**  
of an object.



# TYPE OF FORCES

```
graph TD; A[TYPE OF FORCES] --> B[CONTACT FORCES]; A --> C[NON CONTACT FORCES]; B --> B1[MUSCULAR FORCES]; B --> B2[FRICTIONS]; C --> C1[MAGNETIC FORCE]; C --> C2[ELECTROSTATIC FORCE]; C --> C3[GRAVITATIONAL FORCE];
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**CONTACT FORCES**

**MUSCULAR FORCES**

**FRICTIONS**

**NON CONTACT FORCES**

**MAGNETIC FORCE**

**ELECTROSTATIC FORCE**

**GRAVITATIONAL FORCE**

# CONTACT FORCE

- A FORCE WHICH CAN BE EXERTED BY AN OBJECT ON ANOTHER OBJECT ONLY THROUGH PHYSICAL TOUCHING IS CALLED A CONTACT FORCE.





## **MUSCULAR FORCE**

**THE FORCE EXERTED BY THE MUSCLES OF THE BODY IS CALLED MUSCULAR FORCE**

# Contact forces :-

## Muscular force :-

Muscular force is the force exerted by the muscles of our body.

We use muscular force for our various activities.

Animals like bullocks, horses, camels, donkeys, elephants also use muscular force to perform various tasks.

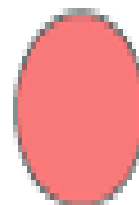
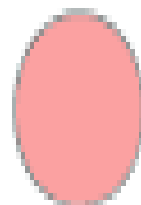
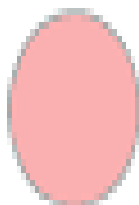




