



Tesla’s Dream STEM Curriculum  
*The Electrostatic Force*

Grade	Time	Subject Area(s)	Key Concepts
9-12	90 minutes	Physics	Electrostatic Force

**Lesson Overview**

In this lesson students will explore the electrostatic force by building a sensor capable of detecting an electrically charged object. They will then use the sensor to investigate how different materials become more easily charged than others and develop their own Triboelectric Table.



## Standards

HS-PS2-4 4 Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

## Learning Objectives

By the end of this lesson, students will be able to:

- Describe qualitatively the behavior of the electrostatic force.
- Describe what happens to materials when they become electrically polarized.
- Explain the triboelectric effect.



### Essential Question

How does the quantity of net electric charge affect the force permeated to the surrounding space?

### Science Concepts Overview

The electrostatic force is a fundamental force of nature that governs the interactions between electrically charged particles. It arises from the principle that opposite charges attract each other, while like charges repel. This force is described by Coulomb's Law, which quantifies the relationship between the magnitude of the force and the distance between charged particles.



## Materials List

- Arduino microcontroller
- Breadboard
- Connecting wires
- LED (preferably red)
- 200 Ohm resistor
- Piezo speaker
- J310 transistor
- Computer with Arduino IDE installed
- Several different materials from the Triboelectric Table

## Lesson Preparation

Prior to the lesson, the instructor should ensure each group of students have the required supplies. Make sure the computers have the Arduino IDE installed and can connect to the Arduino from a student account.



## Safety

This is a safe experiment, but caution should always be taken when working with AC or DC circuits. Students will be working with 5V DC, small amperage circuits. This does present the potential for a minimal shock hazard; however, it is not strong enough to cause anything other than a minor discomfort. Those with pacemakers or other devices that may be subject to interference from the electric circuit should first consult their physician.