



Honors Physics - Unit 7 - Electrostatics

Unit Focus

This unit focuses on the electric field, and the electrostatic force between charged objects. Through this unit, students will extend their knowledge of the Field to include electric fields, and find correlations between the law of gravity and the Coulombs law of electrostatic force. Students will apply their prior knowledge of forces, motion and the atomic model of the atom to analyze situations and problem sets. This unit provides foundational knowledge for the study of electricity.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
<p>Next Generation Science <i>High School Physical Sciences: 9 - 12</i></p> <ul style="list-style-type: none"> Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. <i>HS-PS2-4</i> <p>Madison Public Schools Profile of a Graduate <i>Critical Thinking</i></p> <ul style="list-style-type: none"> Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2) <p><i>Creative Thinking</i></p> <ul style="list-style-type: none"> Idea Generation: Studying a problem, need or model (mentor text, political piece, documents, art work, etc.) to consider limitations and imagine new solutions/transformations. (POG.2.1) <p><i>Collaboration/Communication</i></p> <ul style="list-style-type: none"> Collective Intelligence: Working respectfully and responsibly with others, 	T1 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<p>U1 Attractive and repulsive interactions at a distance (e.g., gravitational, magnetic, electrical and electromagnetic) can be described by using the concept of fields.</p> <p>U2 Energy that is stored in an electric, magnetic, or gravitational field depends upon the position of the objects in the field.</p> <p>U3 The structure and interactions of matter are determined by electrical forces within and between atoms.</p>	<p>Q1 How can position of an object in a field affect the amount of energy it has stored?</p> <p>Q2 How can charges on objects affect their interaction</p>
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<p>K1 Students will understand that electric charge stems from an imbalance of protons and electrons. This imbalance can result in two types of charge: positive and negative. If there is no imbalance between protons and electrons then the object is neutral.</p> <p>K2 Students will understand that in order to charge an object a transfer of electrons (either to or from the object) must occur.</p> <p>K3 Students will understand that charge is quantized. In other words, the total charge must be a multiple of the charge of a single electron. This elementary charge unit is 1.6×10^{-19} C.</p>	<p>S1 Given two charges, using Coulomb's law, students will be able to determine the electrostatic force (magnitude and direction) the charges place on each other.</p> <p>S2 Given a system of charges, students will be able to determine the total/net electrostatic force acting on any one charge in the line.</p> <p>S3 Students will be able to draw (or interpret) electric field diagrams and understand the conventions associated with electric fields.</p>

Stage 1: Desired Results - Key Understandings

exchanging and evaluating ideas to achieve a common objective. (POG.3.1)

K4 Students will understand that the unit for charge is the Coulomb. Students will be familiar with metric multipliers commonly associated with charge values (i.e. μ)

K5 Students will understand that charge is conserved.

K6 Students will understand the methods for charging objects: friction, conduction and induction.

K7 Students will understand how a neutral object can be polarized and how a charged object can attract a neutral polarized object.

K8 Students will understand electric fields. They will be able to draw (or interpret) electric field diagrams and understand the conventions associated with electric fields.

S4 Given the electric field strength, students will be able to determine the electrostatic force acting on a charge placed in the field or vice-versa.

S5 Students, using kinematics, will be able to analyze the subsequent motion of an object due to a uniform/constant electric field.