**Moving Force**



**Fast to slow**



**Friction**

## ii) Force of friction :-

Force of friction is the force which opposes the motion of an object over a surface.

Eg :- A ball rolling on ground gradually slows down and comes to rest due to force of friction.

If we stop pedalling a bicycle, it gradually slows down and comes to a stop due to force of friction.



# NON-CONTACT FORCE

- A FORCE WHICH CAN BE EXERTED BY AN OBJECT ON ANOTHER OBJECT EVEN FROM A DISTANCE(WITHOUT TOUCHING EACH OTHER) IS CALLED A NON-CONTACT FORCE

# Non contact forces :-

## i) Magnetic force :-

Magnetic force is the force exerted by magnets.

Eg :- Force of attraction and repulsion between two magnets.

Force exerted by a magnet on a piece of iron or steel.

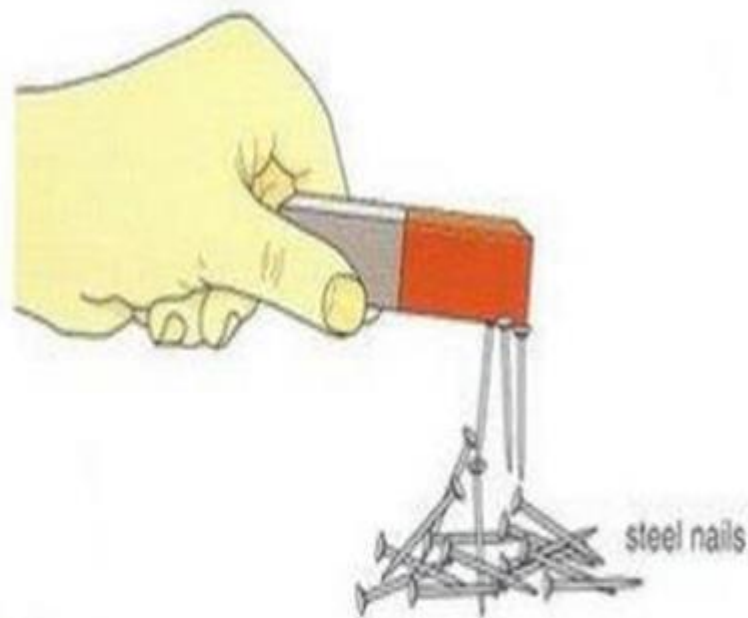
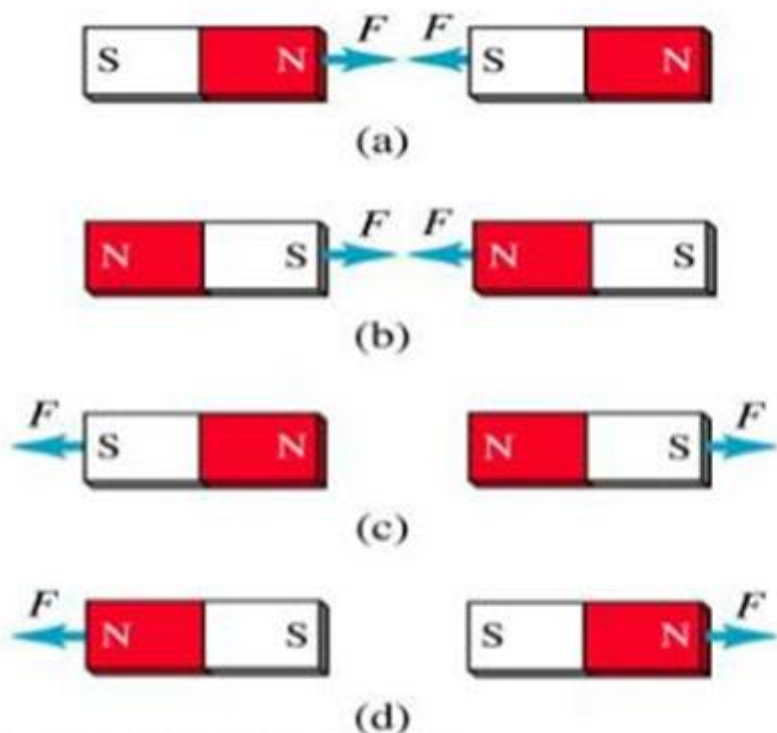


Figure 1 Steel is a magnetic material



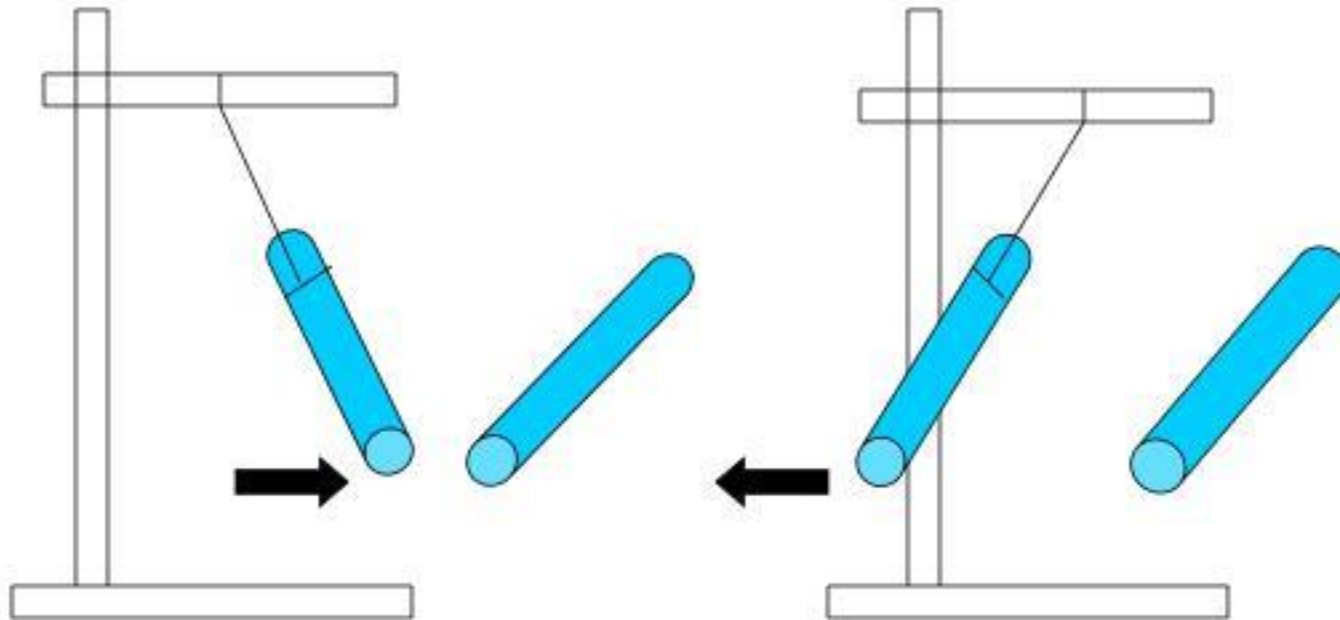
**Fig.11.10** : Observing attraction and repulsion between two magnets

## ii) Electrostatic force :-

Electrostatic force is the force exerted by a charged body on another charged or uncharged body.

