



8th Class

Chapter: 4



➤ PRESSURE ➤

AND ITS

EFFECTS



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4. PRESSURE AND ITS EFFECTS

4.1 Pressure

Introduction

Pressure Around Us

We observe:

- Leaves flying in the wind.
- Trees bending during storms.
- Doors slamming.
- Windows rattling.
- Clothes fluttering.

Reason



These effects occur because **moving air exerts force.**



Leaves flying in the wind.



Trees bending during storms.



Doors slamming.



Windows rattling.



Clothes fluttering.

4. PRESSURE AND ITS EFFECTS

4.1 Pressure

Megha and Pawan

Megha and Pawan carry bags of equal weight.

- Megha's bag has broad straps.
- Pawan's bag has narrow straps.



Observation

The narrow straps hurt more.

Reason

The same force acts on a smaller area, producing greater pressure.



Key Idea

Greater pressure is produced when the same force acts on a smaller area.

4. PRESSURE AND ITS EFFECTS

4.1 Pressure

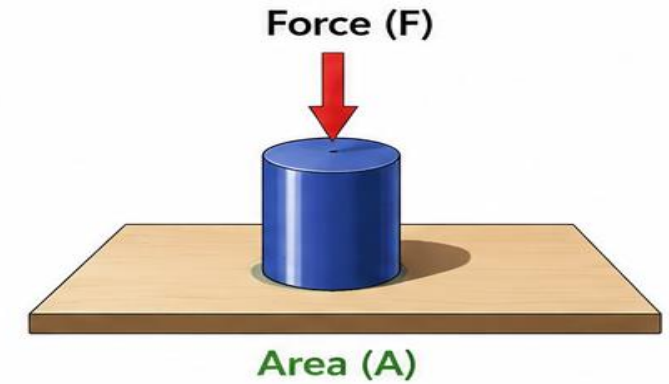
What is Pressure?

Definition

Pressure is the **force** acting per unit **area**.

Formula

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



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

SI Unit

Pascal (Pa)

Relation

- Force ↑ → Pressure ↑
- Area ↑ → Pressure ↓

Key Point

Greater **force** or smaller **area** produces **higher pressure**.

Examples

Small area
→ **High pressure**
(Pin pierces)



Large area
→ **Low pressure**
(Book does not damage)



Larger area
→ **Less pressure**
(Shoe is comfortable)

4. PRESSURE AND ITS EFFECTS

4.1 Pressure

Activity 4.1 – Pressure Depends on Area

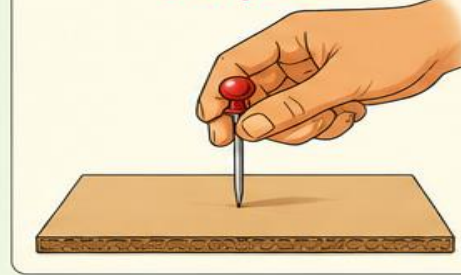
Let Us Explore



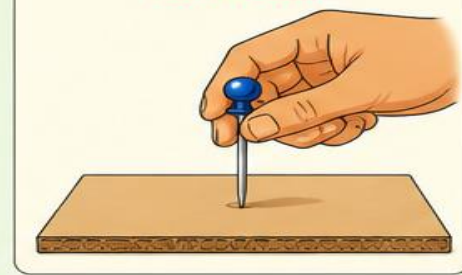
Procedure

- Press a sharp pin on cardboard.
- Press the blunt end of the pin.

Sharp end



Blunt end



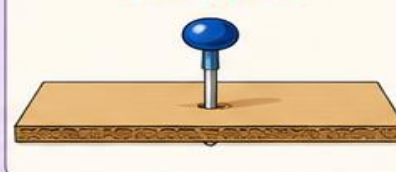
Observation

- Sharp end enters easily.
- Blunt end does not.

Sharp end



Blunt end



Conclusion

**Smaller area produces
greater pressure.**

Examples

- Needle



Very small area at the tip produces high pressure.

- Nail



Small area at the tip helps it to penetrate.

- Knife



Sharp edge (small area) helps in cutting easily.

4. PRESSURE AND ITS EFFECTS

4.1 Pressure

Everyday Applications of Pressure

Pressure in Daily Life

Examples



✓ Sharp knife cuts easily.



✓ Needle pierces cloth.



✓ Nails enter wood easily.



✓ High heels sink into soft ground.



✓ School bags have broad straps.

Remember



Pressure increases
when the area
decreases.

4. PRESSURE AND ITS EFFECTS

4.1 Pressure

Pressure and Area

Comparison

Small Area

Greater pressure



Sharp pin



Knife edge



Needle



Large Area

Less pressure



Broad strap



Snow shoes



Camel's feet



Real-Life Examples



- **Broad tyres** prevent tractors from sinking.



- **Camels** walk easily on sand.



- **Snow shoes** help people walk on snow.

4. PRESSURE AND ITS EFFECTS

4.1 Pressure

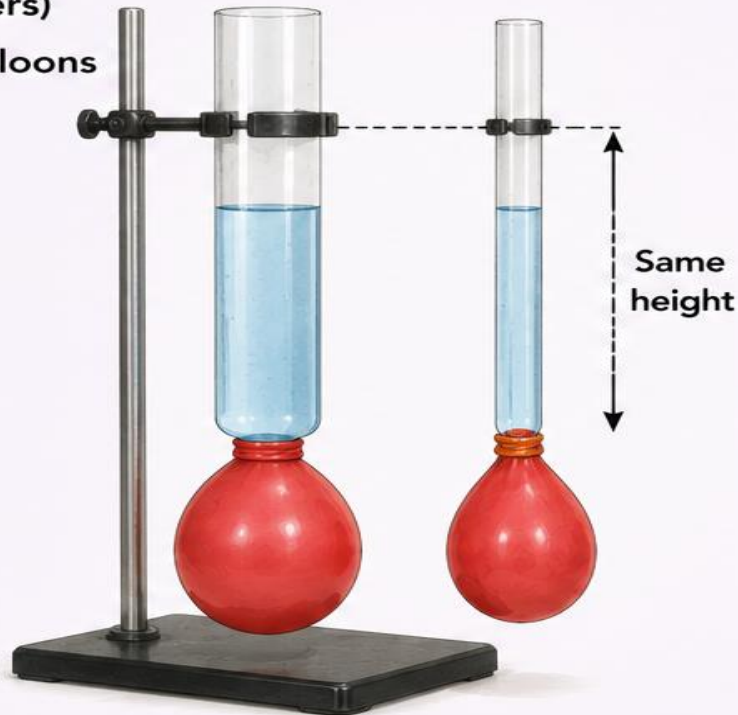
Pressure Exerted by Liquids

Do Liquids Exert Pressure?

Activity 4.1: Let Us Try and Find Out

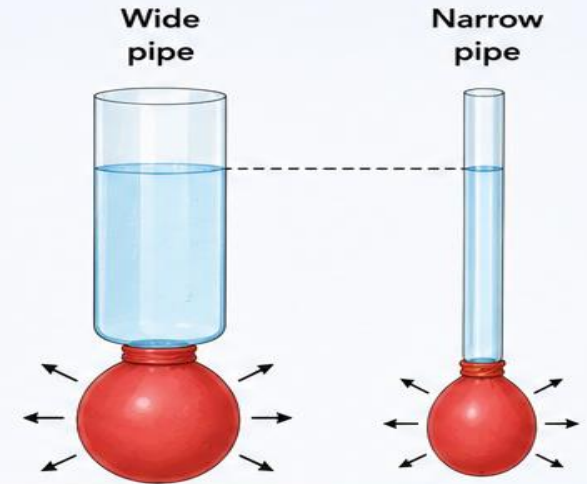
Materials

- Two glass/plastic pipes (different diameters)
- Two balloons
- Water
- Stand



Observation

- Both balloons bulge equally.
- Bulging is not due to the width of the pipe.

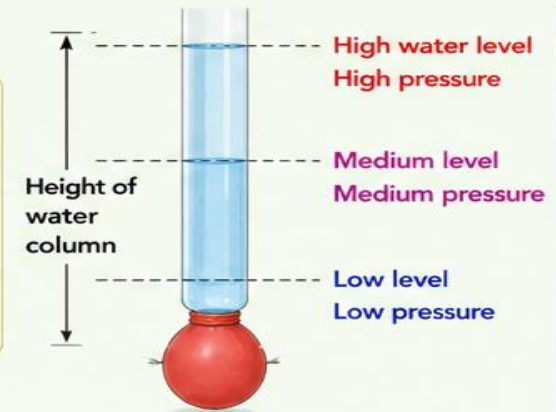


Conclusion

- ✓ Water exerts pressure.
- ✓ Pressure depends on the height of the water column.

