Chapter - 9

SOME NATURAL PHENOMENA

8th CLASS

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Understanding Lightning

Simple Facts about Lightning:

1. A Giant Electric Spark

Lightning is a massive electric spark caused by charged particles in clouds.

2. Ancient Beliefs

Ancient people feared lightning and thought it was the wrath of the gods.

3. Stay Safe!

We need not fear lightning but must take precautions to stay safe.

Lightning Sparks and Ancient Greeks

600 BC - Greeks discovered rubbing amber with fur creates sparks

Taking off woolen or polyester clothes creates sparks

Benjamin Franklin linked sparks from clothes to lightning (1752)

Same phenomenon: Lightning and sparks from clothes

Lightning and sparks are related

CHARGING OBJECTS BY RUBBING

Activity 9.2

Collect objects and the materials listed in the table below. Try to charge each object by rubbing with the materials mentioned. **Record your findings** in the table.

Object Rubbed	Materials Used for Rubbing	Result (Charged / Not Charged)
1 Pen Refill	Polythene, Woollen Cloth	☑ Charged!
2 Balloon	Polythene, Woollen Cloth, Dry Hair	☑ Charged!
3 Eraser	Wool	☑ Charged!
4 Steel spoon	Polythene, Woollen Cloth	☑ Charged!

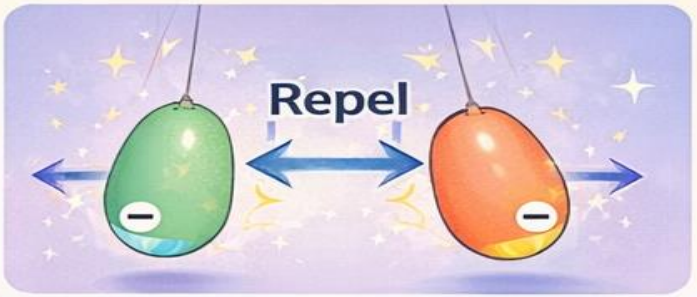
Static electricity makes objects charged when rubbed with specific materials.

9.3 Types of Charges and Their Interaction

Activity 9.3 — Like Charges Repel Each Other

Activity Description

- Take **two balloons and** hang them freely using threads so that they do not touch each other.
- Now **rub both balloons** with a woollen cloth and release them.



What Do You Observe?

- **The two balloons** move away from each other after rubbing.

Excellent Explanation (Simple & Clear)

- When a balloon is rubbed with a woollen cloth,
- it gains electric charge due to friction.
- Rubbing transfers **electrons** from the woollen cloth to the balloon.

This shows that objects **having same** kind of **electric charge** repel each other.

Key Points to Remember

- There are two types of electric charges:
  - **Positive charge** / **Negative charge**
- **Like charges repel** each other.
- **Unlike charges attract** each other.
- This interaction is called ***electrostatic force***.

Conclusion

This simple balloon experiment clearly proves that **Like charges repel each other,** which is a fundamental rule of **electrostatics.**

9.3 Types of Charges and Their Interaction

Activity 9.3 — Interaction Between Like Charges (Refill Experiment)

Activity Description

- Take two used pen refills.
2. **Rub one refill** with **polythene** to charge it.
3. Place this charged refill **carefully** inside a glass tumbler, using the tumbler as a stand. (do not touch it with your hand) with hand).
4. Now **rub the second refill with polythene.**
5. Bring the **second charged refill** close to the refill inside the tumbler without touching it.

Excellent Explanation (Simple & Clear)

- Rubbing the refill with **polythene** transfers **electrons** to the refill.
- As a result, **both refills get the same type of electric charge** (negative charge).
- When two objects have **like charges**, they repel each other.

This experiment again proves that **like charges repel each other.**

What Do You Observe?

- The **refill inside** the tumbler **moves away** from the approaching refill.
- **The two refills repel each other.**
- **Like charges repel, unlike charges attract.**
- Glass is an **insulator**, so it helps in observing electrostatic effects clearly.

Conclusion

The refill experiment clearly shows that:

Objects having the same kind of electric charge

which confirms a basic and important law of **electrostatics.**

9.3 Types of Charges and Their Interaction

Activity 9.3 (b) — Unlike Charges Attract Each Other

Activity Description

1. Take a used pen refill and rub it with **polythene** to charge it.
2. Place the **charged refill gently inside a glass tumbler**, using the tumbler as a stand.
3. Now take an **inflated balloon** and rub it to charge it.
4. Bring the **charged balloon** near the refill without touching it.
5. Observe what happens.

What Do You Observe?

- The refill inside the tumbler **moves towards the balloon.**
- The refill and the balloon get **different types of charges.**
- When two objects have **unlike charges**, they **attract each other.**

Excellent Explanation (Simple & Clear)

- Rubbing objects charges them due to transfer of electrons.
- **The refill and** the balloon get **different types of charges.**

This experiment shows that **unlike electric charges attract each other.**

Conclusion

This activity proves that:

Objects having different kinds of electric charges attract each other, which is an important rule of **electrostatics.**

9.3 Types of Charges and Their Interaction

Summary of Observations & Conclusions

Summary of Observations

From the activities performed, we observe the following:

- A charged balloon repels another charged balloon.
- A charged refill repels another charged refill.
- A charged balloon attracts a charged refill.

What Do These Observations Indicate?

- These are two kinds of electric charges.
- Charges of the same kind repel each other.
- Charges of different kinds attract each other.

Further Explanation

- The electric charges produced by rubbing are called static charges.
- Static charges do not move by themselves.
- When electric charges move, they form an electric current.

This completes the understanding of Types of Charges

What Do These Observations Indicate?

- There are two kinds of electric charges.
- Charges of the same kind repel each other.
- Charges of different kinds attract each other.

Further Explanation

- When a charged glass rod is brought near a plastic straw rubbed with silk is called positive charge.
- The other kind of charge is called negative charge.

Final Conclusion

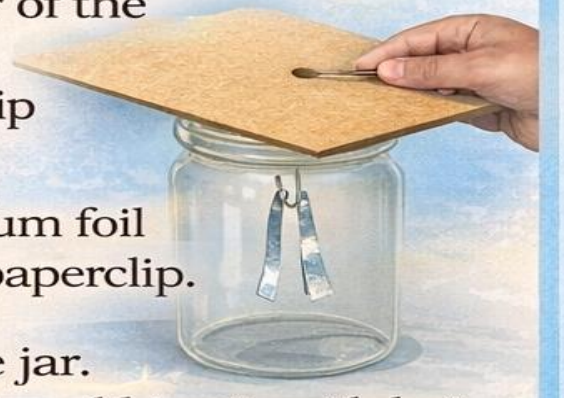
- ✓ There are two kinds of electric charges:
- ✓ positive and negative.
- ✓ Like charges repel each other.

