

Chapter 4: Pressure and Its Effects

RUNNING NOTES

8th Class

Introduction: We experience pressure in everyday life.

Examples:

1. Carrying school bags
2. Cutting fruits
3. Driving nails
4. Drinking through a straw
5. Water flowing from overhead tanks
6. Wind blowing strongly

Pressure plays an important role in all these situations.

4.1 Pressure

Definition: Pressure is the force acting per unit area.

Formula:

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

SI Unit

Pressure = Pascal (Pa)

1 Pascal = 1 Newton/m²

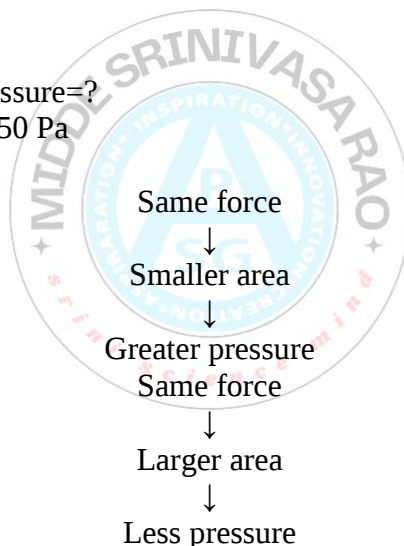
SI Unit of Force = Newton (N)

SI Unit of Area = Square metre (m²)

Example: Force = 100 N, Area = 2 m², Pressure=?

Pressure = $100 \div 2 = 50 \text{ N/m}^2 = 50 \text{ Pa}$

Effect of Area on Pressure



Everyday Examples

- Broad bag straps reduce pressure on shoulders.
- Sharp knife cuts easily.
- Pointed nail enters wood easily.
- Needles have pointed tips.
- High heels exert more pressure than flat shoes.

Activity 4.1

Driving a nail

Observation

1. Driving with the pointed end is easier.

Reason

1. Smaller area produces higher pressure.

Pressure Exerted by Liquids

Liquids also exert pressure.

Liquid pressure depends on 1) Height of liquid column 2) Depth

Activity 4.2

Two pipes of different diameters are filled to the same height.

Observation

1. Both balloons bulge equally.

Conclusion

1. Liquid pressure depends on the height of the water column, not on the amount of water.

Increasing Height

More water
↓
Greater height
↓
Greater pressure
↓
Balloon bulges more

Properties of Liquid Pressure

Liquids exert pressure

- At the bottom
- On the sides
- In all directions

Activity 4.3

Bottle with holes

Observation

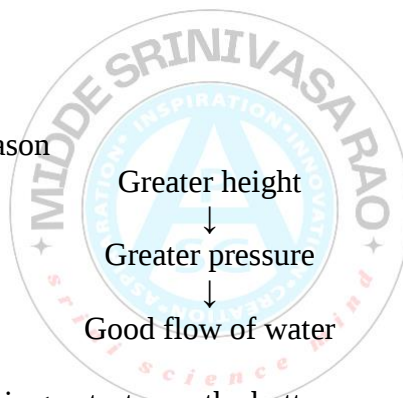
1. Water comes out through all holes.
2. Lowest hole throws water farther.

Reason

1. Pressure increases with depth.

Pressure in Daily Life

Overhead tanks are placed at heights. Reason



Dam Construction

Base of a dam is broader because Pressure is greatest near the bottom.

4.2 Pressure Exerted by Air

Air surrounds Earth. This layer is called Atmosphere.

Atmosphere Contains: Nitrogen, Oxygen, Argon, Carbon dioxide, Water vapour, Other gases

Atmospheric Pressure

Air exerts pressure on every object.

This pressure is called Atmospheric Pressure.

Activity 4.4

Paper Plate Experiment

Observation

1. The paper plate becomes difficult to lift when covered with a larger sheet.

Conclusion

1. Air exerts pressure on the covering sheet.

Balloon Activity

Blowing air into a balloon

↓

Air pressure increases inside

↓

Balloon expands in all directions

Activity 4.5

Rubber sucker

Observation

1. Sucker sticks firmly to a smooth surface.

Reason

1. Outside air pressure is greater than inside pressure.

Important Facts

Atmospheric pressure acts

1. In all directions
2. On every object
3. On our body

Our body is not crushed because Internal body pressure balances atmospheric pressure.

Units of Pressure

SI Unit is Pascal (Pa)

Other Units Millibar (mb), Hectopascal (hPa)

4.3 Formation of Wind

High Pressure



Air moves



Low Pressure



Wind

This movement is called Wind.