Greater height
→ greater pressure

Smaller height
→ smaller pressure



4. PRESSURE AND ITS EFFECTS

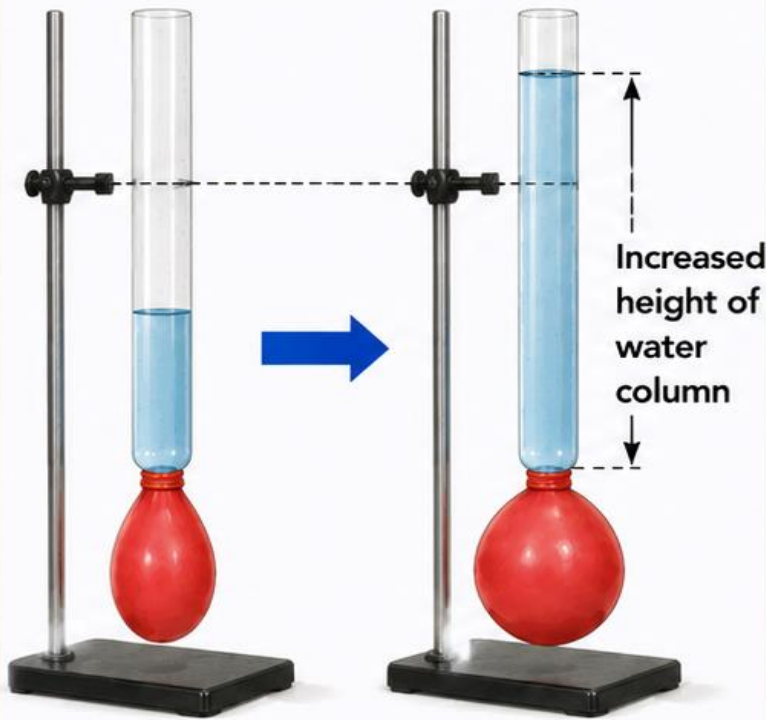
4.1 Pressure

Pressure Depends on Height

Activity 4.1 – Continued

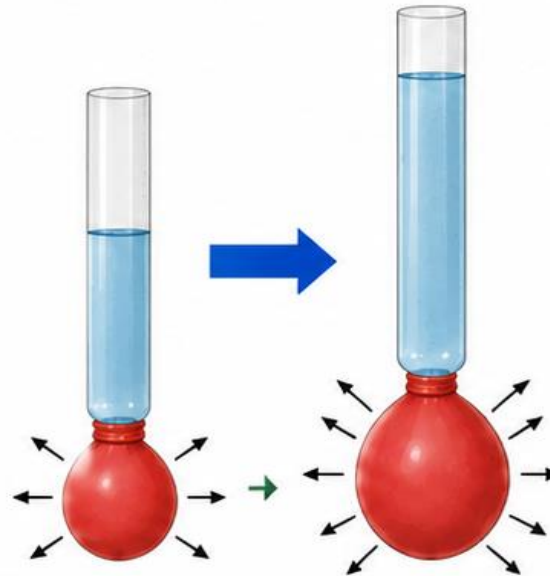
Experiment

Increase the water level in one pipe.



Observation

- Balloon bulges more.
- More water height → **More pressure.**



Conclusion



Liquid pressure **increases** with the height of the liquid column.

Example

Overhead water tanks are built at a height to provide good water flow.



4. PRESSURE AND ITS EFFECTS

4.1 Pressure

Pressure on the Walls of a Container

Activity 4.2: Let Us Find Out

Procedure

- Take a plastic bottle.
- Make four small holes around its sides.
- Fill with water.
- Remove the tape covering the holes.



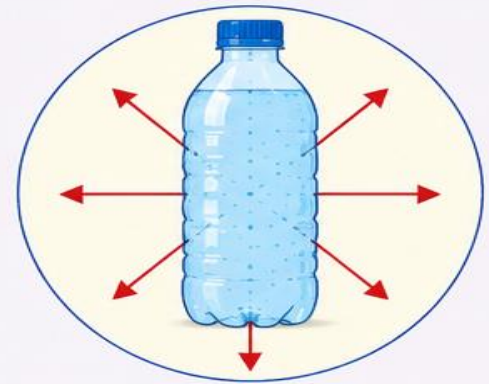
Observation

Water flows out through all the holes.



Conclusion

- ✓ Liquids exert pressure on the sides of a container.
- ✓ Liquid pressure acts in all directions.



4. PRESSURE AND ITS EFFECTS

4.1 Pressure

Pressure Increases with Depth

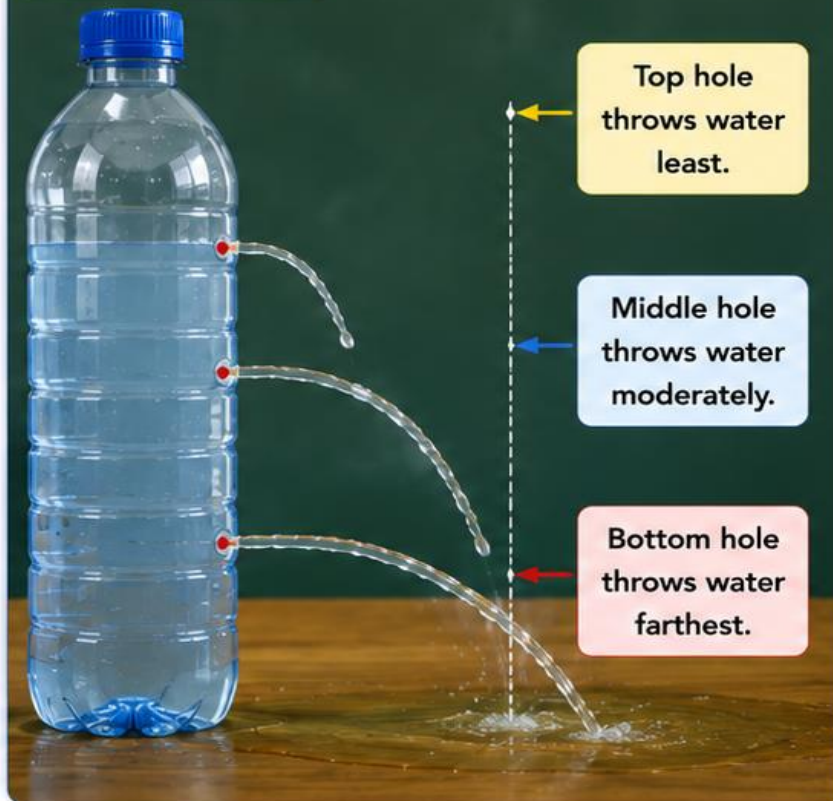
Activity 4.3

Experiment

Make three holes at different heights in a bottle.



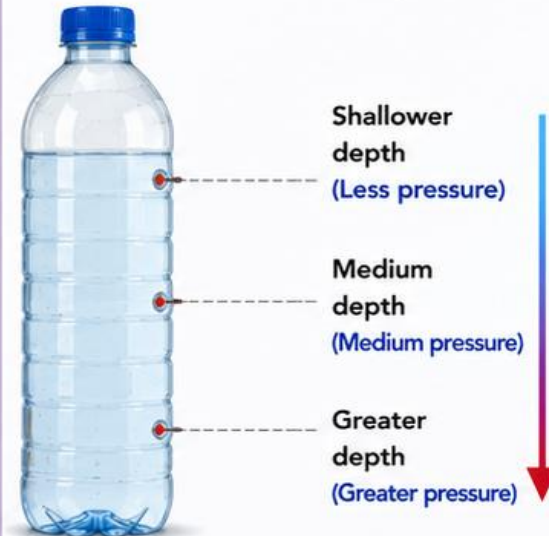
Observation



Conclusion



Pressure increases with depth.



Daily Life Example

Divers experience greater pressure deep underwater.



Key Idea: The deeper the liquid, the greater the pressure.

4. PRESSURE AND ITS EFFECTS

4.1 Pressure

Everyday Applications of Liquid Pressure

Real-Life Examples

- ✓ Dams are thicker at the bottom.



Liquid pressure increases with depth. Therefore, dams are built thicker at the bottom to withstand greater pressure.

- ✓ Water tanks are placed on rooftops.



Keeping the tank at a height increases the water pressure in the pipes and ensures good flow of water.

- ✓ Deep-sea submarines are built with strong walls.



At greater depths, liquid pressure is very high. Strong walls prevent the submarine from getting crushed.

- ✓ High-rise buildings require pumps to lift water.



Water has to be lifted to great heights against gravity and liquid pressure. Pumps are used to supply water to upper floors.



Key Idea: Liquid pressure increases with depth and height. → This principle is used in many aspects of our daily life.

4. PRESSURE AND ITS EFFECTS

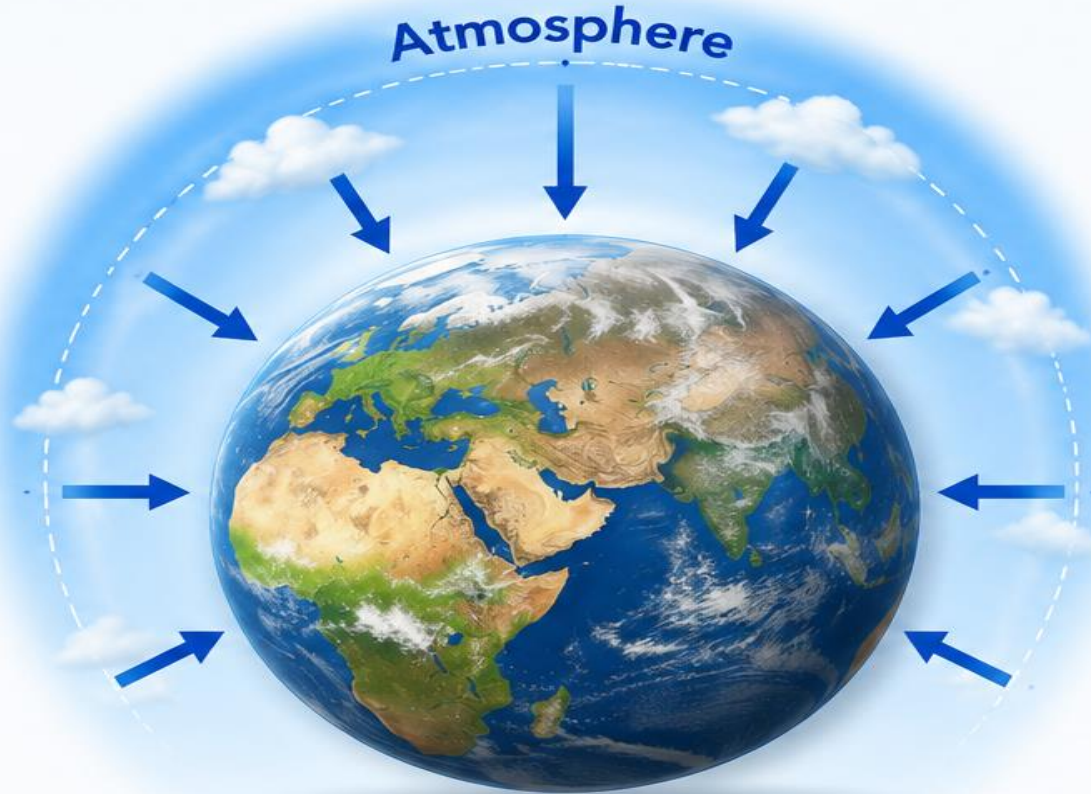
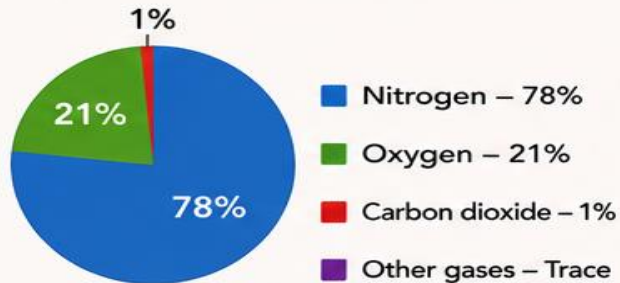
4.2 Pressure Exerted by Air

