



Physics Unit 4- Electricity and Magnetism

Unit Overview: In this unit students will learn the basics of static and current electricity as well as magnetism. Students will describe the similarities and differences between charging by induction and conduction. Students will use Coulomb's Law to calculate electric force. Students will be able to draw and interpret drawings of electric field strength. Students will use Ohm's Law, draw both series and parallel circuits and calculate potential difference, current and resistance. Students will calculate and interpret the resistivity of materials. Students will be able to interpret 4t magnetic field drawings and explain the relationship between electricity and magnetism.

Essential Questions:

- What are the charge carriers?
- How do charges interact?
- How do objects become charged?
- How do charges move in fields and circuits?

MST Standard 4 - Science

Key Idea 4

Energy exists in many forms, and when these forms change energy is conserved.

Key Idea 5

Energy and matter interact through forces that result in changes in motion.

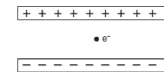


Time Frame	Skills, Practices or Expectations	Specific Standards / Performance Indicators	Resources	Content Vocabulary	Measurement of Student Learning
<p>1 week 1.09.23-1.13.23</p> <p>2 weeks 1.16.23- 2.03.23</p> <p>2 weeks 2.06.23 - 2.17.23</p> <p>1 week 2.27.23 - 3.03.23</p>	<p>Static Electricity and Fields</p> <ul style="list-style-type: none"> Understand the basic properties of electric charge. Distinguish between charging by induction and conduction. Calculate electric force using Coulomb’s law and review the inverse square relationship. Draw and interpret electric fields. Quantitatively and qualitatively describe electric field strength. <p>Electrical Current</p> <ul style="list-style-type: none"> Calculate the work required to move a quantity of charge through differing potentials. Current requires a complete circuit. Current is the rate of charge moving past a point. Use Ohm’s law to identify the relationship between current, resistance and voltage. Identify and use factors to calculate resistance. <p>Circuit Analysis</p> <ul style="list-style-type: none"> Draw and interpret circuit diagrams. Correctly place meters in a circuit. Compare and contrast series and parallel circuits. Determine the electrical power and energy for circuit elements. <p>Magnetism</p> <ul style="list-style-type: none"> Identify characteristics of magnets. Draw and interpret magnetic field lines. 	<p>4.1 j 5.1t,u 5.3 b,f 5.1s 4.1 l,m 4.1 n,o,p 4.1 k</p>	<p>Holt Textbook Chapter 16-19 Castle Learning</p> <p>Interactive Simulations: http://phet.colorado.edu</p>	<p>charge carriers electron proton coulomb conductor insulator ampere (C/S) volt (J/C) series parallel resistivity conduction induction polarization ammeter voltmeter battery cell resistor variable resistor potential difference (voltage) current electric field magnetic field test charge</p> <p>Higher Level Questions</p> <p>From June 2015 exam</p>	<p>Ticket out the door Formative assessment using Castle Learning Unit test Weekly quizzes Homework using Castle Learning</p>



- Explain that the motion of electric charges produces magnetic fields.
- Identify that relative motion between a conductor and a magnetic field may produce a potential difference in the conductor.

Two concentric parallel plates 30×10^{-2} meter apart are charged with a 12-volt potential difference. An electron is located midway between the plates. The magnitude of the electrostatic force on the electron is 3.8×10^{-16} newton.



- 71 On the diagram in your answer booklet, draw at least three field lines to represent the direction of the electric field in the space between the charged plates. [1]
- 72 Identify the direction of the electrostatic force that the electric field exerts on the electron. [1]
- 73-74 Calculate the magnitude of the electric field strength between the plates, in newtons per coulomb. [Show all work, including the equation and substitution with units.] [2]
- 75 Describe what happens to the magnitude of the net electrostatic force on the electron as the electron is moved toward the positive plate. [1]

Resources

<http://ngss.nsta.org/Classroom-Resources.aspx>

<http://newyorkscienceteacher.com/sci/>

English Language Learners (ELL) Enhancements

To access [hyperlinked](#) material, you must be logged into your BPS Google Drive

Listening

- **Cross- Linguistic Practices:** Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates.)
- **Build background knowledge**
- **Activating Prior Knowledge** Activating prior knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content
- **Activating Prior Knowledge**
- **Visuals** - GIFs, pictures- will assist students in understanding what they are listening to. Use [visual thinking strategies](#) to set the lens for learning.
- Video to review or introduce a topic – use [closed captioning](#) to help students see the words and

