

STATIC ELECTRICITY



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Understanding Static Electricity

Static electricity affects us in many everyday situations. You've likely experienced it when walking across a carpet and getting a small shock from a doorknob, or when clothes fresh from the dryer stick together and make crackling sounds. While these instances are mostly harmless, static electricity can also manifest as something far more powerful -- lightning. This dramatic display of nature's energy is both awe-inspiring and potentially destructive. But how exactly is static electricity created?

Everything around us—living or non-living—is made up of tiny units of matter called **atoms**. Each atom consists of even smaller particles: **protons**, **neutrons**, and **electrons**. Protons and neutrons are located at the atom's center, known as the **nucleus**, while electrons orbit around the nucleus, much like satellites orbiting the Earth.

In these activities, students will explore the fundamental building blocks of matter and discover how static electricity is formed. They will learn how electrons can be transferred between objects, leading to the buildup and sudden discharge of static charges. Through hands-on experiments, students will also compare the effectiveness of at least three different materials in generating static electricity, gaining a deeper understanding of this fascinating natural phenomenon.

Middle School (Grades 6–8) – Physical Science (MS-PS2)
Relevant Performance Expectation:

- **MS-PS2-3:** *Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.*

Disciplinary Core Ideas:

- **PS2.B: Types of Interactions**
 - Electric and magnetic forces can be attractive or repulsive, and their strength depends on the magnitude of the charges, currents, or magnetic strength and the distance between the interacting objects.
 - Static electricity involves the buildup of electric charges on surfaces and the interactions between them.

Clarification:

- This includes understanding **forces between charged objects**, like the attraction/repulsion of hair to a balloon, or the spark when touching a doorknob.

Grade 3 – Physical Science (3-PS2)

Performance Expectations:

- **3-PS2-1:** *Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.*
- **3-PS2-3:** *Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.*

Disciplinary Core Idea:

- **PS2.B: Types of Interactions**
 - Electric and magnetic forces can be observed between objects not in contact (e.g., a charged balloon attracting hair).
 - Static electricity is a classic example of this kind of non-contact electric force.

Clarification:

- While “static electricity” isn’t named, students are expected to **observe and describe phenomena** such as objects **attracting or repelling each other without touching**, which opens the door to introducing static electricity concepts through **hands-on activities**.

Grade 4 – Energy (4-PS3)

Though not focused on electricity, some performance expectations cover:

- **4-PS3-2:** *Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.*

This can help build background knowledge that supports future learning about **electric charge movement** (like in a spark from static discharge).

Summary for Elementary Teachers or Curriculum Planners:

- **Static electricity is not named explicitly**, but **foundational concepts are embedded** in 3rd-grade standards on forces and interactions.
- Static electricity demos and vocabulary can be added **as enrichment** to help students understand real-life examples of non-contact forces.