Atmosphere

The Earth is surrounded by air.

Air contains:

- Nitrogen
- Oxygen
- Carbon dioxide
- Other gases



The blanket of air around the Earth is called the **atmosphere**.

Important Fact

Air has mass.



Therefore,



Air exerts pressure.



Key Idea: Because air has mass, it pushes on everything — this push is called **air pressure**.

4. PRESSURE AND ITS EFFECTS

4.2 Pressure Exerted by Air

Activity 4.4 – Air Exerts Pressure

Experiment

We can show that air exerts pressure.



How to do?

- ➔ Place a paper plate on a stick.
- ➔ Keep one folded sheet of chart paper on it.
- ➔ Try to lift it up.
- ➔ Now keep two unfolded sheets on the plate.
- ➔ Try to lift again.

Materials

- Paper plate
- Stick
- Chart papers

Paper plate



Stick



Chart papers

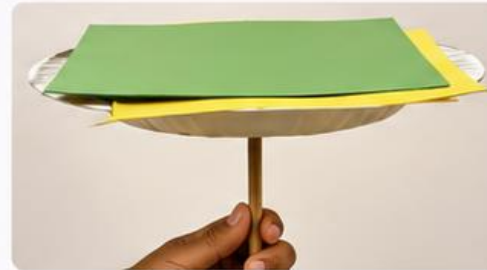


Observation

- One folded sheet is easier to lift.

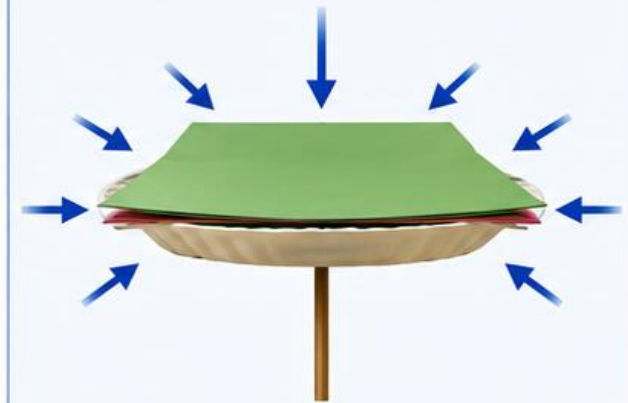


- Two unfolded sheets require more effort.



Conclusion

Air presses on the paper from all directions.



Air exerts pressure.



Key Idea: Air has mass and it presses on objects from all sides. This push is called **air pressure**.

4. PRESSURE AND ITS EFFECTS

4.2 Pressure Exerted by Air

Balloon and Air Pressure

Air Pressure in Daily Life

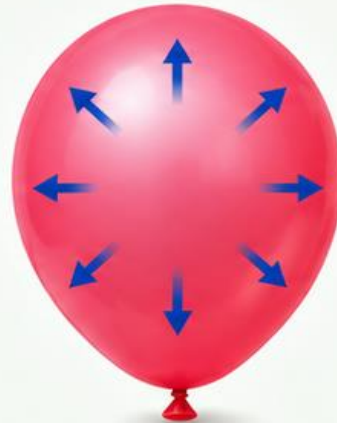
Observation

A balloon expands when air is blown into it.



Reason

Air inside the balloon exerts pressure on its walls.



If the Balloon is Open

- 1 Air escapes.
- 2 Pressure decreases.
- 3 Balloon collapses.



Examples

- ✓ Tyres
- ✓ Football
- ✓ Volleyball



4. PRESSURE AND ITS EFFECTS

4.2 Pressure Exerted by Air

Activity 4.5 – Rubber Sucker

Experiment

Press a rubber sucker on a smooth surface.



Observation

It sticks tightly.



It is not easy to pull it off.

Reason

- Air inside is pushed out.



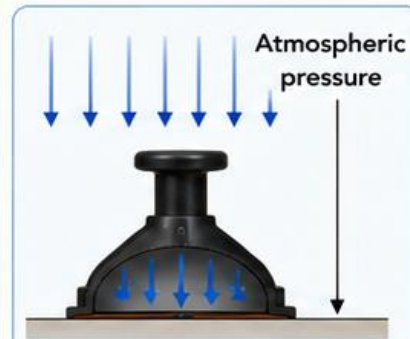
- Outside atmospheric pressure is greater.



Conclusion



Atmospheric pressure keeps the sucker attached.



Greater outside pressure holds it firmly.

Applications

- Glass lifters



- Wall hooks



- Mobile holders



Key Idea: When the air inside the sucker is removed, the outside air pressure pushes it against the surface and keeps it stuck.

4. PRESSURE AND ITS EFFECTS

4.3 Formation of Wind

Formation of Wind



Key Idea

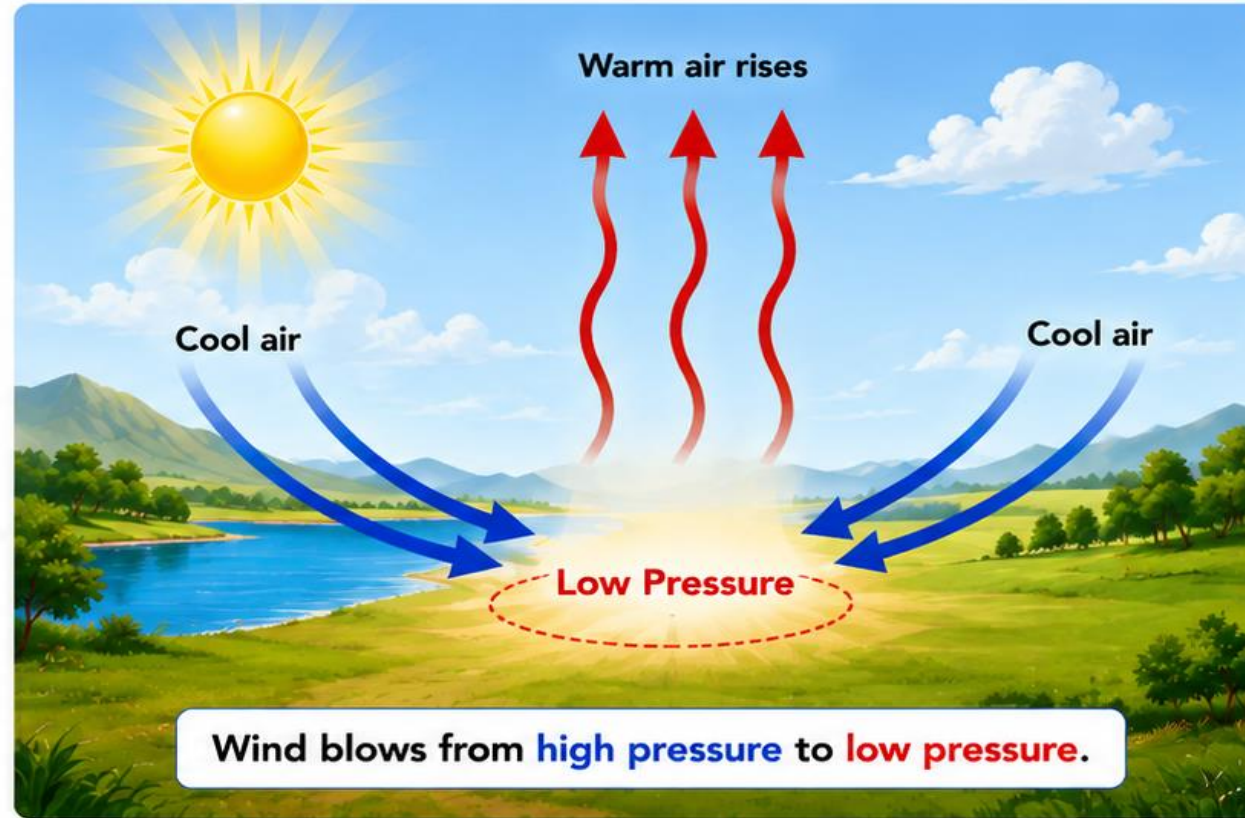
Wind is the movement of air from a region of **high pressure** to a region of **low pressure**.

