

Lesson Plan

Lesson: Electrostatic Forces

Timeframe: Week 1 – Class 2 – 75 minutes

Materials needed: whiteboards, markers, projector, “clickers”

Objectives:

Basic:

1. Describe the effects of electrical charges on each other.
2. Relate the scale of the fundamental electric charge to the human scale.
3. Describe the difference between insulators and conductors.

Advanced:

1. Calculate electrostatic forces in two dimensions.
2. Incorporate electrostatic forces into Newton’s laws.
3. Describe the creation and effects of an electric dipole.

Background:

This is part of the third quarter of an algebra and trigonometry based introductory physics course sequence. Students will have previously passed physics courses including Newtonian mechanics, oscillators, waves, fluids, and thermodynamics.

Introduction to Lesson:

This is the first lesson on the larger topic of electricity and magnetism. This lesson is about electrostatic forces (electric charges and the forces between them). Even though this is a new type of force for the students, electrostatic forces still obey Newton’s laws that the students have previously studied.

Pre-Class Individual Space Activities and Resources:

Steps	Purpose	Estimated Time	Learning Objective
Step 1: Read textbook sections: 19-1, 19-2, 19-3.	Introduction to new physical concepts.	12 pages 1 hour	Electric charge, insulators, conductors, and Coulomb's law.
Step 2: At least one day after Step 1, read through Chapter 9A PowerPoint presentation.	Reinforce new knowledge from textbook reading.	30 slides 30 minutes	Electric charge, insulators, conductors, and Coulomb's law.
Step 3: Practice multiple choice conceptual problems 1 – 13 from the textbook.	Practice applying acquired knowledge.	13 Questions 30 minutes	Problem solving with new physics concepts.

In-Class Group Space Activities and Resources:

Steps	Purpose	Estimated Time	Learning Objective
Step 1: Ask questions about pre-class learning objectives and summarize the pre-class learning objectives.	Make sure that the pre-class learning objectives are achieved.	5 – 10 minutes	Electric charge, insulators, conductors, and Coulomb's law.
Step 2: Clicker questions on lower-level learning objectives.	Turn book learning into practical knowledge.	20 – 30 minutes	Problem solving with new physics concepts.
Step 3: Group problem solving on higher-level learning objectives.	Turn practical knowledge into working knowledge.	35 – 50 minutes	Using physics concepts, diagramming, and mathematics to solve multifaceted problems.

Closure/Evaluation

Analysis:

Electrostatic forces are almost identical to the gravitational force that students previously studied. The mass charge from gravitation is replaced with an electric charge that now can be both positive and negative. The force law equations have exactly the same form and both can be incorporated into Newton's laws of motion.

Post-Class Individual Space Activities:

Complete online homework assignment W1A.

Connections to Future Lesson Plan(s):

The subsequent lesson will build from Coulomb's law and introduce electric fields, electric potential energy, and electric potential.