CCPS Science Unit Plan

Grade	HS	**Subject**	HS Physical Science	**Unit #**	7
Unit Name	Electricity and Magnetism		**Timeline**	1.5 weeks	
How to use the Framework	This Framework should be used to implement daily science instruction. The resources and instructional strategies reflected in the Framework will provide a foundation for effective implementation and student mastery of standards. Please see the hyperlinked abbreviation document to ensure understanding of all abbreviations used with this framework.				

Unit Overview	**This unit focuses on the understanding that electricity involves charged particles that may build up (static) or flow (current). Students will investigate the properties of static and current electricity as well as applications of electromagnetism. An expansion upon this focus will be done for the purpose of understanding the relationship between electricity and magnetism. This unit will also build upon an understanding of various interactions involving the conductivity of solutions.**
	
	Concepts:
	● Voltage
	● Current
	● Resistance
	● Circuits
	  □ Series circuits
	  □ Parallel circuits
	● Magnetism
	  □ Electromagnet
	  □ Simple Motor
	  □ Generator				

Lesson Plan guidance document and template	CCPS Lesson Plan Template Day View Lesson Plan Template Week View Department of Science Guidance Document				
3Dimensional Instruction					

GSE	Science and Engineering Practices	Crosscutting Concepts
SPS10. Obtain, evaluate, and communicate information to explain the properties of and	Developing and using models	Developing and using models

	relationships between electricity and magnetism. a. Use mathematical and computational thinking to support a claim regarding relationships among voltage, current, and resistance. b. Develop and use models to illustrate and explain the conventional flow (direct and alternating) of current and the flow of electrons in simple series and parallel circuits. (*Clarification statement:* Advantages and disadvantages of series and parallel circuits should be addressed.) c. Plan and carry out investigations to determine the relationship between magnetism and the movement of electrical charge. (*Clarification statement:* Investigations could include electromagnets, simple motors, and generators.)	Planning and carrying out investigations Using mathematics and computational thinking Constructing explanations (for science) and designing solutions (for engineering) Obtaining, evaluating, and communicating information	Planning and carrying out investigations Using mathematics and computational thinking Constructing explanations (for science) and designing solutions (for engineering) Obtaining, evaluating, and communicating information
NGSS Alignment	NGSS Alignment to Disciplinary Core Ideas		

Weekly Lesson Tasks

Week 1	
GSE: **SPS10. Obtain, evaluate, and communicate information to explain the properties of and relationships between electricity and magnetism.**	**Focused Concept:** Ohm's Law, Direct and Alternating Current, Series and Parallel Circuits, Electromagnets

a. Use mathematical and computational thinking to support a claim regarding relationships among voltage, current, and resistance.

b. Develop and use models to illustrate and explain the conventional flow (direct and alternating) of current and the flow of electrons in simple series and parallel circuits.
(*Clarification statement:* Advantages and disadvantages of series and parallel circuits should be addressed.)
c. Plan and carry out investigations to determine the relationship between magnetism and the movement of electrical charge.
(*Clarification statement:* Investigations could include electromagnets, simple motors, and generators.)

Phenomenon:
Faraday Generator (energy is transformed from mechanical to electrical)

Simple Motor (energy is transformed from electrical to mechanical)

DQ: What is the relationship between voltage, current and resistance?
What are the advantages and disadvantages of series and parallel circuits?
What are the variables to change the strength of an electromagnet?

SEP:
- Ask Questions.
- Develop and Use Models.
- Plan and Carry out Investigations.
- Analyze and Interpret Data.
- Use Mathematics and Computational Thinking.
- Construct Explanations.
- Engage in Argument from Evidence - including dialogue.
- Obtain, Evaluate, and Communicate Information.

CCC:
- Cause and Effect
- Systems and System Models
- Stability and Change
- Patterns