Make a Simple Electroscope

Detect electric charge using an easy-to-make electroscope.

Step-by-Step Instructions

1. Take an empty glass jar and cut a piece of cardboard larger than the mouth of the jar.
2. Pierce a hole in the center of the cardboard and insert a straightened metal paperclip through the hole.



3. Hang two strips of aluminum foil (about 4 cm × 1 cm) on the paperclip.
4. Place the cardboard on the jar. Charge a plastic refill (e.g, by rubbing it with hair or wool) and bring it close to the paperclip. Observe the foil strips repelling each other.

The Science Behind It

The charged refill transfers the same charge to the paperclip and the aluminum foil strips. Since like charges repel each other, the foil strips move apart, indicating the presence of electric charge.

This simple device is called an **Electroscope**

9.3 Types of Charges and Their Interaction

Transfer of Electric Charge & Earthing

Observation (What Happens?)

- When a charged object is brought near the electroscope, the foil strips diverge.
- Touching the paper clip (metal conductor) gently with your hand causes the foil strips to collapse.
- Repeating the charging and touching process shows that each time you touch the paper clip, the foil strips return to their original position.

Excellent Explanation (Simple & Clear)

- Electric charge can flow through a **metal conductor.**
- When you touch the paper clip with your hand, the charge on the foil strips flows from the electroscope to the Earth through your body.
- ✓ As a result, the foil strips lose their charge and collapse back.
- ➡ This happens because the **Earth can accept** electric charge easily.

What Is Earthing?

- When the charge from a charged object flows to the Earth, the object becomes neutral (uncharged).
- We say that the object is **discharged.**
- ✓ The process of transferring electric charge from a charged object to the Earth is called:

Earthing

✓ The process of transferring electric charge from a charged object to the Earth is called:

Final Conclusion

- ✓ Electric charge can **be transferred** through a conductor.
- ✓ Touching a charged object allows charge to flow to the Earth.
- ✓ This process is called **earthing.**
- ✓ Earthing makes a charged object **neutral and safe.**

THE STORY OF LIGHTNING

Lightning can be explained by electric charges produced due to rubbing.

1 Charges Produced by Rubbing

During thunderstorms, strong air currents move upward while water droplets move downward. These vigorous movements cause rubbing and collisions, which produces **electric charges.**

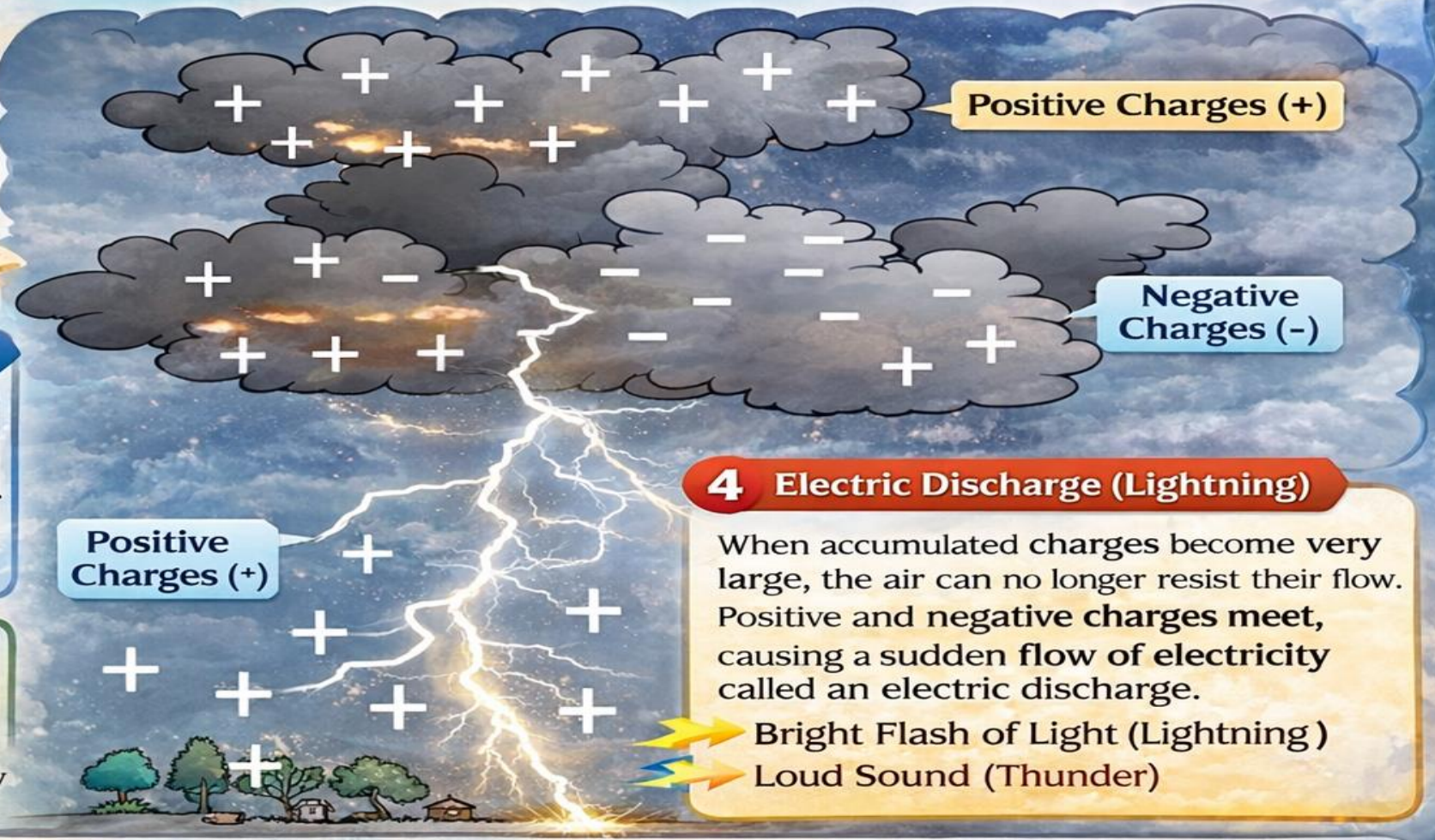
2 Separation of Charges in Clouds

Positive charges collect near the upper edges of the cloud. **Negative charges** collect near the **lower** edges of the cloud. **Positive charges** also accumulate on the **ground.**

3 Accumulation of Charges

A large amount of **charge** accumulates at the top and bottom of the cloud and on the ground.

Normally, **air** is a poor conductor of electricity and prevents the charges from flowing.



4 Electric Discharge (Lightning)

When accumulated charges become very large, the air can no longer resist their flow. Positive and **negative charges meet,** causing a sudden **flow of electricity** called an electric discharge.