Why Does Wind Form?

- 1 Air gets heated by the Sun.
- 2 Warm air becomes lighter and rises.
- 3 A low-pressure area is created.
- 4 Cooler air moves into this low-pressure area.
- 5 This movement of air is called wind.



Low Pressure



Key Points

- ★ Uneven heating of the Earth's surface causes differences in air pressure.
- ★ Air always moves from high pressure to low pressure.
- ★ This movement of air is what we experience as wind.
- ★ Stronger the pressure difference, stronger the wind.

Examples of Wind



Sea Breeze



Land Breeze



Strong Wind

High Pressure Area

Cool air is heavy and sinks down.
(More air, more pressure)



Low Pressure Area

Warm air is light and rises up.
(Less air, less pressure)

4. PRESSURE AND ITS EFFECTS

4.3 Formation of Wind

Activity 4.6 – Air Moves from High Pressure to Low Pressure

Experiment with Two Balloons

Materials

- Two balloons
- Drinking straw
- Rubber bands



Procedure

- 1 Inflate one balloon.



- 2 Leave the other balloon empty.

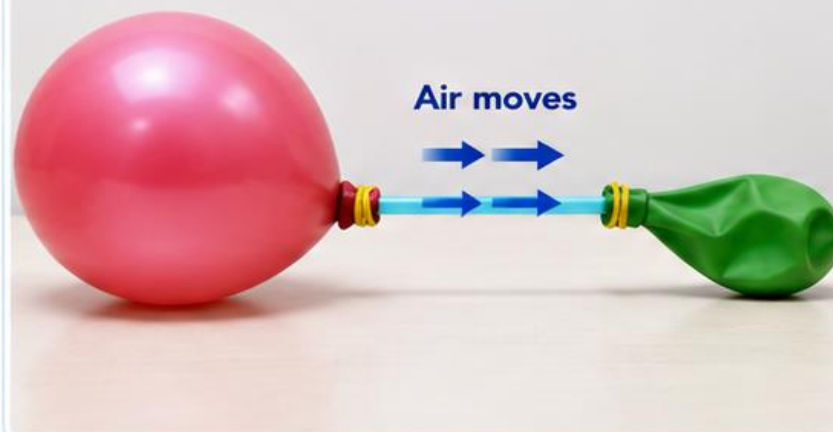


- 3 Connect both balloons with a straw.



High Pressure
(Inflated Balloon)

Low Pressure
(Empty Balloon)



The air moves through the straw from the high pressure balloon to the low pressure balloon.

Observation

Air moves from the inflated balloon to the empty balloon.



Conclusion



Air always moves from **high pressure** to **low pressure**.



Key Idea:

Air moves from a region of **high pressure** to a region of **low pressure**.

4. PRESSURE AND ITS EFFECTS

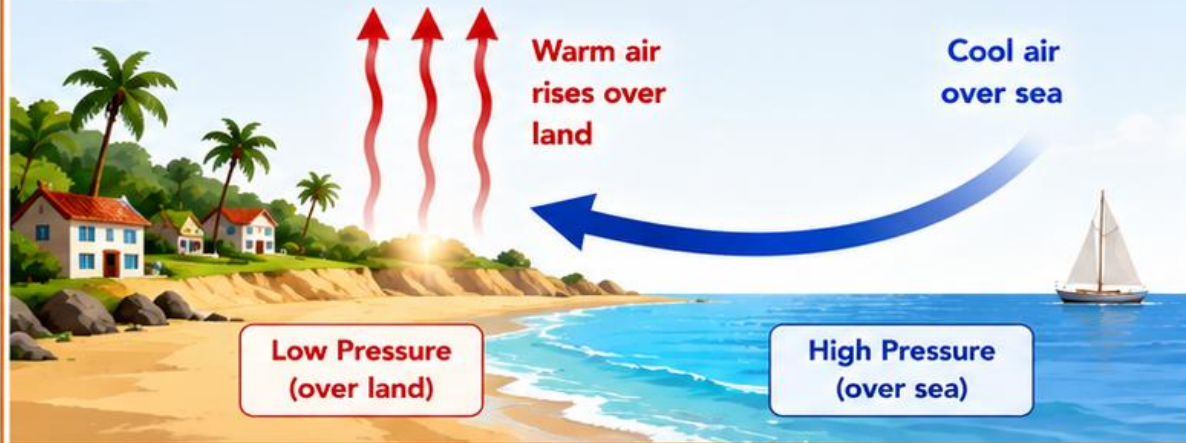
4.3 Formation of Wind

Sea Breeze and Land Breeze

Formation of Local Winds

Sea Breeze (Day)

- 1 Land heats up faster than sea.
- 2 Air over land rises.
- 3 Cool air from the sea moves towards the land.



During the day, cool air blows from **sea** to **land**.

Land Breeze (Night)

- 1 Land cools faster than sea.
- 2 Air over the sea rises.
- 3 Cool air from land moves towards the sea.



During the night, cool air blows from **land** to **sea**.

**Key Idea:**

Winds are caused due to difference in **heating** and **cooling** of land and water, which creates **high** and **low** pressure.

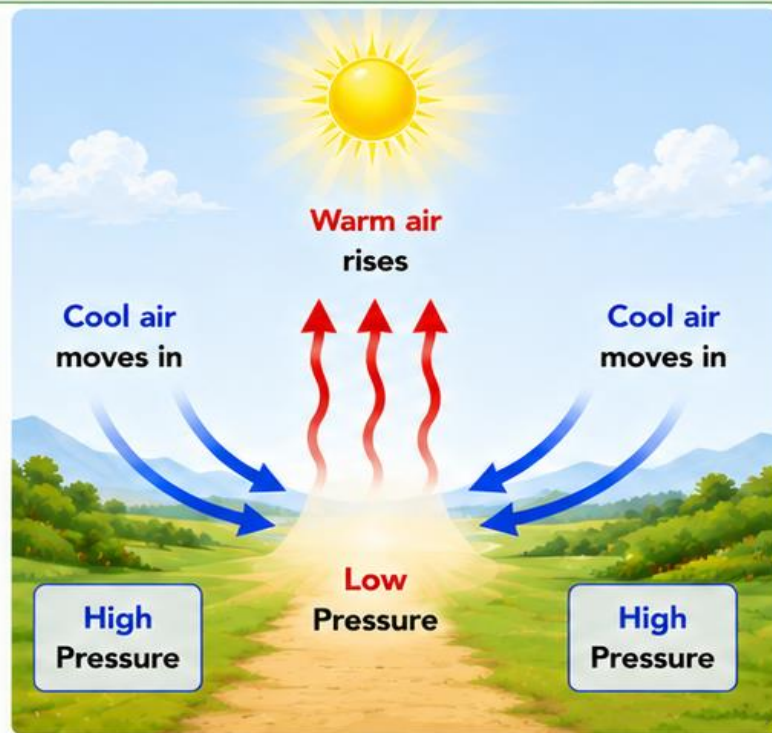
4. PRESSURE AND ITS EFFECTS

4.3 Formation of Wind

Important Points about Wind

**Remember**

- ✓ Wind is caused by **pressure differences**.
- ✓ Warm air **rises**.
- ✓ Cool air **moves** to replace it.
- ✓ Greater pressure difference → **Stronger wind**.



Wind flows from **High Pressure** to **Low Pressure**.
The greater the difference, the stronger the wind.

Daily Life Examples

- Cool breeze near beaches



- Fans create air movement



- Ventilation in houses

**Key Takeaway:**

Wind is nature's way of balancing air pressure and keeping our environment comfortable.

4. PRESSURE AND ITS EFFECTS

4.4 High-Speed Winds Result in Lower Air Pressure

Activity 4.7 – High-Speed Winds Result in Lower Air Pressure

**EXPERIMENT**

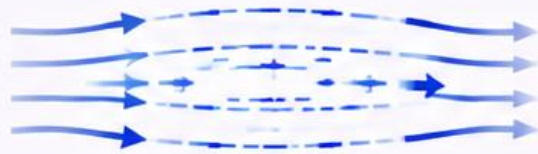
- Inflate two balloons.
- Hang them close together.
- Blow air between them.

**OBSERVATION**

The balloons move **towards** each other.

**REASON**

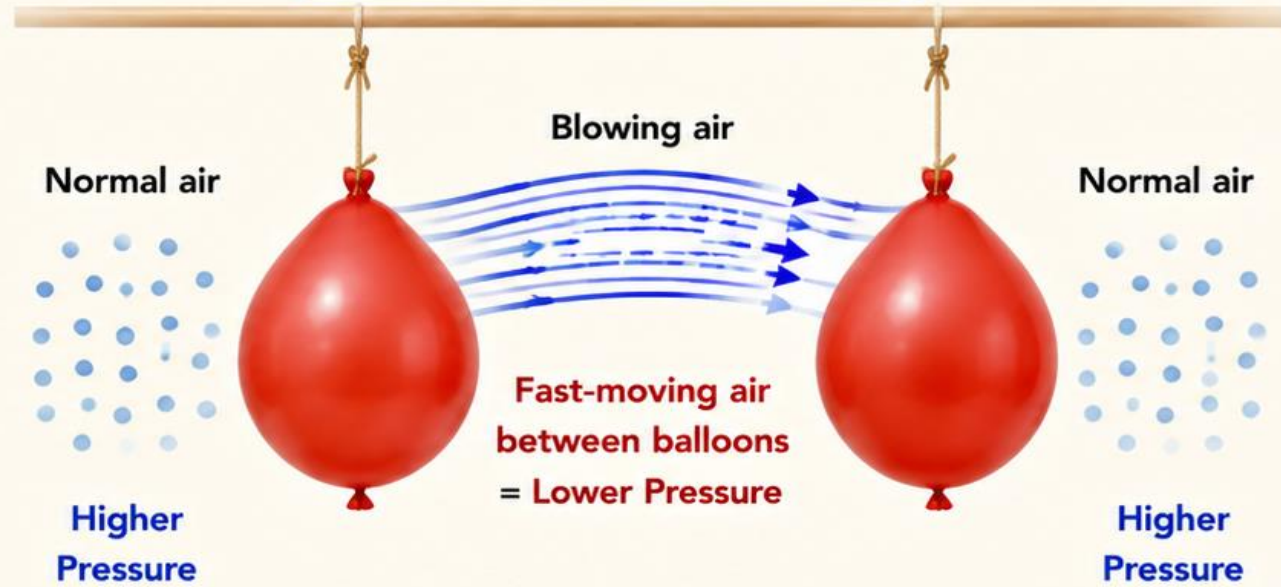
Fast-moving air has **lower pressure**.



