

Lecture Notes: Electric Charge

1. Historical Perspective

Thales of Miletus and the Origin of the Term "Electricity"

- The concept of electricity dates back to **600 BC**, when **Thales of Miletus**, a Greek philosopher, observed that rubbing **amber (fossilized tree resin)** with wool or fur attracted small objects like dust, hair, and bits of paper.
 - This phenomenon was **static electricity**, a result of charge transfer due to friction.
 - The word "**electricity**" comes from the Greek word "**elektron**", meaning **amber**.
 - This was one of the first recorded observations of electrostatic effects.
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2. Experiments on Electric Charge

Scientists conducted simple experiments to understand electric charge using different materials.

A. Glass Rod and Wool/Silk Experiment

- When a **glass rod** is rubbed with **wool or silk**, it gets **positively charged**.
- The wool or silk, in turn, gets **negatively charged**.
- If two similarly charged glass rods are brought close to each other, they **repel**.

B. Plastic Rod and Fur Experiment

- When a **plastic (or ebonite) rod** is rubbed with **cat's fur**, the rod becomes **negatively charged**.
- The fur gets **positively charged**.
- If two similarly charged plastic rods are brought close, they **repel**.

Key Observations from These Experiments

1. Rubbing transfers charge between materials.
 2. Similar materials (glass-glass or plastic-plastic) repel each other.
 3. Oppositely charged materials attract (glass rod attracts plastic rod).
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3. Properties of Electric Charges

Electric charge exhibits several fundamental properties:

A. Like Charges Repel, Unlike Charges Attract

- When two objects have the **same** charge (either both positive or both negative), they **repel** each other.
- When two objects have **opposite** charges (one positive, one negative), they **attract** each other.

B. Concept of Polarity

- Charges are **differentiated** by their **polarity**:
 - **Positive Charge (+)**
 - **Negative Charge (-)**
 - The polarity of charge determines its behavior with other charges.
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4. Neutralization of Charges

- When two oppositely charged objects come in **contact**, their charges **cancel out**.
 - This process is called **neutralization**.
 - Example: If a positively charged glass rod is touched to a negatively charged plastic rod, they **lose their charges** and become neutral.
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5. Benjamin Franklin's Naming Convention

- **Benjamin Franklin** (1706–1790) was one of the first scientists to classify electric charge.
 - He assigned:
 - **Positive charge (+)** to **glass rods rubbed with silk**.
 - **Negative charge (-)** to **plastic rods rubbed with fur**.
 - He proposed the "**conservation of charge**", meaning charge cannot be created or destroyed, only transferred.
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6. Summary

- **Thales of Miletus** first observed static electricity with amber.
 - **Electric charge** can be transferred by **rubbing** objects.
 - **Experiments** show that **like charges repel** and **unlike charges attract**.
 - **Charge polarity** determines attraction or repulsion.
 - **Neutralization** occurs when opposite charges cancel out.
 - **Benjamin Franklin** introduced the **positive and negative charge** convention.
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Applications of Static Electricity

1. **Photocopiers and Laser Printers** – Use charge to attract toner onto paper.
 2. **Lightning** – A large-scale example of electric discharge.
 3. **Air Purifiers** – Remove dust particles using electrostatic attraction.
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