- Bright Flash of Light (Lightning)
- Loud Sound (Thunder)

Lightning is sudden flow of electric charges

Lightning produces **light** and **sound**

ELECTRIC DISCHARGE AND LIGHTNING SAFETY

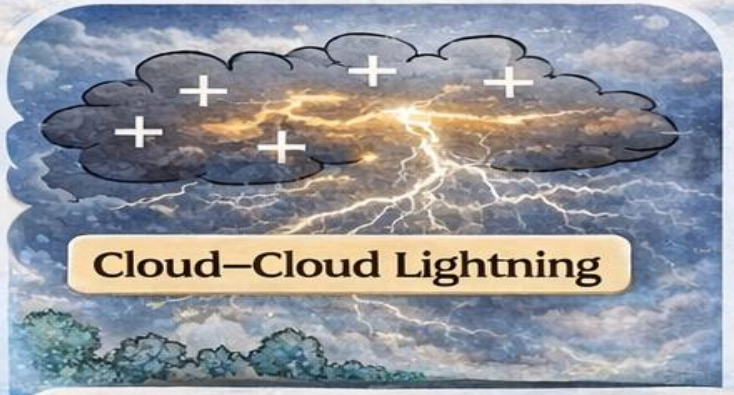
Lightning can occur between clouds or between clouds and the Earth.

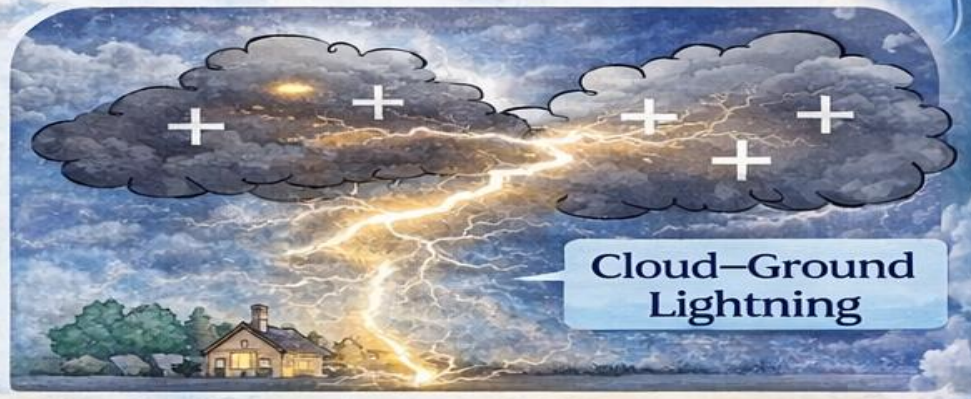
1 Electric Discharge

Sudden flow of **electric charges** through air is called **electric discharge.**

Electric discharge can occur:

- Cloud–Cloud Lightning
- Cloud–Ground Lightning





2 Understanding Lightning

In the past, people were frightened of lightning as they did not understand

Today, we understand the basic phenomenon of electric charges in clouds.

Scientists are working to improve this understanding!

3 Why Lightning is Dangerous

- Can destroy life
- Can damage houses, trees, electric lines
- Can cause fires and accidents

4 Need for Safety Measures

Lightning can destroy life and property, so, it is necessary to take safety measures:

- Stay indoors during thunderstorms
- Avoid open fields and tall trees
- Do not use electrical appliances
- Fix lightning

Lightning is an electric discharge.

Safety measures are necessary

DO's and DON'TS DURING A THUNDERSTORM

Know how to protect yourself from lightning.

✕ Don't Unsafe Places & Actions

- Open vehicles.

- Avoid open fields and tall trees.
- Avoid park shelters and high places.

- Do not carry an umbrella.
- Do not lie flat on the ground.

✓ Do Safe Places and Actions

- In a forest, take shelter under shorter trees.

- In an open field, stay far from all trees and poles.

Safe Position During Lightning

- Squat low and place your hands on your knees with your head between.

LIGHTNING SAFETY INDOORS

How to Stay Safe from Lightning Inside the House

Stay indoors during thunderstorms and take these safety measures:

Don't

Use mobile or cordless phones.
Do not use wired phones.

Do not use taps, showers, or run water.

Unplug electrical appliances like computers, TVs, etc.

Do

- In a forest, take shelter under shorter trees.

Stay indoors during thunderstorms.

LIGHTNING CONDUCTORS

A device used to protect buildings from the effects of lightning.

1 What Is a Lightning Conductor?

- A lightning conductor is a device that protects buildings from lightning strikes.
  It provides a safe and easy path for electric charge to flow into the ground.

2 Construction of a Lightning Conductor

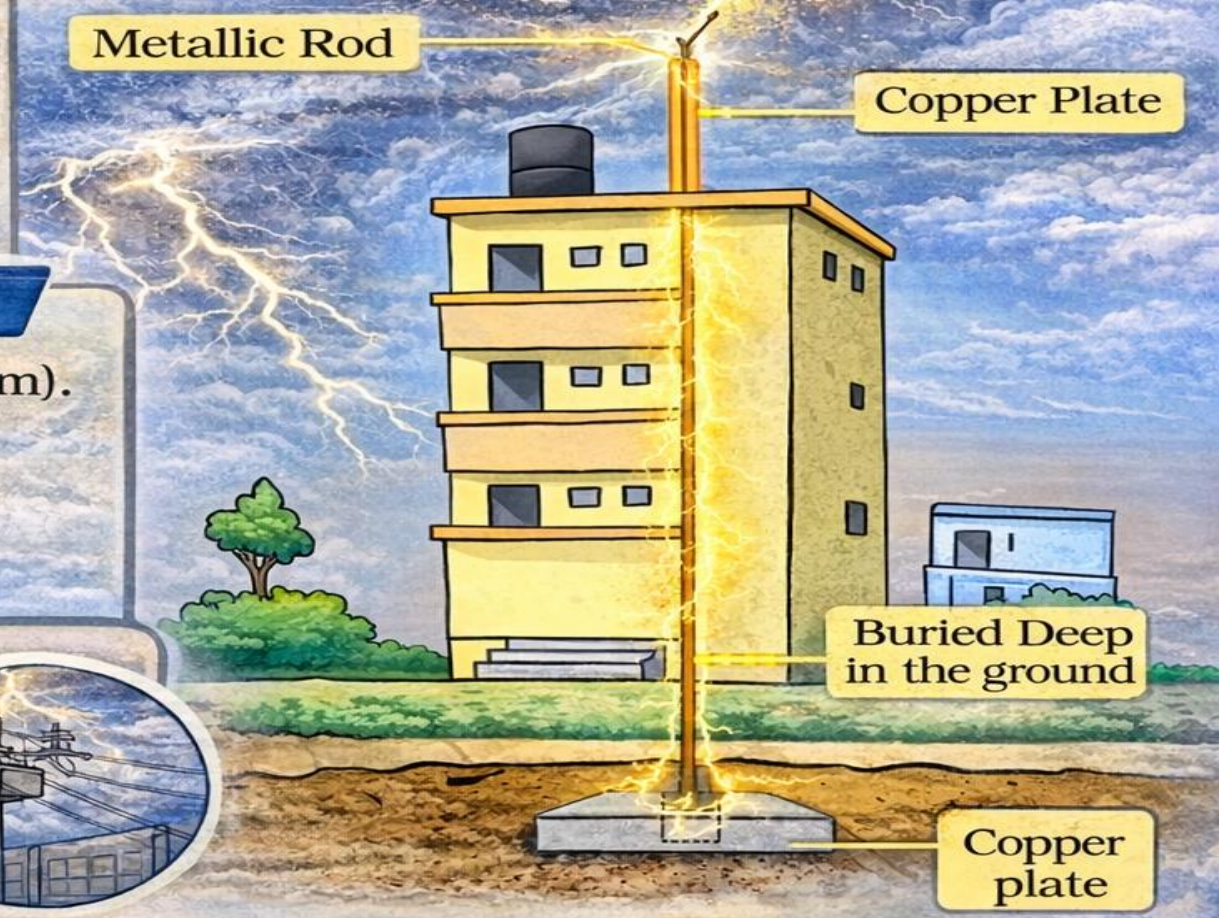
- It is a metallic rod (usually copper or aluminium).
- The rod is taller than the building.
- It is fixed to the walls of the building during construction.