Two balloons connected by a straw

Observation

1. Air moves from the inflated balloon to the smaller balloon.

Conclusion

1. Air flows from high pressure to low pressure.

Land Breeze and Sea Breeze

Day Time:

- Land heats faster.
- Air above land rises.
- Low pressure develops.
- Cool air from sea moves to land.
- Sea Breeze

Night Time:

- Land cools faster.
- Sea remains warmer.
- Air above sea rises.
- Cool air from land moves to sea.
- Land Breeze

Wind Speed

Greater pressure difference



Faster wind

4.4 High-Speed Winds Reduce Air Pressure

Two balloons hanging

Blow air between them.

Observation

1. Balloons move towards each other.

Reason

Activity 4.6

Activity 4.7

1. Fast moving air has lower pressure.
2. Higher pressure outside pushes balloons together.

Bernoulli's Principle:

Fast moving air
↓
Lower pressure

Slow moving air
↓
Higher pressure

Applications: Airplanes, Birds, Perfume spray, Atomizer, Spinning balls

Roofs Blown Away

- High-speed winds create
- Low pressure above roofs.
- Pressure inside the house becomes higher.
- The roof may lift and blow away.
- Keeping doors and windows open during storms reduces pressure difference.

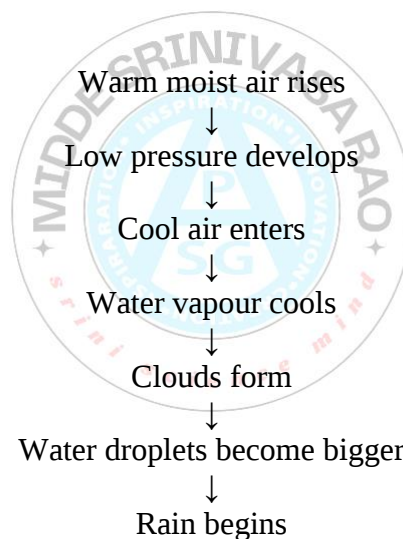
4.5 Storms, Thunderstorms and Lightning

Storm

A storm is accompanied by

- Strong winds
- Heavy rain
- Thunder
- Lightning

Formation of Thunderstorm



Lightning Inside clouds Positive and negative charges separate. When charges suddenly combine, A bright flash is produced. This is Lightning.

Thunder

Lightning heats surrounding air rapidly. Hot air expands suddenly. Produces sound. This sound is Thunder.

Thunderstorm

A storm accompanied by Lightning and Thunder is called Thunderstorm.

Safety During Lightning

- ✓ Do not stand under trees.
- ✓ Avoid open fields.
- ✓ Avoid umbrellas with metal rods.
- ✓ Do not touch electric poles.
- ✓ Stay inside a building or vehicle.
- ✓ If outdoors, Crouch low.

Lightning Conductor

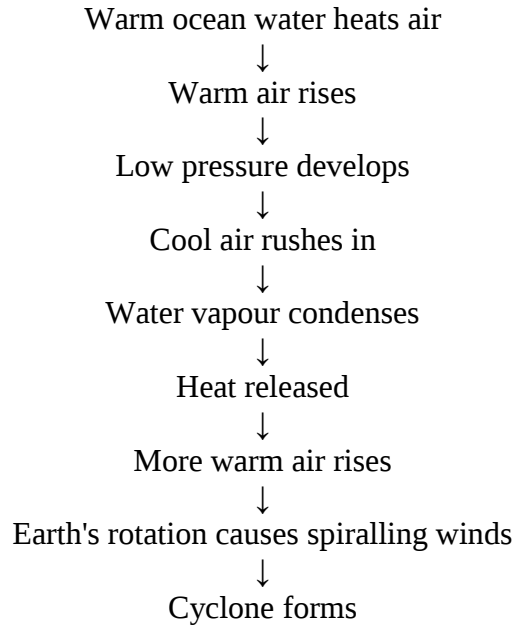
A metal rod fixed on buildings.

Purpose: Provides an easy path for electric charges to reach the ground. Protects buildings from lightning.

4.6 Cyclone

Cyclones are powerful storms formed over warm ocean waters.

Formation



Eye of Cyclone: The calm central region is called Eye of the Cyclone.

Effects of Cyclones

- Strong winds
- Heavy rainfall
- Storm surge
- Floods
- Landslides
- Damage to houses
- Crop destruction
- Power failures
- Loss of life



Cyclone Safety

- Follow weather forecasts.
- Listen to IMD warnings.
- Keep emergency kit ready.
- Move to cyclone shelters.
- Stay indoors.
- Avoid flood water.
- Do not touch electric wires.

Important Scientists:

Bernoulli: Explained relationship between air speed and pressure.

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