Lower Pressure in between

**Key Takeaway:**

High-speed winds (fast-moving air) create **lower pressure**, and **higher surrounding pressure** forces objects towards the low-pressure region.

WHY DOES THIS HAPPEN?

Higher pressure on the outside pushes the balloons towards each other.

4. PRESSURE AND ITS EFFECTS

4.4 High-Speed Winds Result in Lower Air Pressure

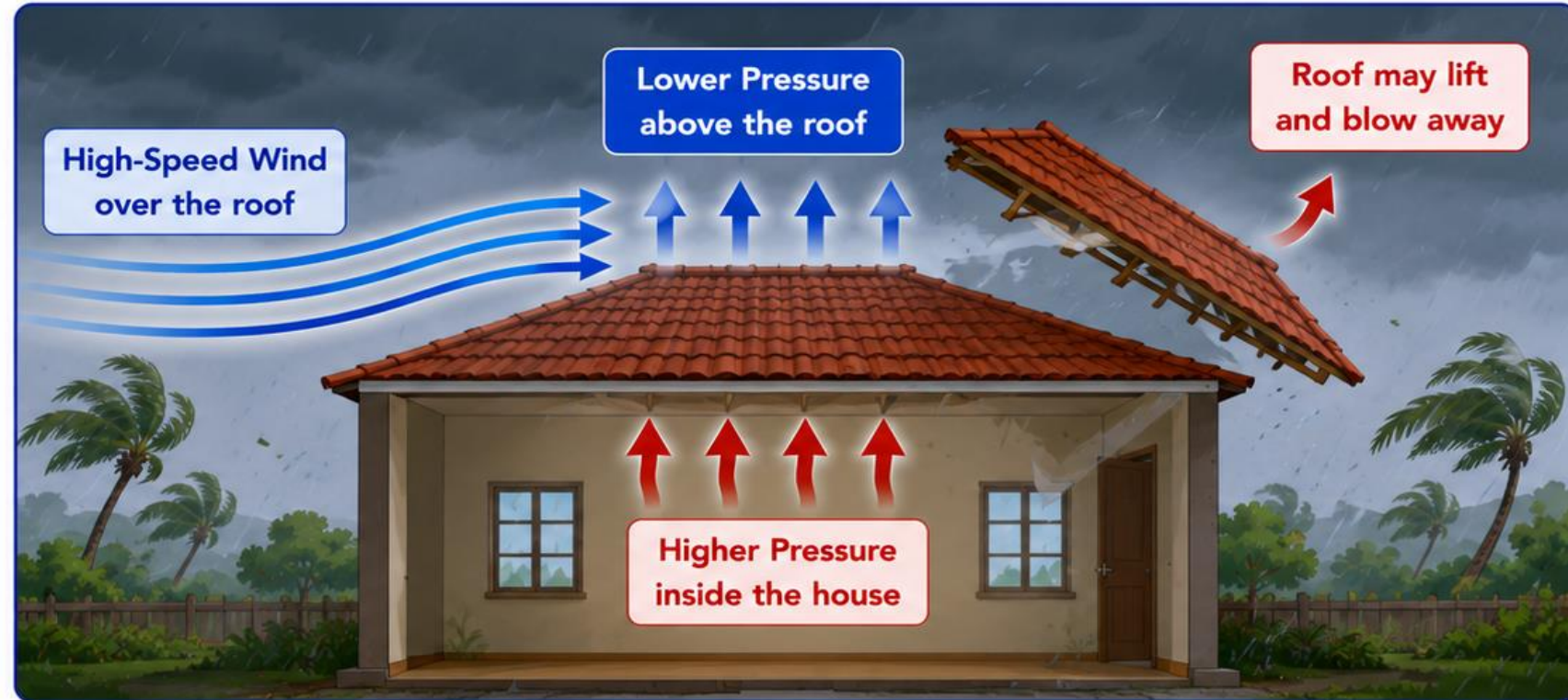
High-Speed Winds and Roofs



How Do Roofs Blow Away?

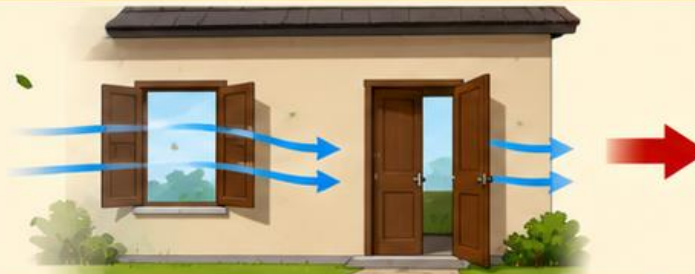
During storms:

- 1 Wind moves rapidly over the roof.
- 2 Pressure above the roof **decreases**.
- 3 Pressure inside the house remains **higher**.
- 4 The roof may lift and blow away.



SAFETY TIP

Keep doors and windows open during severe storms to reduce pressure difference.



Less pressure difference means less chance of roof being blown away.



4. PRESSURE AND ITS EFFECTS

4.4 High-Speed Winds Result in Lower Air Pressure

Bernoulli's Principle

SCIENTIST CORNER

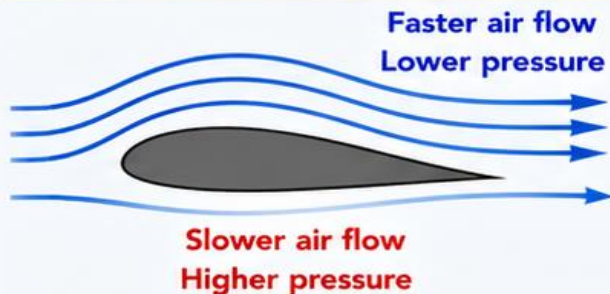


Daniel Bernoulli
(1700 – 1782)

A Swiss mathematician and physicist who discovered Bernoulli's Principle.

Bernoulli's Principle

Faster moving air
has **lower** pressure.



APPLICATIONS

1 Aeroplane Wings



Air moves faster over the top surface of the wing, creating **lower pressure** and **lift**.

2 Flying Birds



Birds use faster air flow over their wings to create **lift** and stay in air.

3 Perfume Sprayers



Fast-moving air over the tube **lowers pressure** and draws perfume up and sprays it.

4 Atomizers



Fast air flow **reduces pressure** and breaks liquid into tiny droplets.

5 Cricket Ball Swing



Faster air on one side of the ball creates **lower pressure**, causing the ball to **swing**.

**Key Takeaway:**

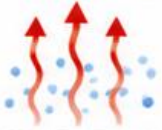
When air moves **faster**, its **pressure decreases**. This difference in pressure causes **lift** and many useful effects in our daily life.