3 How Does It Work?

- During lightning, a huge electric charge flows through the air.

4 Protection Inside Buildings

Metal columns, electrical wires, and water pipes inside buildings also give some protection. However, we should not touch metal objects during a thunderstorm because they carry electric current.



EARTHQUAKES

A natural phenometon that causes large-scale destruction of human life

1. Natural Phenomena We Have Learnt

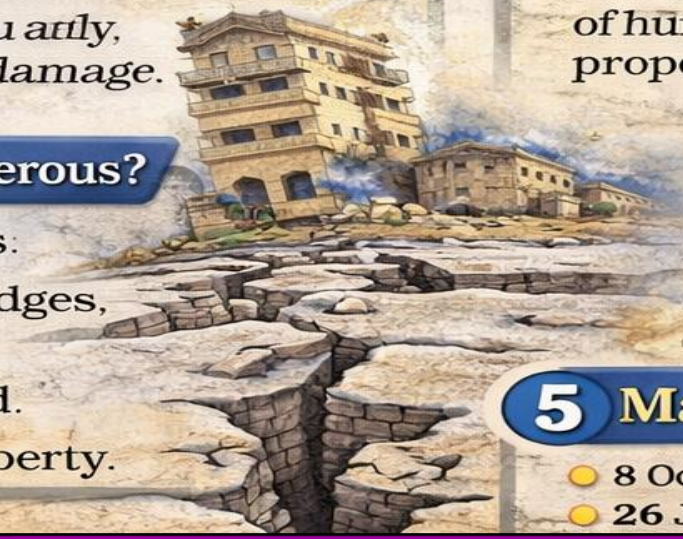
- You have already learnt about, thunderstorms, lightning, and cyclones.
- These natural phenomena can cause large cerng destructbeit of human life and property.

2. Thunderstorms and Associated Dangers

- When a thunderstorm occurs, there is always a sposibility of lightning and cyclones aling arind.,
- *Secuess of adveres warnings, we qu atly, get time to protect extesdvee from damage.*

3. Why Are Earthquakes So Dangerous?

- Earthquakes are very dangerous.
- Cause bellsanses of buildings, bridges, and roads.
- Create deep cracks in the ground.
- Resut in heavy loss of life and property.

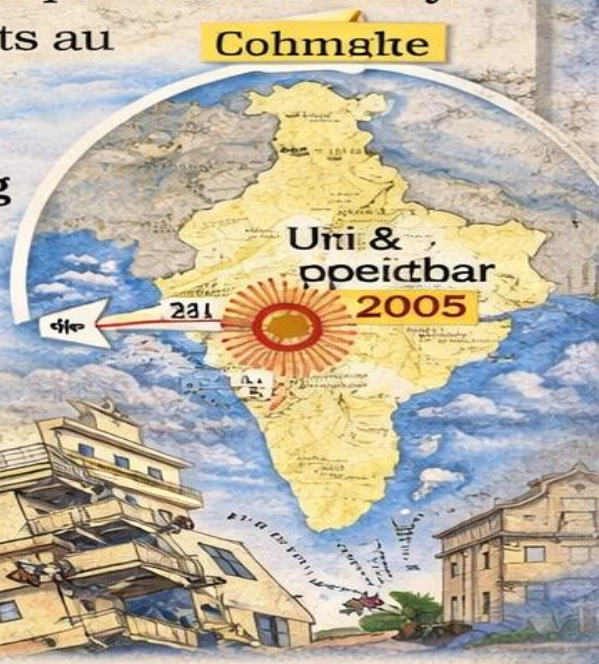


4 Earthquake – An Unpredictable Natural Phenomenon

There is one natural phenomena that eresees can not to proeec accurately.

This phenomenor ts au dertnoaure.

- An earthquake is **a sudden shaking of the ground.**
- It nou *coarthiage* of human and property.



5 Major Earthquakes in India

- 8 October 2005 Uri and Tangdhar, North Kashmir.
- **26 January 2001** Bhuj district, Guiarat.

ACTIVITY 9.5 – EARTHQUAKES

Understanding the huge damage to life and property caused by earthquakes.

1 Aim of Activity 9.5

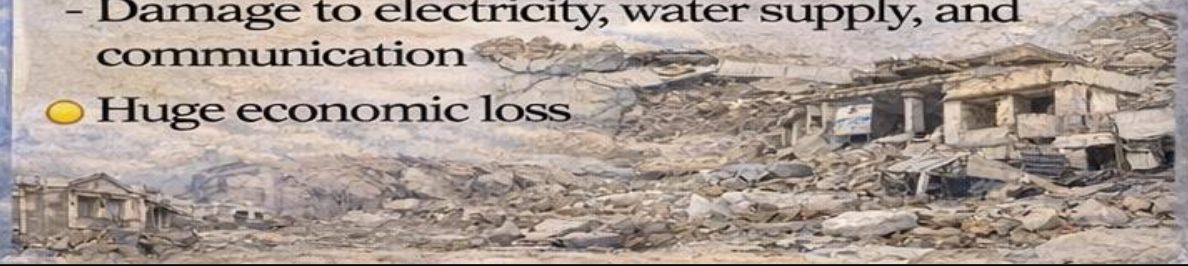
- Earthquakes are powerful natural phenomena that cause severe damage to human life and property.
- The aim of this activity is to help students:
  - Understand the destruction caused by earthquakes
  - Learn about the suffering of people,
  - Develop awareness and preparedness for such disasters