Eg :- A plastic straw charged by rubbing with paper attracts a suspended plastic straw.

A plastic straw charged by rubbing with paper repels a suspended plastic charged by rubbing with paper.





Electrically charged comb  
attracts tiny pieces of paper

# Gravitational Force

The force of attraction between any two objects possessing mass is called gravitational force.

It is the gravitational force between the sun and the earth which holds the earth in its orbit around the sun.

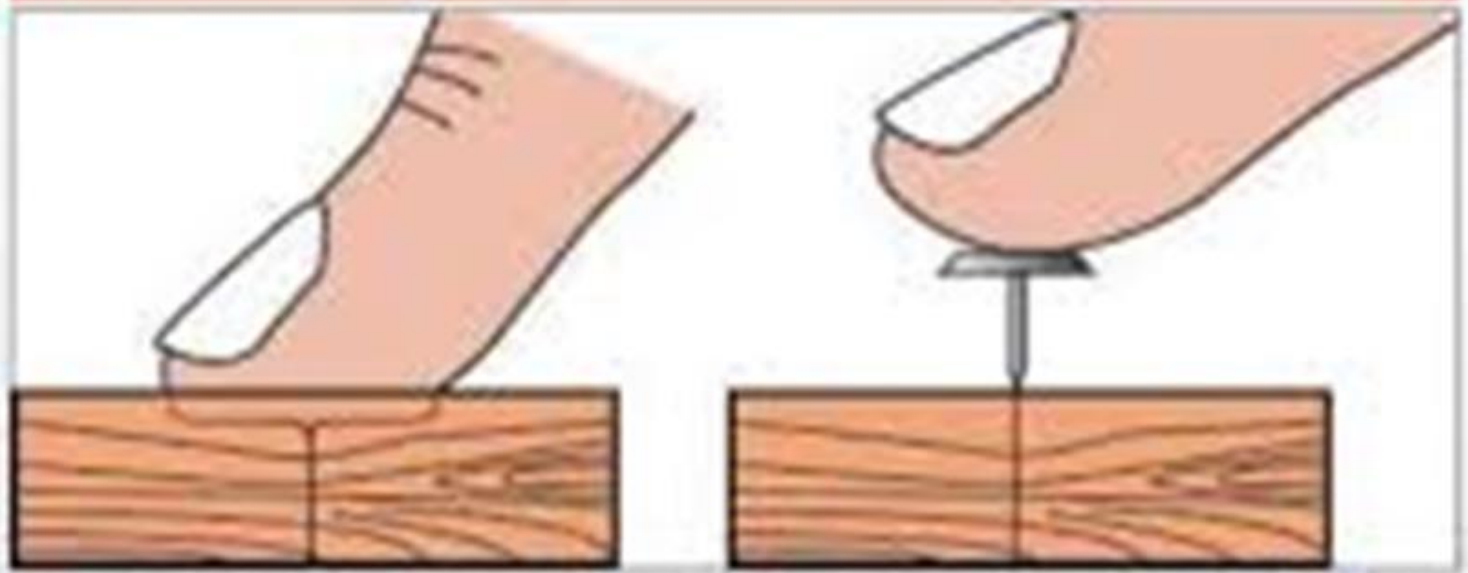
The force with which the earth pulls the objects towards it, is called the force of gravity.