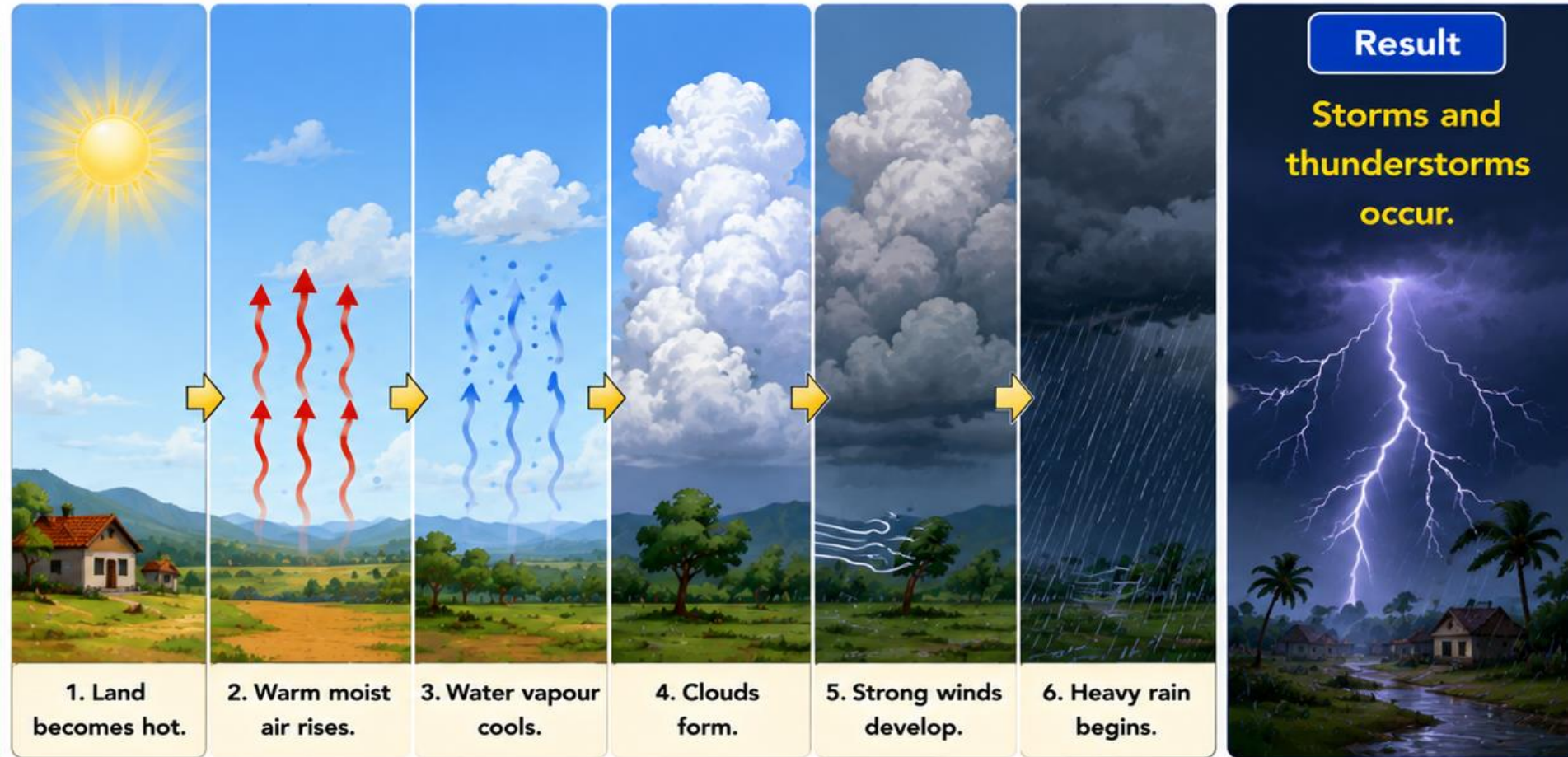
4. PRESSURE AND ITS EFFECTS

4.5 Storms, Thunderstorms and Lightning

Storms, Thunderstorms and Lightning

How Do Storms Form?

- 1 Land becomes hot. 
- 2 Warm moist air rises. 
- 3 Water vapour cools. 
- 4 Clouds form. 
- 5 Strong winds develop. 
- 6 Heavy rain begins. 

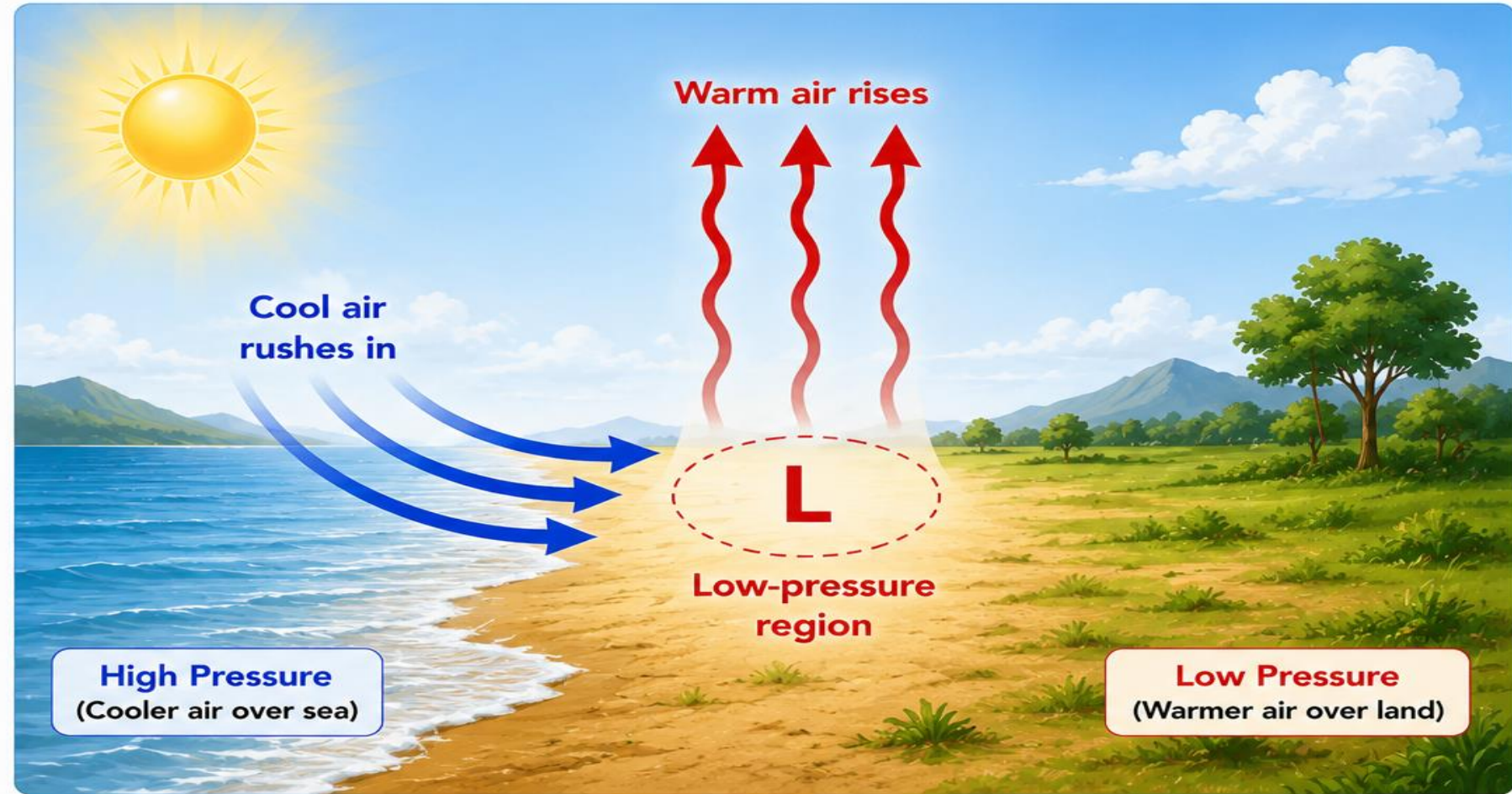
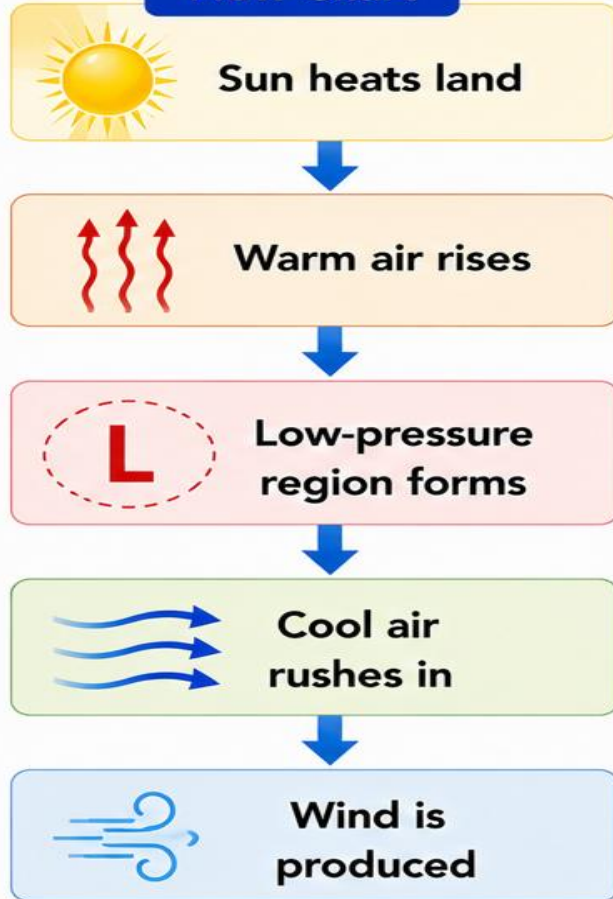


Key Idea: When warm moist air rises and forms clouds, strong winds and heavy rain happen, causing storms and thunderstorms. **Lightning** and **thunder** are also produced.

4. PRESSURE AND ITS EFFECTS

4.5 Storms, Thunderstorms and Lightning

Formation of Wind

Flow Chart

Wind is the movement of air from a region of **high pressure** to a region of **low pressure**.
(Nature always tries to balance air pressure differences.)