2 Research Activities for Students

- Ask their parents or elders about major earthquakes
- Collect pictures from newspapers and magazines of those days

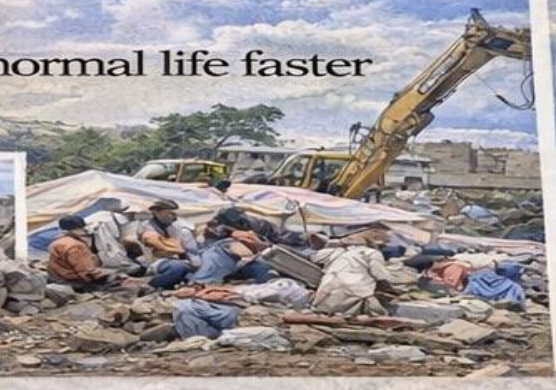
3 Damage to Life and Property

- Earthquakes cause:
  - Loss of human lives.
  - Destruction of houses, schools, hospitals, and roads
  - Damage to electricity, water supply, and communication
- Huge economic loss



4 Human Suffering Due to Earthquakes

- People suffer greatly:
  - Awareness helps return to normal life faster
- Generates economic loss.



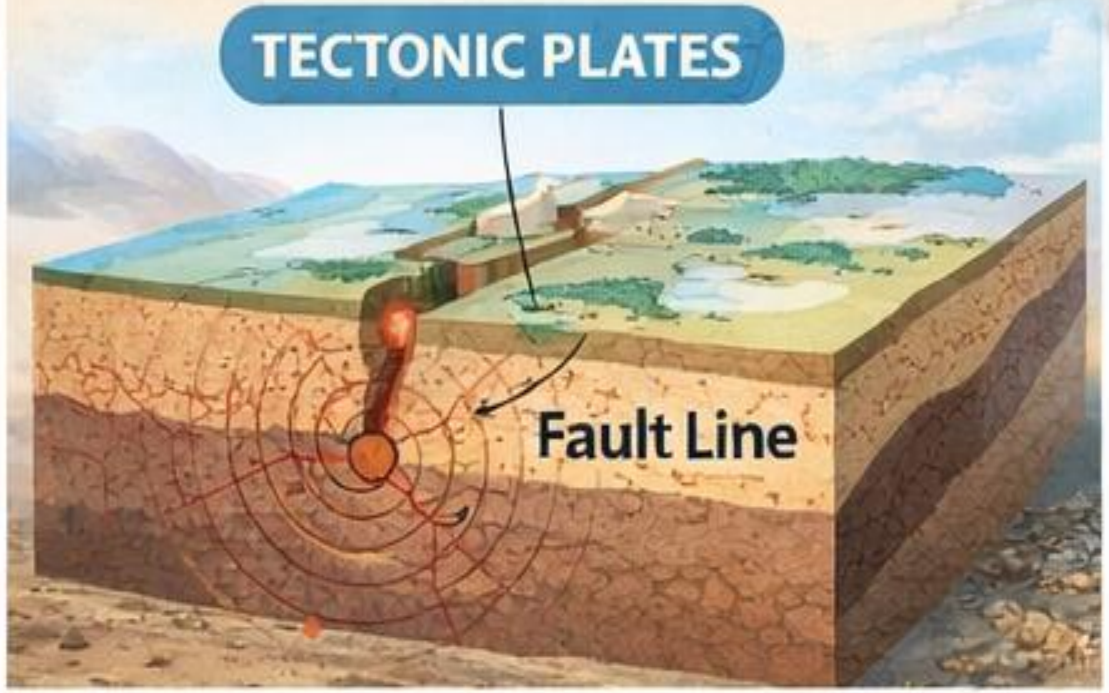
WHAT IS AN EARTHQUAKE?

What is an Earthquake?

An **earthquake** is a sudden shaking or trembling of the Earth which lasts for a very short time. It is caused by a **disturbance** deep inside the Earth's crust.

How Does an Earthquake Occur?

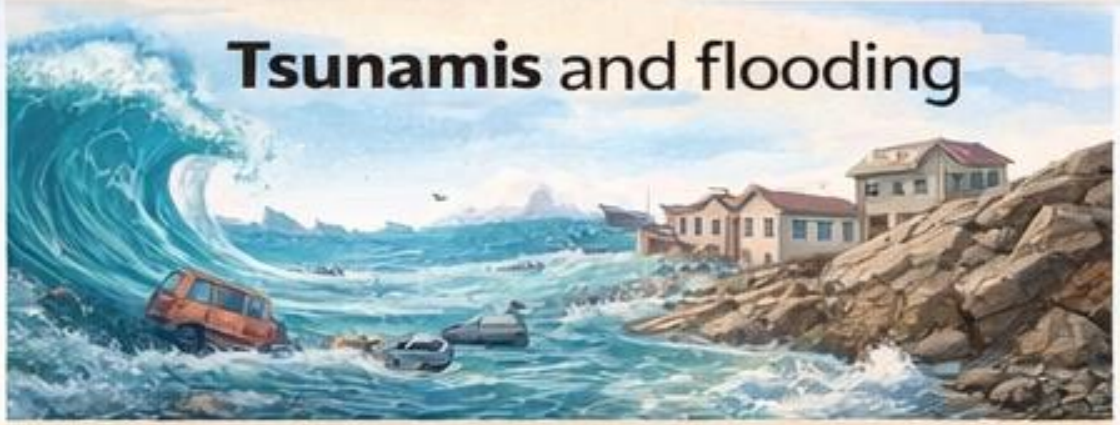
The Earth's crust is made up of large pieces called **tectonic plates.** When these plates move, **collide** or **slide past** each other, energy is released from deep within the Earth. This sudden release of energy travels as waves, causing the ground to shake.



Effects of Earthquakes

Collapse of **buildings** and **houses**

Damage to **bridges**, roads, and **dams**



Tsunamis and flooding

Landslides

Earthquake and Tsunami

A strong undersea earthquake can cause a **tsunami**.

A **tsunami** is a series of huge sea waves caused by an earthquake under the ocean.