A ball thrown upward falls down,

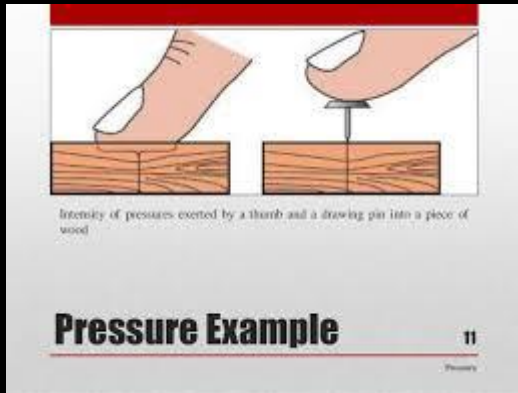
A ripened fruit falling from a tree







Intensity of pressures exerted by a thumb and a drawing pin into a piece of wood



# PRESSURE

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

Pressure = Force / Area on which it acts  
S.I. unit of pressure is Pascal.

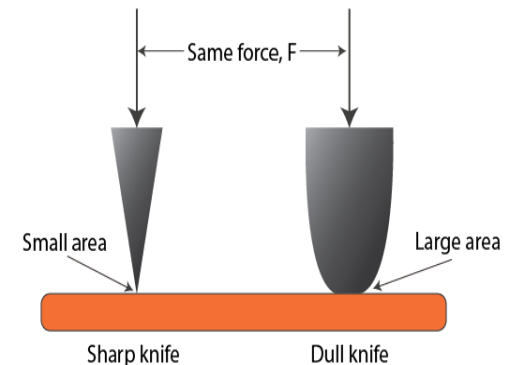
# FACTORS AFFECTING THE MAGNITUDE OF PRESSURE:

- Magnitude of the force:

The larger the force, the higher the pressure.

- Contact area:

The larger the contact area, the lower the pressure.





Force Applied



Cylinder with large surface area.

# Applications of Pressure

*Sharp knife cuts better than a blunt knife so the force of our hand falls over a very small area of object produces large pressure.*



# EVERY DAY OBSERVATION

- 1. ***School bags have wide straps so the weight of bag may fall over a large area of the shoulder of the student producing less pressure on shoulder.***