	Day 1	Day 2	Day 3	Day 4	Day 5
Learning Target	SWBAT construct series and parallel circuits.	SWBAT distinguish between direct and alternating currents.	SWBAT identify the relationship between current, resistance and voltage.	SWBAT design an electromagnet that can pick up 50 paper clips.	SWBAT design an electromagnet that can pick up 50 paper clips.
Opening	Teachers will: Show students the phenomenon and have them engage in a see-think-wonder Show students this image and article and have them complete a KWL chart based on the image individually.	Inform students the goal for the day is to distinguish between direct and alternating currents. Show students this presentation (slides 1 - 8) and have them take notes on direct and alternating currents as you progress through the presentation.	The teacher should review the teacher notes to the Ohm's Law PhET prior to the lesson. Present the simulation and manipulate the voltage and resistance to model how to work the simulation. Inform students they will work from the simulation and as they work they should keep in mind they are trying to discover the relationship between voltage, current and resistance.	**ADI Lab 11:** Which electromagnet design is best for picking up 50 paper clips? Provide students the ADI handout (p.205 of Physical Science ebook) and conduct a close read of the ADI handout having students highlight key points. How to close read	**ADI Lab 11:** Which electromagnet design is best for picking up 50 paper clips? Have students take out their lab handout from the first day of the ADI and the data they collected yesterday. Review the guiding question and what data students can now use to answer the guiding question.
Guided Practice/ Transition	Introduce the Circuit Builder Gizmo Whole group: Complete page 1 of the student exploration sheet.	Use slides 9 - 11 to check for understanding of AC and DC. Provide students 15 minutes to complete the 2 slides and at the end of those slides go over their ideas and address any possible misconceptions.	In pairs: students will complete the Ohm's Law Phet worksheet (questions 1 - 6). ***This would be a great time for the teacher to pull a small group of struggling students and work with them to provide additional support.**	Have students write paragraph 1 of their lab report using the following **Writing Criteria**: -Restate the guiding question. -What is the lab about? -Provide scientific background information **(from the lab handout)**	In groups: Students will complete the ADI white board activity where they write the guiding question, a claim, support the claim with evidence and provide a reasoning/justification. Once students complete the white boards, have them engage in an argumentation session. **Argumentation Session:** -One student remains with their group's board to explain their group's findings. -The other group members rotate to other groups

					where they receive the white board presentations from that group and provide suggestions and feedback.
Independent Practice	Independently, students should complete activity A and B Of the student exploration sheet.	Have students use the resources linked on slide 12 to write a CER in response to the question, "What is the difference between direct and alternating current?" Resource: What is a CER and why is it crucial to science instruction?	Independently, students should complete number 7 from the Ohm's Law Phet worksheet. This task requires students to write a paragraph explaining the relationship between voltage, current and resistance.	In groups, have students write their lab proposals (**see p. 415 of ADI ebook**). The teacher will: -Rotate to the various groups and provide guiding questions to ensure students are on the right track for their lab proposal. Ensure all safety precautions are identified in the proposal. In Groups: students will complete their lab and data collection.	-After rotating to all groups, students will return to their group. The presenter will share the feedback he/she received and the group members who rotated, should share any information they learned from the other groups. -WIth this information, the students will revise their information as needed, based on the feedback, suggestions, and observations from other groups.
Assessment Summary	Revisit the KWL from the previous day and now have students complete the L portion of the chart identifying what they have learned about series and parallel circuits. Have students take the 5 question Gizmo quiz associated with the Circuit Builder Gizmo.	Students should trade papers and conduct peer reviews of one anothers CER. After the CER, students should make the revisions necessary before submitting their work. Peer Review Checklist	TOTD: If the voltage of a circuit is 9 volts and the resistance is 300 ohms, what must the current be? *Ensure students are using the necessary units of measurement (volts, ohms and amperes).	Independently, students write the second paragraph of their ADI lab report using the following criteria: What data did you collect? Why did you decide to collect this data? How will the data assist you in answering the guiding question?	Using the revised white board, students should write paragraph 3 **(the final paragraph)** of their lab reports, using the following **Writing criteria:** -Restate the guiding question. -State your claim. -Support your claim with evidence (include any data tables). -rovide a reasoning/justification.
Small Group Tasks (TBA)					
Teacher Notes	Additional Supports for		.Additional Resource: **Inspire Physical Science**		.

	Struggling Learners DOE Teacher Notes	Additional Supports for Struggling Learners DOE Teacher Notes	**Module 6: Lesson 2: Electric Current** Additional Supports for Struggling Learners DOE Teacher Notes	Additional Supports for Struggling Learners DOE Teacher Notes	Additional Supports for Struggling Learners DOE Teacher Notes

Week 2	
GSE: **SPS10. Obtain, evaluate, and communicate information to explain the properties of and relationships between electricity and magnetism.** a. Use mathematical and computational thinking to support a claim regarding relationships among voltage, current, and resistance. b. Develop and use models to illustrate and explain the conventional flow (direct and alternating) of current and the flow of electrons in simple series and parallel circuits. (*Clarification statement:* Advantages and disadvantages of series and parallel circuits should be addressed.) c. Plan and carry out investigations to determine the relationship between magnetism and the movement of electrical charge. (*Clarification statement:* Investigations could include electromagnets, simple motors, and generators.)	**Focused Concept:** **Electricity and Magnetism**
Phenomenon:	**DQ: What are the relationships that exist between electricity and magnetism?**