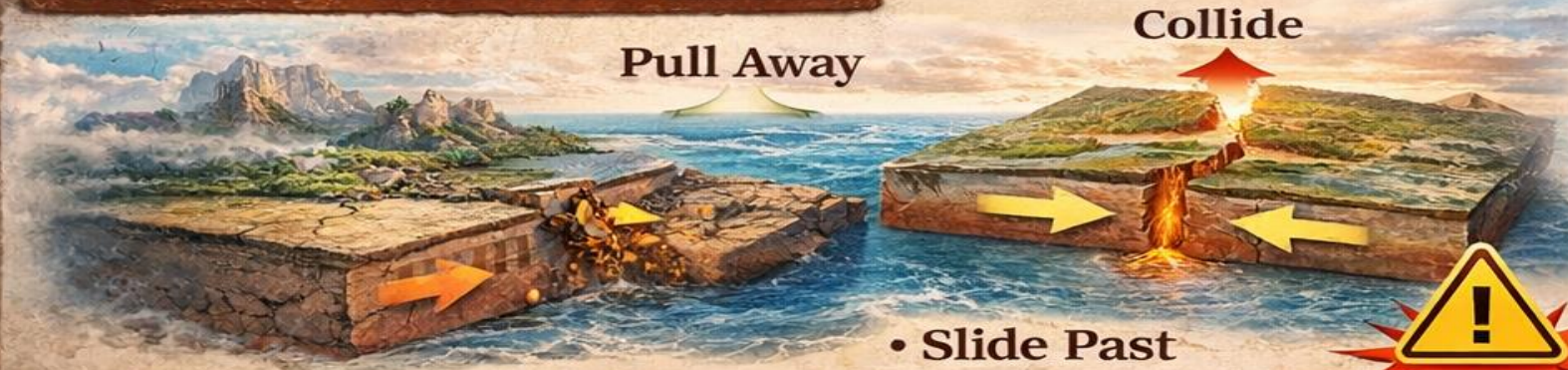
Example: A major tsunami occurred in the Indian Ocean on 26 December 2004, causing massive destruction in coastal areas.

WHAT CAUSES an EARTHQUAKE?

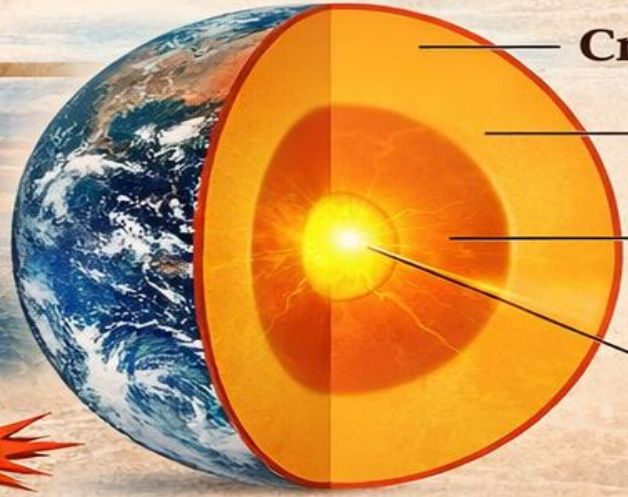
- In ancient times, people did not know the true cause of earthquakes. They believed in mythical stories.

Earthquakes are caused by disturbances deep inside the uppermost layer of the Earth, **called the crust.**

Tectonic Plates Movement



Sudden movement of tectonic plates causes vibrations called an earthquake.



Structure of the Earth

Earthquakes are caused by the sudden movement of tectonic plates in the Earth's crust.

WHAT CAUSES an EARTHQUAKE?

Earth's Crust and Tectonic Plates

- The Earth's crust is broken into many large fragments called **tectonic plates.**
- These plates are always moving, slowly and continuously.

- **Eurasian Plate**
- **Arabian Plate**
- **Indian Plate**

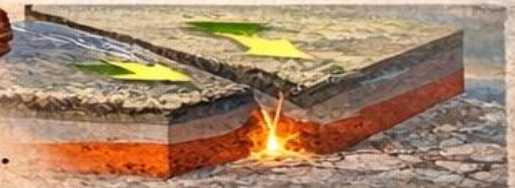
How Tectonic Plate Movements Cause Earthquakes

COLLIDING

One plate goes under another. (Subduction)

BRUSHING PAST

Plates slide past each other sideways.



When tectonic plates move like this, they build up pressure in the crust.

- Eventually, the **pressure** is released as strong vibrations, which cause the ground to shake.

An earthquake is caused by the sudden movement of **tectonic plates** in the Earth's surface.

EARTHQUAKES EXPLAINED

What Causes an Earthquake?

An earthquake is the shaking of the earth caused by the release of **energy** inside the earth due to tectonic movements.

Although we know what causes an earthquake, it is **not yet** possible to predict **when** and where the next earthquake might occur.

Other Causes of Earth Tremors

Tremors on the earth can also be caused when:

- **Volcano Erupts** – movement of magma creates vibrations
- **Meteor impacts** – a meteor hitting the Earth *releases* strong energy

Volcano Erupts

Meteor Hits the Earth

Underground Nuclear Explosion

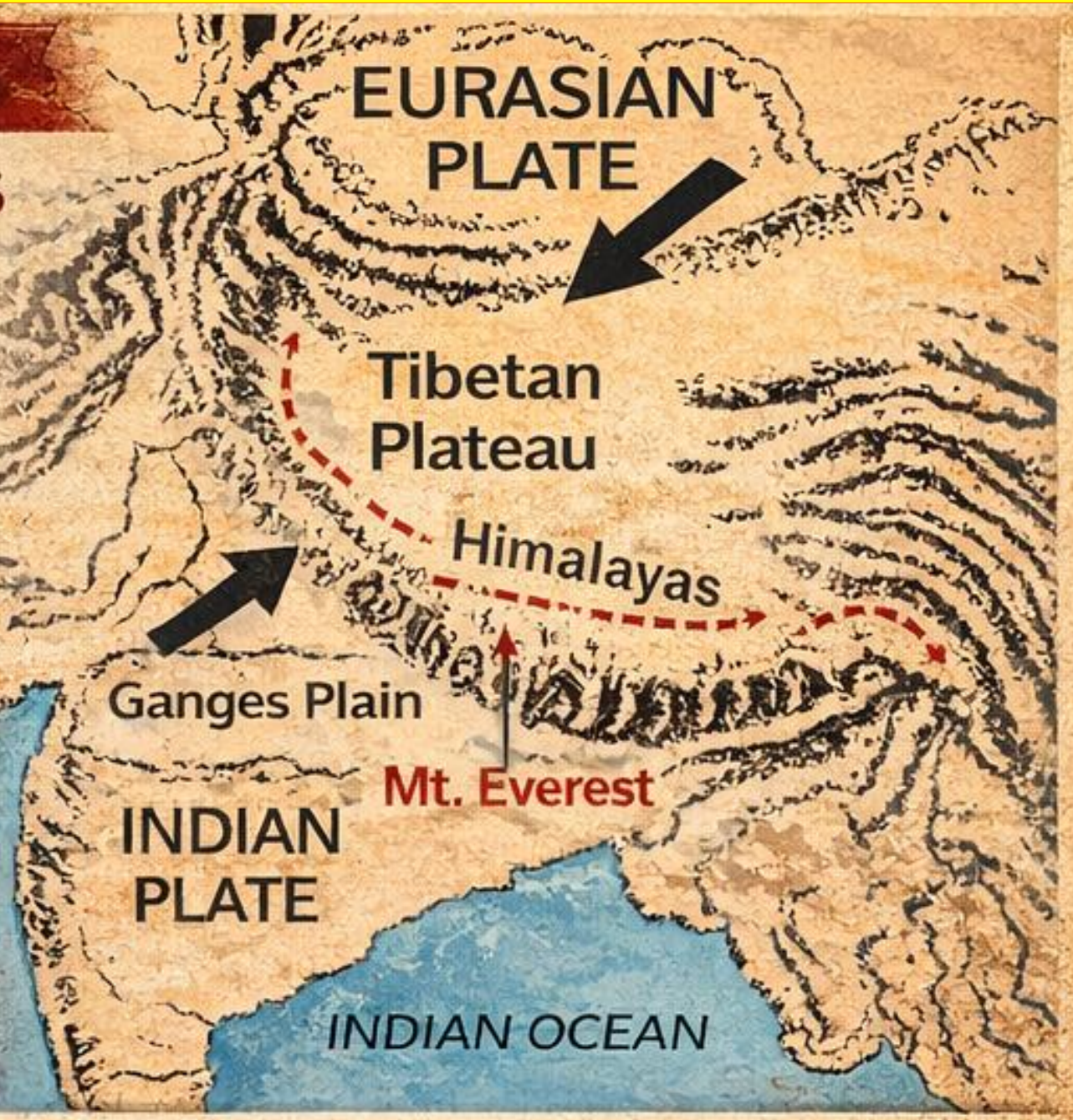
⚠ **It is not yet possible to predict exactly** when and where the next earthquake will occur.