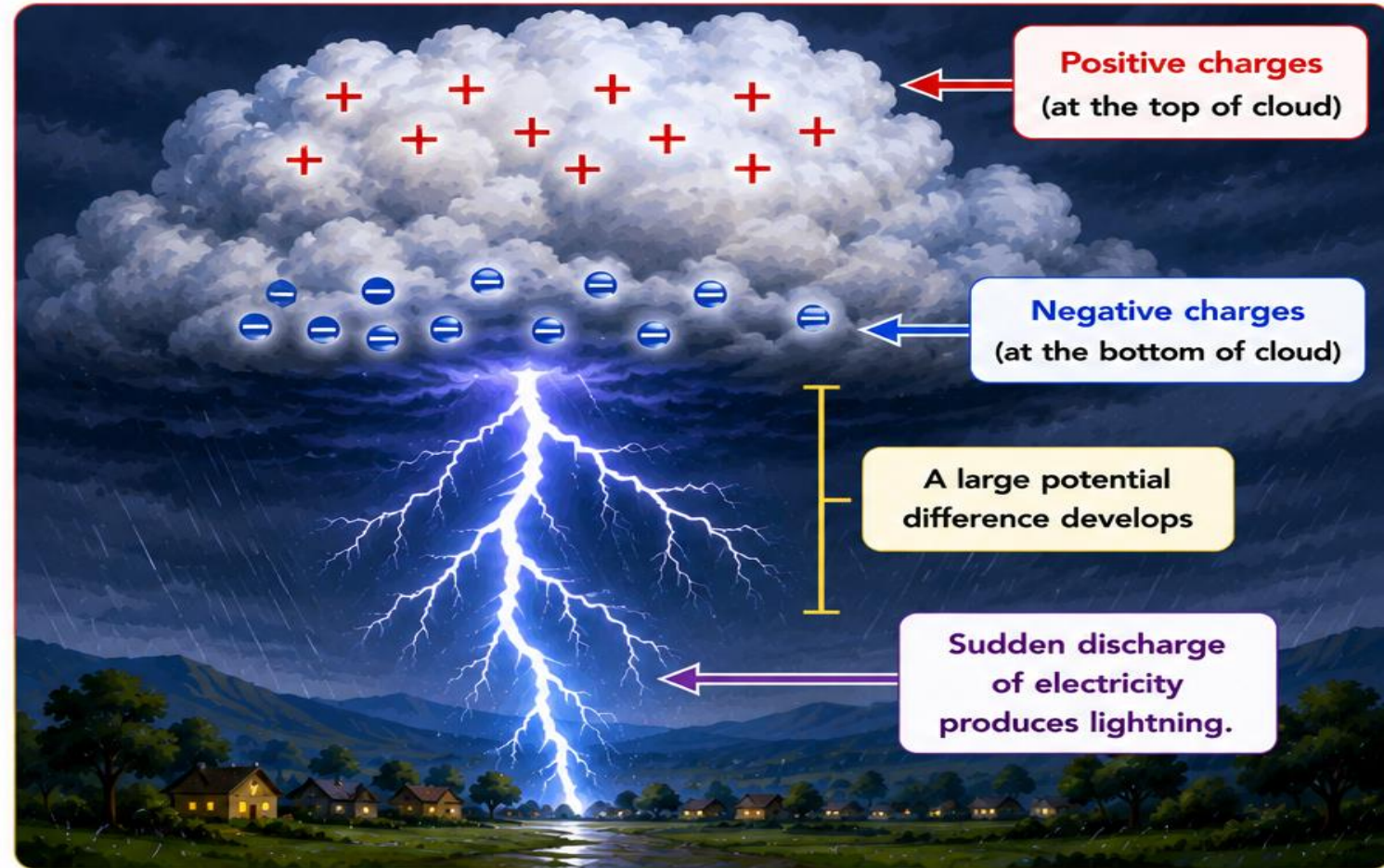
4. PRESSURE AND ITS EFFECTS

4.5 Storms, Thunderstorms and Lightning

Lightning – A Natural Electrical Discharge

How is Lightning Produced?

- 1 Strong winds move water droplets and ice particles inside clouds. 
- 2 Friction between them produces electric charges. 
- 3 Positive charges collect at the top of the cloud. 
- 4 Negative charges collect at the bottom of the cloud. 
- 5 A large potential difference develops. 
- 6 Sudden discharge of electricity produces lightning. 

**KEY POINT**

Lightning is a **sudden discharge of electricity** between clouds or between a cloud and the Earth.

4. PRESSURE AND ITS EFFECTS

4.5 Storms, Thunderstorms and Lightning

Thunder

What Causes Thunder?

1 Lightning heats the surrounding air suddenly.



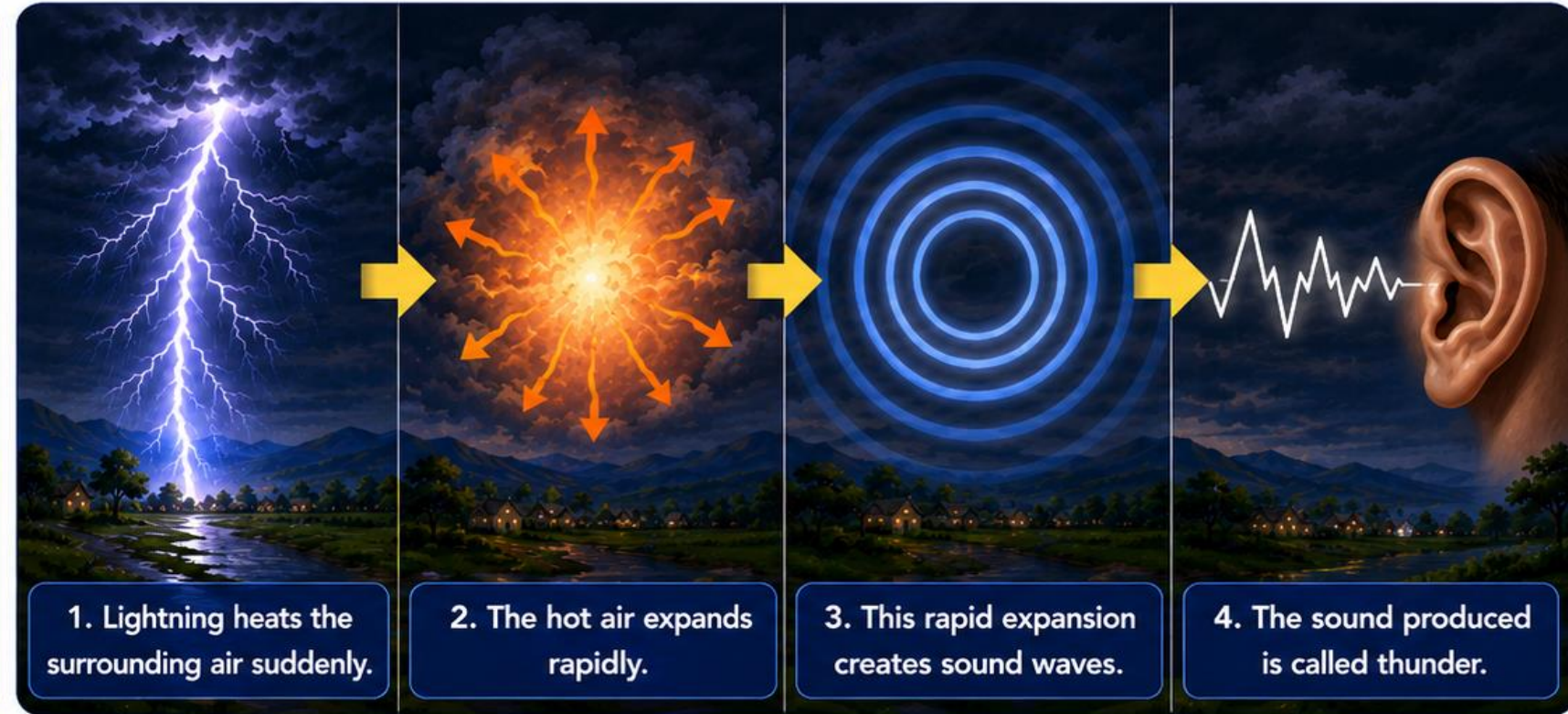
2 The hot air expands rapidly.



3 This rapid expansion creates sound waves.



4 The sound produced is called thunder.



Interesting Fact



We see **lightning** before hearing **thunder** because **light** travels faster than **sound**.



We see lightning



Later we hear thunder

4. PRESSURE AND ITS EFFECTS

4.5 Storms, Thunderstorms and Lightning

Safety During Lightning

Precautions During a Thunderstorm



Do's



Stay inside a building.



Stay inside a closed vehicle if outdoors.



Switch off electrical appliances.



Keep away from doors and windows.



Don'ts



Do not stand under trees.



Do not use umbrellas with metal rods.



Avoid open fields.



Stay away from electric poles and water bodies.



Lightning can be dangerous. Follow these safety rules to protect yourself and others.

4. PRESSURE AND ITS EFFECTS

4.5 Storms, Thunderstorms and Lightning

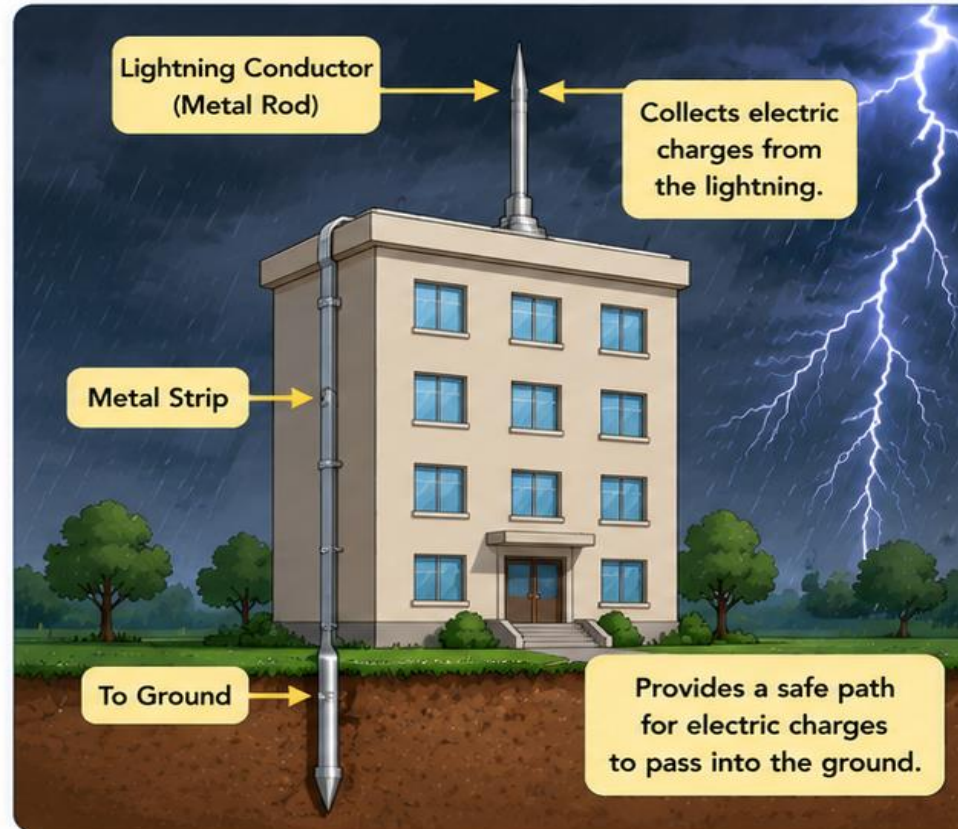
Lightning Conductor

Protection from Lightning



What is a Lightning Conductor?