# Pressure



High-heeled shoes sink deeper into soft ground than flat shoes because the weight is spread over a small area, exerting a higher pressure. Flat shoes sink less because the weight is spread over a larger area, exerting a lower pressure.

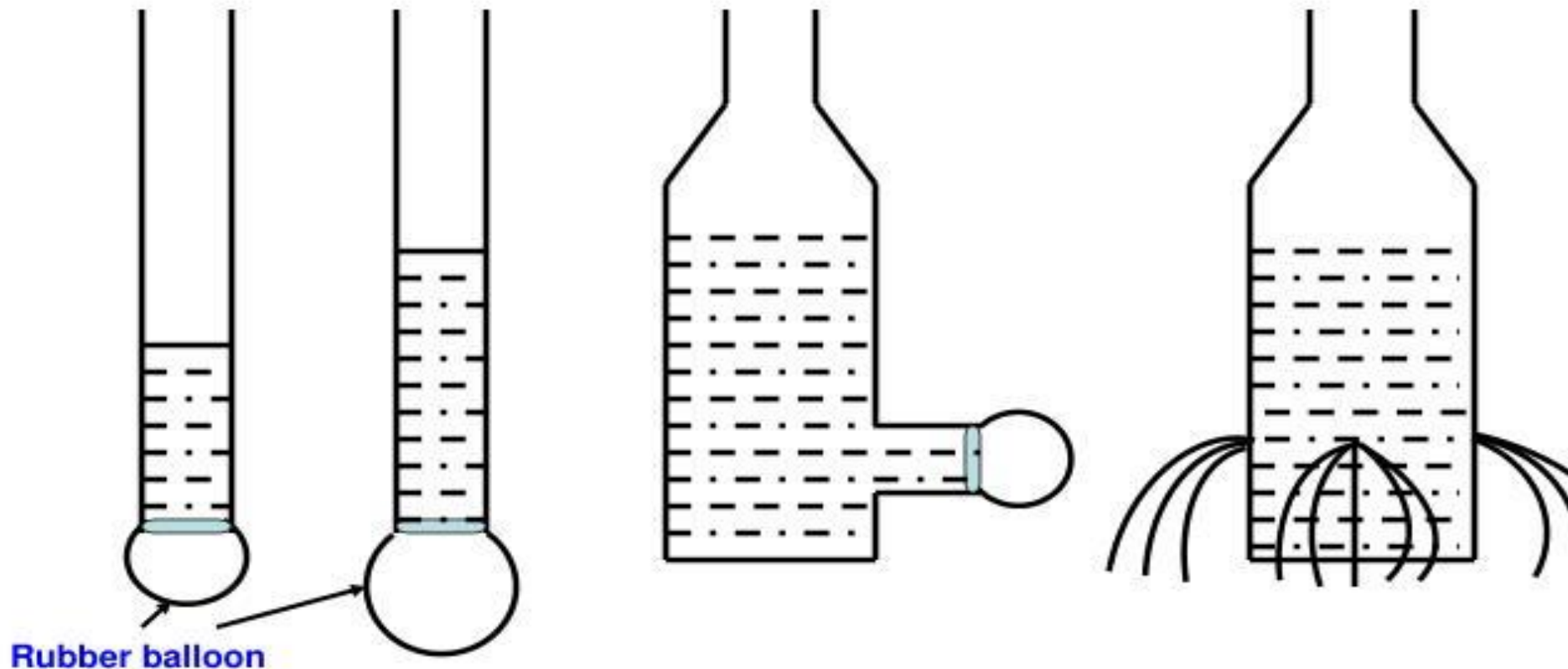
## 9) Pressure exerted by liquids gases :-

Liquids exert pressure on the walls of a container.

Liquids exert pressure on the bottom of a container. It depends upon the height of the liquid column.

Liquids exert sideways pressure.

Liquids exert equal pressure at the same height.





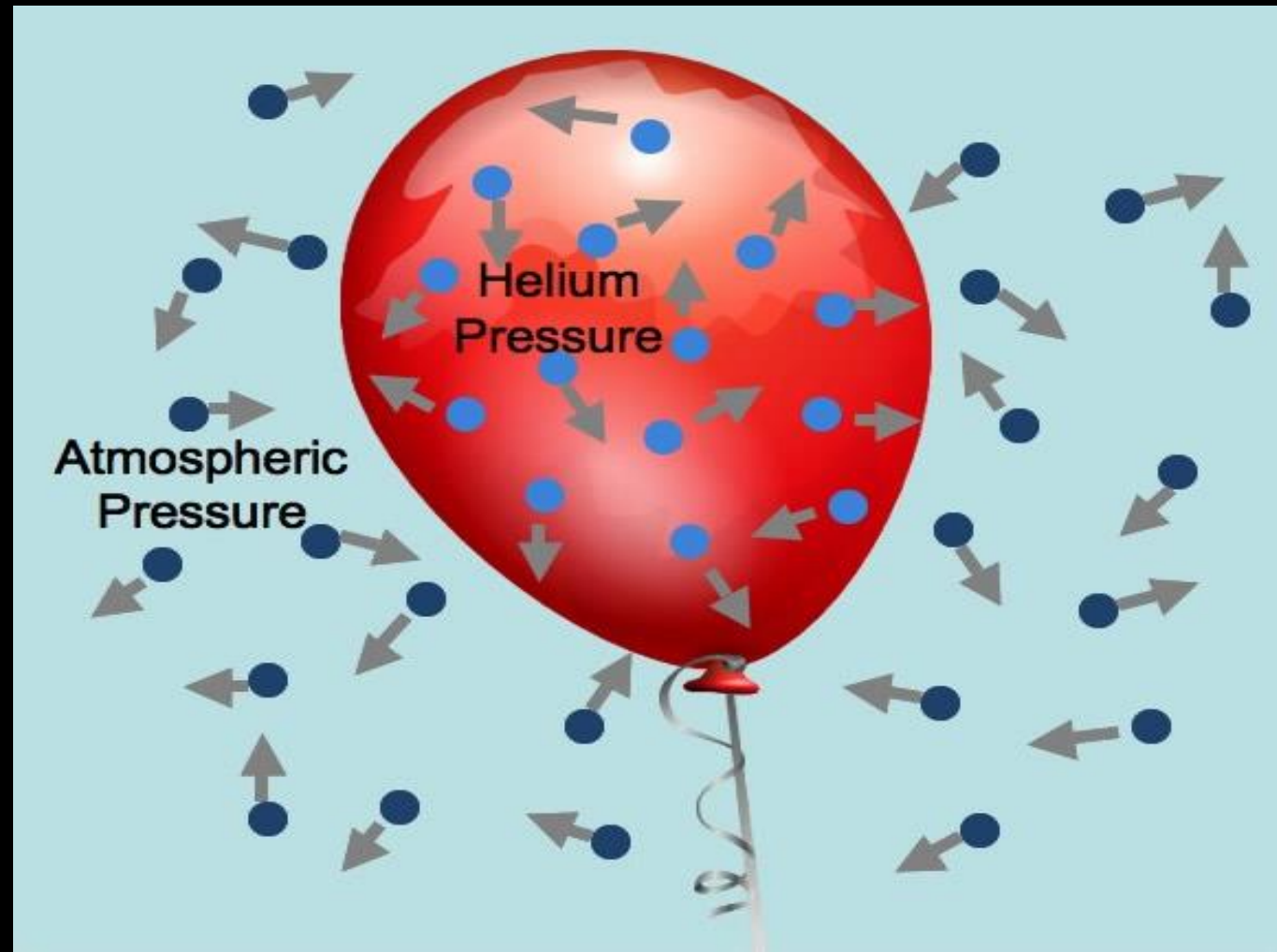
# LIQUIDS EXERTS PRESSURE

Liquids exerts pressure on the walls of the container.



# GASES EXERTS PRESSURE

- Gases exert pressure on the walls of the container.



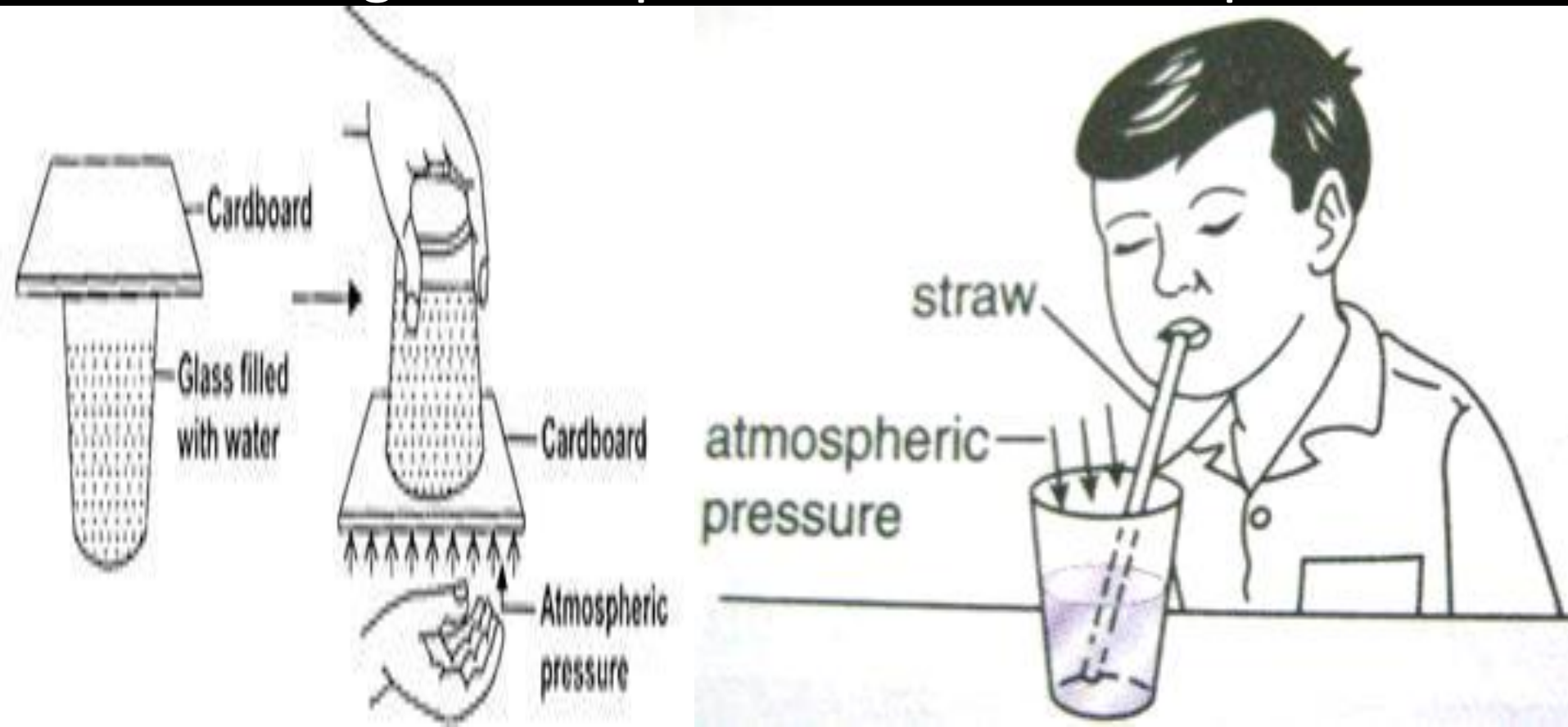
## 10) Pressure exerted by gases :-

Gases exert pressure on the walls of a container.



# ATMOSPHERIC PRESSURE

- The pressure exerted by the air around us known as atmospheric pressure. Atmospheric pressure is due to the weight of air present in the atmosphere.