⚠ **Volcanoes, meteors, and nuclear explosions can also cause earth tremors,** but most earthquakes are caused by movements of the earth's plates.

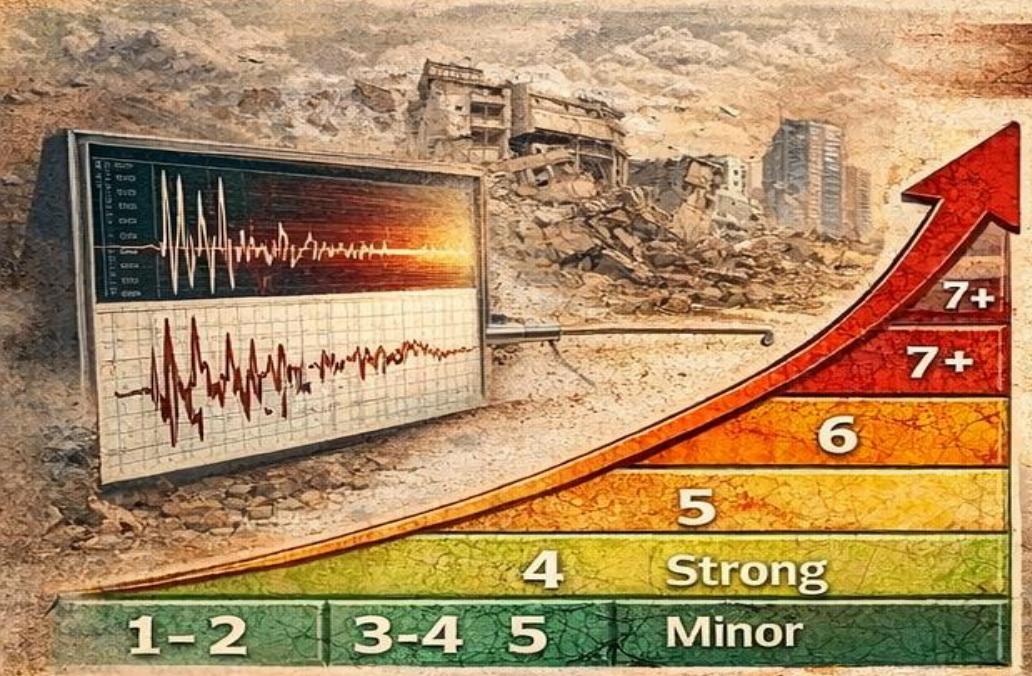
CAUSE OF MOST EARTHQUAKES

MOVEMENT OF TECTONIC PLATES

- The Earth's crust is made up of pieces called **tectonic plates.**
- Where these plates meet are **weak areas called seismic or fault zones.** Most earthquakes occur along these zones.



RICHTER SCALE: MEASURING EARTHQUAKES



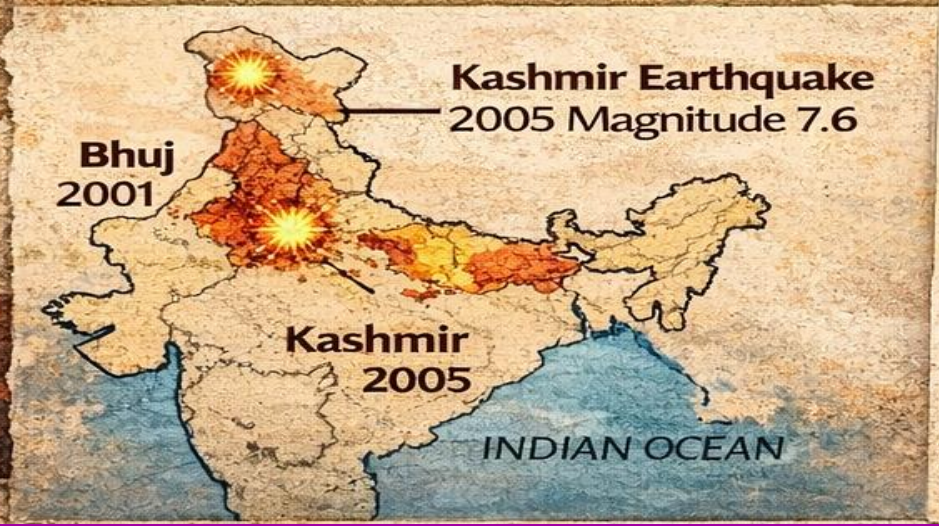
- It measures the power (strength) of an earthquake.
- The scale is **open-ended**, but earthquakes above **magnitude 7** are considered **very destructive.**

What is the RICHTER SCALE?

- It measures the power (strength) of an earthquake.
- The scale is open-ended, but earthquakes above magnitude 7 are considered **very destructive.**
- Each increase of 1 unit on the scale means the earthquake is **10 times stronger.**

☑ Magnitude 7 and higher are considered very destructive.