- A metal rod fixed on the top of a building.
- Connected to the ground by a metal strip.



Function

- Provides a safe path for electric charges.
- Protects buildings from lightning damage.



Applications

- ✓ Schools
- ✓ Hospitals
- ✓ High-rise buildings
- ✓ Factories



A lightning conductor provides a **safe path** for lightning to pass into the ground and **protects buildings**.

4. PRESSURE AND ITS EFFECTS

4.6 Cyclone

Definition



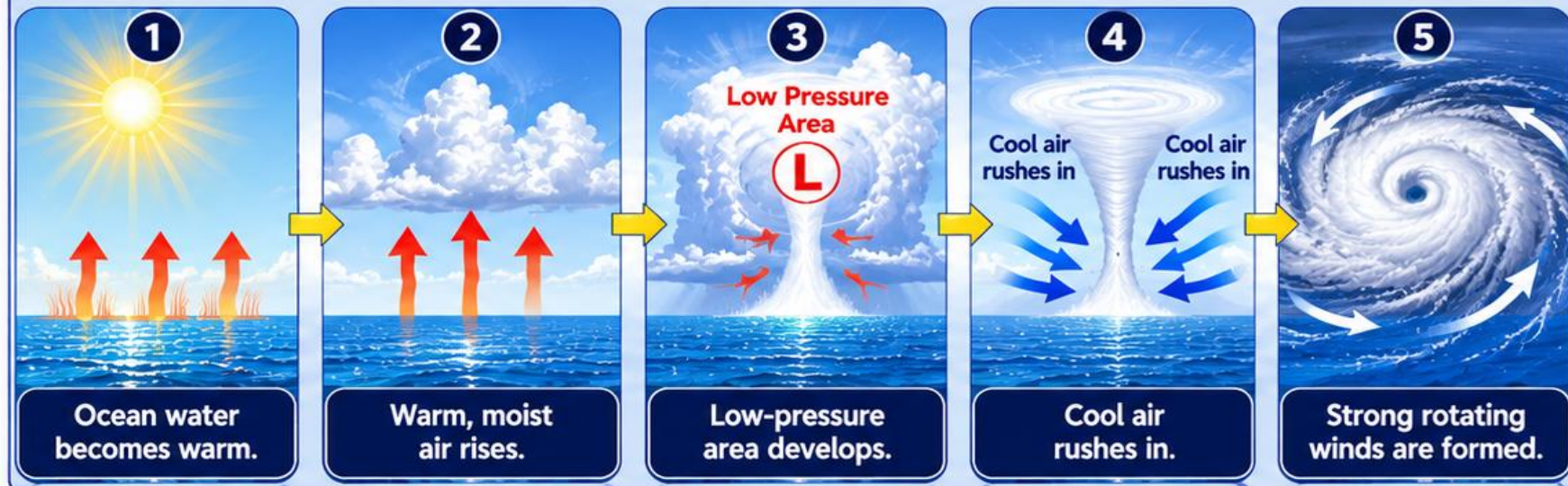
A **cyclone** is a powerful storm that develops over warm ocean waters.



Formation

- 1 Ocean water becomes **warm**.
- 2 Warm, moist air **rises**.
- 3 **Low-pressure** area develops.
- 4 Cool air **rushes in**.
- 5 Strong **rotating winds** are formed.

How a Cyclone Forms?



Key Point

Cyclones are large, **rotating storms** that form over **warm oceans**.

4. PRESSURE AND ITS EFFECTS

4.6 Cyclone

Structure of a Cyclone

Parts of a Cyclone

Eye of the Cyclone

- ✓ Centre of the cyclone.
- ✓ Calm and clear weather.



Surrounding Region

- Strong winds.
- Heavy rain.
- Thunderstorms.

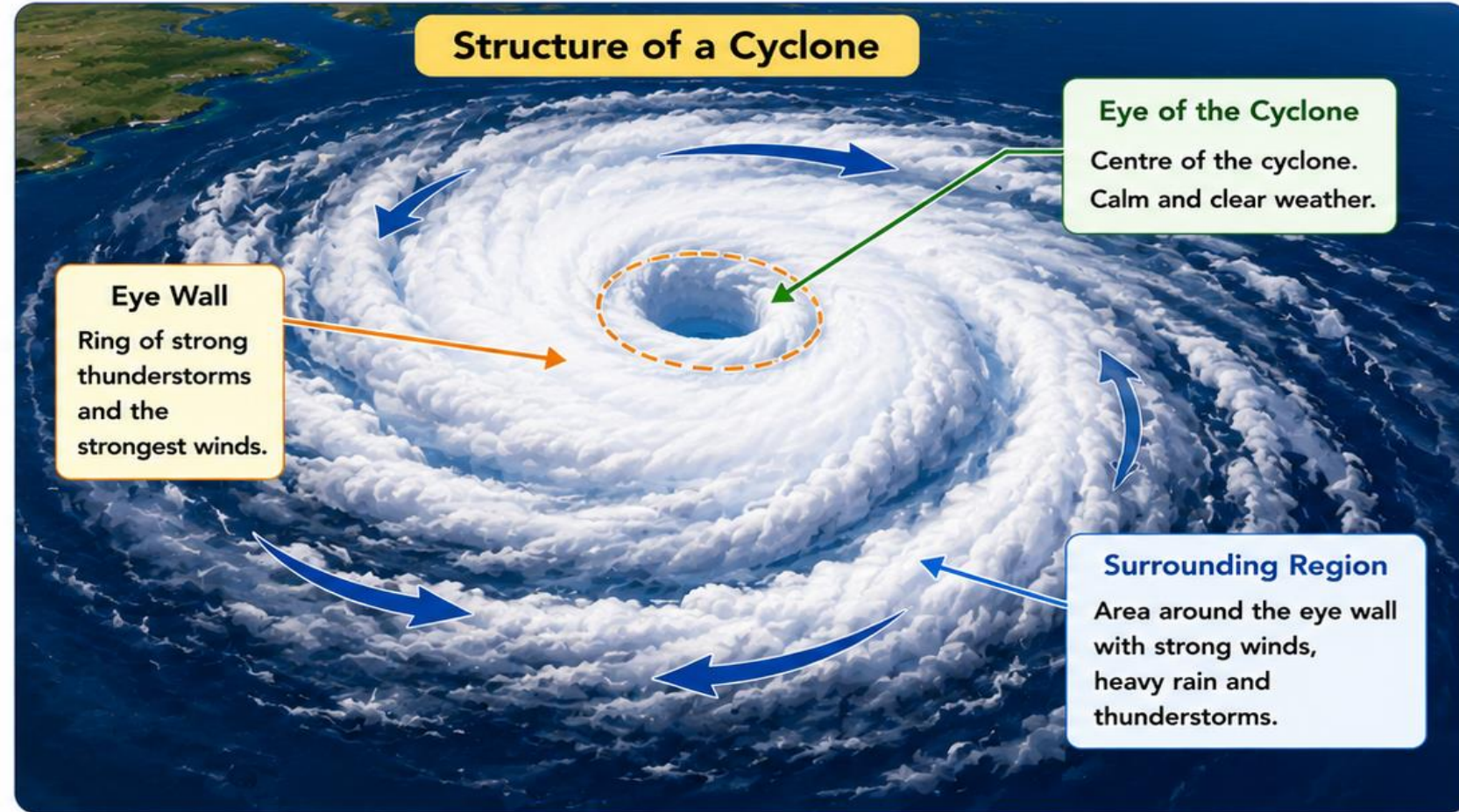


Interesting Fact



The strongest winds occur around the **eye wall**.

Structure of a Cyclone



Cyclones are large rotating storms with a **calm centre (eye)** and **very strong winds** around it.

4. PRESSURE AND ITS EFFECTS

4.6 Cyclone

Effects of Cyclones

Damage Caused by Cyclones

- ✓ Strong winds destroy houses.



- ✓ Heavy rainfall causes floods.



- ✓ Trees and electric poles fall.



- ✓ Crops are damaged.



- ✓ Roads and bridges are damaged.



- ✓ Loss of human and animal life.



Example

Amphan Cyclone (2020) caused severe destruction.



Very strong winds



Severe flooding



Homes destroyed



Widespread damage



Cyclones bring heavy rain, strong winds and cause widespread destruction. **Preparedness and safety save lives.**

4. PRESSURE AND ITS EFFECTS

4.6 Cyclone

Cyclone Safety Measures

How Can We Stay Safe?

Before a Cyclone

- ✓ Listen to weather forecasts.



- ✓ Keep an emergency kit ready.



- ✓ Store drinking water and food.



During a Cyclone

- ✓ Stay indoors.



- ✓ Switch off electricity if necessary.



- ✓ Move to a safe shelter.



After a Cyclone

- ✓ Avoid damaged electric wires.



- ✓ Follow government instructions.



Being prepared **saves lives.**



Stay alert, stay safe, stay strong!



Thank's
you