Speaking

- **Sentence Frames** - to begin a sentence - such as *Evolution is...* or *I think that evolution is...*
- **Academic Conversation Starters:** Have a visual of a list of academic sentence starters that students can refer to in a discussion. Examples include- I expect ___ to happen. My data shows that... This helps students have a more science focused dialogue.
- **Choral Reading** - To build fluency, self-confidence and motivation with [reading/speaking](#)
- Create [movement](#) to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent

Reading

- **Supplementary Text** to help reinforce concepts. If necessarily, use lower Lexile levels to ensure comprehension.
- **Visual Aids** - Pictures or models to support vocabulary words and concepts
- Video to review or introduce a topic - use [closed captioning](#) to help students read along while they listen to the content
- **4 Square / Frayer models** to help students gain a deeper understanding of vocabulary.
- **Highlighting** important text to assist students in answering questions after the reading.
- **Chunking**-Break reading of text into chunks or paragraphs
- **Performance Level Descriptors** this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in

Writing

- **Sentence Frames** - to begin a sentence- such as *Biodiversity is...* or *An example of competition is....*
- **Cloze passages** with word banks
- **Word banks**
- **Graphic Organizers** to help break down the writing process and organize thoughts
- **Standards-based sentence stems**
- **Performance Level Descriptors** this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of writing. Scroll for grades 9-12.

Instructional Accommodations (depending on the student's needs)

- **Extended time** for tests in class, projects and assignments
- **Directions read.** Broken down as necessary
- **Model** how to complete the activity in the lesson
- **Oral simplification** of directions or questions
- **Translated version** of test when available. Student may have both version English and native language version
- Use of [approved bilingual glossaries](#) from NYS in each subject



	<p>pronunciations while they listen to the content.</p> <ul style="list-style-type: none"> ● Word stretching / Vowel stretching when instructing allows student to listen closely to the pronunciation of the word ● Performance Level Descriptors this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of listening Scroll for grades 9-12. 	<p>reading while triggering brain function for optimal learning</p> <ul style="list-style-type: none"> ● Performance Level Descriptors This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of speaking. Scroll for grades 9-12 	<p>the modality of reading. Scroll for grades 9-12.</p> <ul style="list-style-type: none"> ● Vocabulary Morphology- Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student’s vocabulary. 		
<p>Special Education Modifications</p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p>	<p><u>Instructional</u></p> <ul style="list-style-type: none"> ● Pre-teach vocabulary ● Use picture vocabulary ● Scaffold Depth of Knowledge questions ● Provide copy of notes/notes in “cloze” form ● Use of Think, Pair, and Share strategy to help process information ● Scaffold written assignments with the use of graphic organizers ● Allow for multiple ways to respond (verbal, written, response board) ● Provide model of performance task ● Modify informational text to fit the needs of the students ● Provide a digital or paper interactive notebook ● Present complex tasks in multiple ways ● Provide mnemonic strategies for Physics concepts 	<p><u>Technology:</u></p> <ul style="list-style-type: none"> ● Audio reading of text ● Text to type functions ● Videos to clarify/visualize Physics concepts ● Record class lecture/discussions and make accessible to student ● Nearpod- interactive presentations of notes ● Playposit - show a video clip about the topic and add your own questions for them to answer as they watch ● Allow students to type answers in chat on Teams <p><u>Other:</u></p> <ul style="list-style-type: none"> ● Arrange seating for maximum engagement and minimum distraction ● Accessible lab space (counter level) 	<p><u>In Class Assessments</u></p> <ul style="list-style-type: none"> ● Provide review packet or review sheet of concepts covered on the test ● Practice similar questions prior to the test ● Provide multiple options for projects ● Give a timeline of when things are due and remind them of the process often. ● Use of timer in class ● Break all complex tasks into chunks 		
<p>BPS Science K-12 Schoology Group Resources Grades 9-12 Resources Physics Physics Curriculum Materials</p>	<p><u>SUTW Strategies</u></p> <ul style="list-style-type: none"> ● Informal Outline ● Color-Coding – Informative/Explanatory Text ● Two-column notes ● I-V-F Topic Sentence progressing to Four Step Summary Paragraph ● CUPS – Capitalization, Usage, Punctuation, Spelling ● Transitions 				