Examples of Highly Destructive Earthquakes (7+):

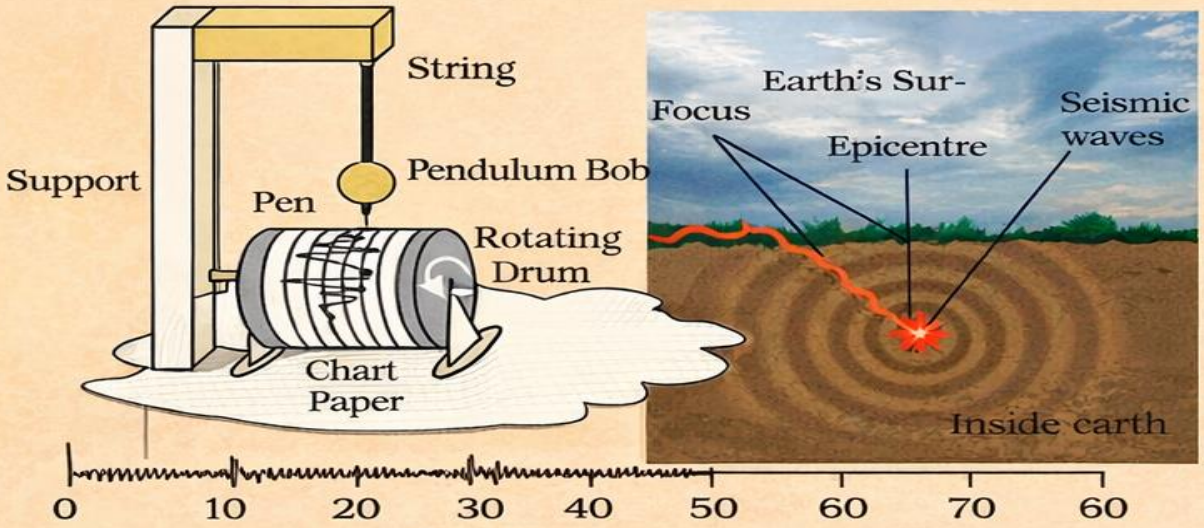


★ **Both the Bhuj (2001) and Kashmir (2005) earthquakes had magnitudes greater than 7.5.**

Understanding Seismographs & the Richter Scale

1. Seismographs

Tremors produce seismic waves that travel through the Earth. Scientists use an instrument called a **seismograph** to record these waves.



A typical seismograph record

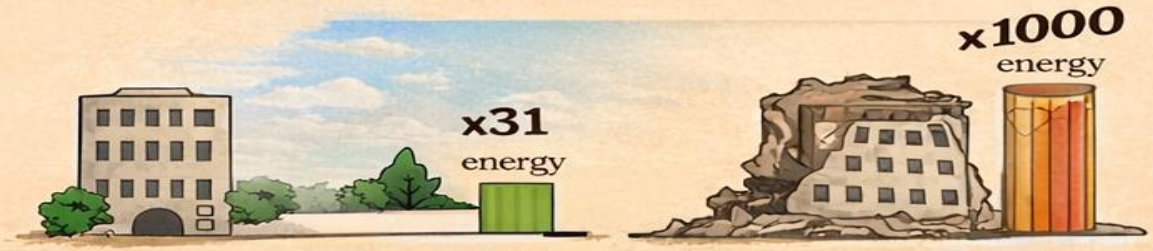
By analyzing the waves recorded, scientists can determine the location and **strength** of an earthquake.

The **Richter scale** measures the magnitude (strength) of an earthquake. It is logarithmic, meaning each whole number increase represents **10** times more wave amplitude and approximately

2. The Richter Scale

The **Richter scale** measures the magnitude (strength) of an earthquake. It is logarithmic, meaning each whole number increase represents **10** times more wave amplitude and approximately **31.6 times** more energy release.

- A magnitude **6** earthquake releases over **31** times more energy than a **magnitude 5.**
- A magnitude **7** earthquake releases over **1000 times** more energy than a **magnitude 5.**



- A magnitude **6** earthquake releases over **31 times** more energy than a magnitude **5.**
- A magnitude **7** earthquake releases over **1000 times** more energy than a magnitude **5.**

Protection Against Earthquakes

Earthquakes **cannot be predicted** but we can take precautions to protect ourselves all the time.

Build Earthquake-Resistant Buildings

Construct buildings that can withstand major tremors using modern technology.

Secure Heavy Items

- ✓ Bolt down heavy furniture like bookshelves, TVs, and water heaters.

Emergency Kit

- ✓ Keep an emergency kit with water, food, flashlight, first aid supplies, and radio.

Know Safety Measures

- ✓ Learn and practice safety measures like "Drop, Cover, Hold On!" during an earthquake

Tips to Make Buildings Quake Safe

Simple steps to help buildings stay safe during an earthquake.

- Consult qualified engineers and architects.
- Use light, strong materials for building structure.
- Fix shelves and cupboards to the walls.

- Fix shelves and cupboards to the walls.

- Hang clocks and frames away from beds.

- Keep fire safety equipment ready.

The Central Building Research Institute, Roorkee, has learned how to build quake-safe houses.

Safety Tips During an Earthquake

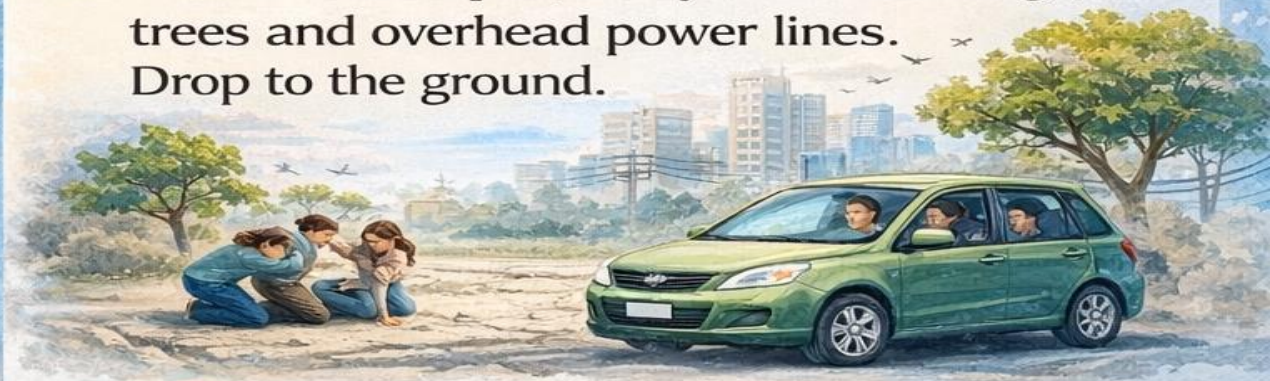
What to do when the earth starts shaking.
Stay calm and protect yourself!

1 If You Are at Home

- Take shelter under a table and stay there till the shaking stops.
- Stay away from tall and heavy objects that may fall on you.
- ✓ If you are in bed, do not get up. Protect your head with a pillow.

2 If You Are Outdoors

- Find a clear spot, away from buildings, trees and overhead power lines. Drop to the ground.



- If you are in a car or a bus, do not come out. Ask the driver to drive slowly to a clear spot. Do not come out till the tremors stop.


thank you