# Things to Think about

- 1. Air planes have pressurized cabins . Why ?
- 2. How the vacuum cleaner works ?
- 3. Camel can run or walk on sand very easily but humans not ? Why ?
- 4. Have you ever think about atmospheric pressure on other planets . Do other planets have atmospheric pressure ?

## FUN TIME

Write three non-contact forces that you have studied  
.Now take the first alphabet from each of the forces  
and make a word that means 'something precious '.

# Suggested Project

- Make a chart with colourful pictures of various things like a car, a glass of water, a person standing , a boy writing , a tailor stitching , someone cutting vegetables, a doctor giving an injection, etc. Make a caption under each picture to say where the pressure is being applied and write a few lines about it .
- **Outdoor Activities**
- Next time you go to the petrol station , take time to talk to the person who fills air in the tyre. Ask him to show you the pressure gauge he uses. Find out how much pressure is needed for each vehicle (scooter, auto, car, truck, bus, etc. )

# SUMMARY

LET US SUMMARIZE WHAT HAVE WE LEARNT:-

- FORCE IS A PUSH OR PULL RESULTING IN MOTION OF A BODY.
- FORCE CAN CHANGE THE SHAPE OF AN OBJECT, MOVE AN OBJECT FROM THE POSITION OF REST, CHANGE THE DIRECTION OF A BODY IN MOTION AND CHANGE THE SPEED OF THE MOVING OBJECT.
- THERE ARE TWO KINDS OF FORCE: CONTACT FORCE AND NON-CONTACT FORCE.
- MUSCULAR FORCE AND FORCE OF FRICTION ARE THE EXAMPLES OF CONTACT FORCES.
- GRAVITATIONAL FORCE, ELECTRO STATIC FORCE AND MAGNETIC FORCE ARE THE EXAMPLES OF NON-CONTACT FORCES.

- FORCE PER UNIT AREA IS KNOWN AS PRESSURE.
- PRESSURE FROM SOLIDS IS DUE TO THEIR WEIGHT AND ACTS DOWNWARD, BUT IN THE CASE OF LIQUIDS AND GASES THE PRESSURE EXERTED BY THEM IS DOWNWARD, SIDEWAYS AND UPWARD ALSO, THAT MEANS IN ALL DIRECTIONS.
- THE ENVELOPE OF AIR AROUND THE EARTH IS KNOWN AS ATMOSPHERE.
- THE PRESSURE OF THE AIR UPON THE SURFACE OF THE EARTH IS KNOWN AS THE ATMOSPHERIC PRESSURE.



THANK YOU