1. **Natural Phenomena:** Natural events that occur due to various forces in nature, some of which can be destructive, like earthquakes and lightning.
   Examples: Lightning, thunderstorms, earthquakes, cyclones.

2. **Lightning**: A sudden electrical discharge occurring due to the accumulation of electric charges in clouds.

Formation of Charges in Clouds

- Clouds carry water droplets that move and collide with each other.

- These collisions cause separation of charges, with positive charges accumulating at the top and negative charges at the bottom of clouds.
- When the difference between charges becomes too large, a spark of lightning occurs as charges try to balance.

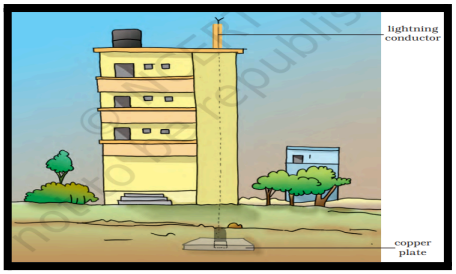
Types of Lightning

1. **Cloud-to-Cloud:** Discharge occurs between clouds.
2. **Cloud-to-Ground:** Discharge occurs from the cloud to the ground.

2.1 Safety Measures During Lightning

1. **Stay Indoors:** Avoid open areas during thunderstorms.

2. **Avoid Electrical Appliances:** Do not use electrical devices as lightning can cause power surges.



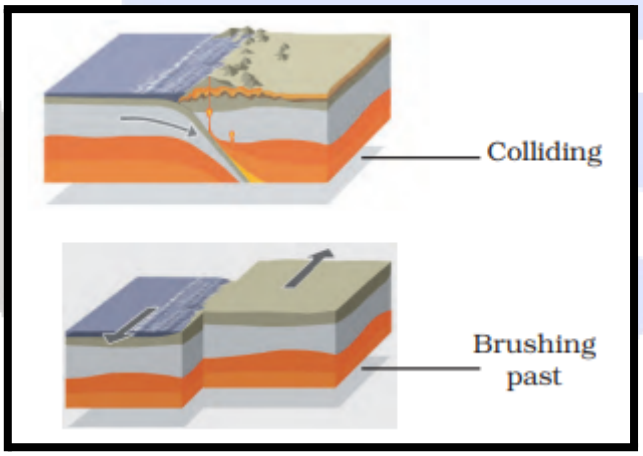
3. **Avoid Tall Trees and Water Bodies:** These can attract lightning, posing a risk.
4. **Lightning Conductor:** A metal rod installed on buildings to safely direct lightning into the ground.

3. What is an Earthquake?

A sudden shaking of the ground caused by the movement of tectonic plates or volcanic activity.

3.1 Causes of Earthquakes

- **Tectonic Plate Movement:** The Earth's crust is divided into plates that are constantly moving. When these plates rub against or collide with each other, stress builds up, releasing energy in the form of seismic waves, resulting in an earthquake.
- **Volcanic Activity:** Earthquakes can also occur due to volcanic eruptions.

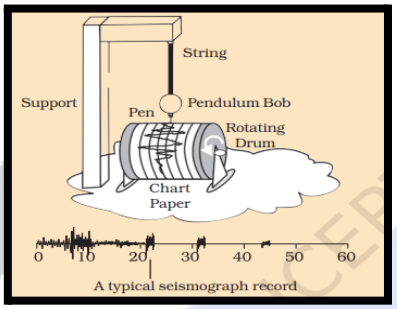


3.2 Measurement of Earthquakes

- **Seismograph:** An instrument used to detect and record seismic waves.
  - **Working of a Seismograph:** It consists of a base anchored to the ground and a suspended pen that records vibrations on a rotating drum.
- **Richter Scale:** Measures the magnitude of earthquakes on a scale from 0 to 10, with higher numbers indicating more powerful earthquakes.

3.3 Activity: Simulating Seismic Waves

- **Materials:** Slab of wood, rubber bands, rocks.
- **Procedure:** Place rocks on the slab, then shake the slab slightly to observe how they move.
- **Observation:** Objects on the slab move in response to the vibrations, similar to how objects react during an earthquake.



3.4 Effects of Earthquakes

- **Primary Effects:** Ground shaking, damage to buildings, bridges, and roads.
- **Secondary Effects:** Landslides, tsunamis, fires, and destruction of infrastructure.

3.5 Protection Against Earthquakes

1. **Building Design:** Structures in earthquake-prone areas should be designed to withstand seismic activity (e.g., cross-bracing, shear walls).
2. **Safety Drills:** Practicing "Drop, Cover, and Hold On" can save lives.
3. **Immediate Precautions:** Stay away from heavy furniture and windows during an earthquake.

4. What is Electrostatic Charge?

- A form of electric charge that is stationary, created by friction between two objects.
- **Examples:** Rubbing a balloon on hair or rubbing a plastic comb on woolen fabric creates static electricity.

- **Conductors:** Materials that allow electric charges to flow through them easily (e.g., metals like copper, aluminum).
- **Insulators:** Materials that do not allow electric charges to flow easily (e.g., rubber, wood, plastic)

4.1 Charging by Rubbing

- When two objects are rubbed together, electrons transfer from one object to another, resulting in one object becoming positively charged and the other negatively charged.

- **Example:** A plastic ruler rubbed with wool can attract small pieces of paper due to static electricity.

4.2 Types of Charges and Their Interaction

- **Like Charges Repel, Unlike Charges Attract:**
  - Positive charges repel other positive charges but attract negative charges.
  - Negative charges repel other negative charges but attract positive charges.

4.3 Transfer of Charge – Earthing

- The process of transferring excess charge to the Earth to prevent electric shocks.
- **Application of Earthing:** Electrical appliances are earthed to protect users from electric shock due to leakage currents.

5. Electroscope

An **electroscope** is a device used to detect the presence and magnitude of electric charge. It works on the principle that like charges repel each other, and unlike charges attract each other.

Working of Simple Electroscope:

When a charged object (like a charged rod) is brought near the metal plate at the top, the charge transfers to the electroscope.

- If a **positively charged object** is brought near, electrons from the electroscope will be repelled to the metal plate, leaving the rod and leaves with a positive charge.

- If a **negatively charged object** is brought near, electrons will move towards the metal plate, giving the electroscope a negative charge.

5.1 Principles of Electroscope:

1. **Like charges repel:** When the electroscope is charged, the like charges on the leaves push them apart.
2. **Opposite charges attract:** If an object with opposite charge (positive or negative) is brought near, it can cause the leaves to collapse or move closer together.
3. **Charge Transfer:** The charge introduced into the electroscope is transferred throughout the conducting parts of the device, affecting the behavior of the leaves.

5.2 Uses of an Electroscope:

1. **Detecting Electric Charge:** The electroscope is primarily used to detect the presence of electric charge.
2. **Measuring the Amount of Charge:** The amount of leaf divergence can be used to estimate the amount of charge present on the electroscope.
3. **Demonstrating Electrostatic Phenomena:** The electroscope is often used in classroom demonstrations to show how charges interact and behave.