Faraday Generator (energy is transformed from mechanical to electrical) Simple Motor (energy is transformed from electrical to mechanical)					
SEP: Ask questions Construct Explanations			**CCC:** Cause and Effect Systems and System Models		
	Day 6	**Day 7**	**Day 8**	**Day 14**	**Day 15**
Learning Target	SWBAT explain how current can cause a magnetic field.	SWBAT explain how magnetic fields can cause a current.	SWBAT score a 75% or higher on the unit assessment.		
Opening	Assign Pivot Lesson: Current & Magnetic Fields I: Current Caused by Magnets To introduce the lesson, have students access the Pivot lesson and navigate to part I: Electricity Phenomenon. Introduce the activity for Part I, show the video for Part I, and work whole class to to answer the questions that accompany part I.	Assign Pivot Lesson: Current & Magnetic Fields II: Magnetic Fields Caused by Current To introduce the lesson, have students access the Pivot lesson and navigate to part I: An Electricity Phenomenon. Introduce the activity for Part I, show the video for Part I, and work whole class to to answer the questions that accompany part I.	Present SPS10a, SPS10b, and SPS10c and go over the annotation guide. Read through the annotation guide and work through it the whole class.		
Guided Practice/Transition	In pairs, students should move to Part 2 and 3 on the pivot lesson. Check students work in this section before allowing them to proceed to independent practice.	In pairs, students should move to Part 2 and 3 on the pivot lesson. Check students work in this section before allowing them to proceed to independent practice.	Answer any final questions students may have prior to testing. Consider using questions from Unit 7 Assessment Prep Presentation to briefly review.		
Independent Practice	Independently, students should complete Parts 4	Independently, students should complete Part 4 of	Unit 7 Assessment		

	and 5 of the Pivot lesson. Students who struggled in parts 2 and 3 may need additional support during independent practice.	the Pivot lesson. Students who struggled in parts 2 and 3 may need additional support during independent practice.			
Assessment/Summary	TOTD: Review student data from their submissions of the Pivot lessons and address any misconceptions.	TOTD: Review student data from their submissions of the Pivot lessons and address any misconceptions.	Review test data from Illuminate		
Small Group Tasks (TBA)					
Teacher Notes	Additional Supports for Struggling Learners DOE Teacher Notes	Additional Supports for Struggling Learners DOE Teacher Notes	Additional Supports for Struggling Learners DOE Teacher Notes	Additional Supports for Struggling Learners DOE Teacher Notes	Additional Supports for Struggling Learners DOE Teacher Notes

Assessment Prep

Prepare students for assessment by reviewing the following Assessment Prep Presentation.

Unit 7 Assessment Prep Presentation

Provide the following guidance:
Ask the students to use what they know about the tasks completed to answer the provided assessment prep question.

- What is the question asking you?
- What do you know about the vocabulary or concept in the question?
- Is this question similar to any investigations or tasks we've completed?
- How can what you've done help you answer this question?
- Just view the assessment question: What is the question asking you?

Guide students to think about how their experience connects to the question.
Using the answer choices provided, ask the students the following:

- Identify a wrong answer: How do I know this answer is incorrect?
- Identify the right answer: How do we know this answer is correct?

Allow the students time to discuss in collaborative groups.

TEACHER NOTE: If students struggle with any question, review that question the next day. **Do not** rush to the next question; instructional time is the only time they have to prepare for the end-of-year assessment.

Labs / Investigations		
Mandatory Labs	**Explore Learning Gizmo**	**Pivot Interactives/Phet**
ADI Lab 11: Which electromagnet design is best for picking up 50 paper clips?	Electromagnetic Induction Magnetic Induction Circuit Builder Phet: Electromagnet **Ohm's Law** Circuit Construction Kit (AC + DC)	• Current and Magnetic Fields 1: Currents Caused by Magnets • Current and Magnetic Fields 2: Magnetic Fields Caused by Currents

Supplemental Resources	Paper Circuits Greeting Cards GaDOE Inspire **Pivot** • Current and Magnetic Fields 1: Currents Caused by Magnets • Current and Magnetic Fields 2: Magnetic Fields Caused by Currents