CCPS Science Unit Plan

Grade	9 - 12	**Subject**	HS Physical Science	**Unit #**	4
Unit Name	Energy		**Timeline**	2 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 is based on the understanding that energy can be transferred and transformed. In doing so, energy affects and is affected by matter. This unit ties together energy at the nuclear level, atomic/molecular level, and at the macroscopic level of everyday experience. You will also introduce the following topics briefly in association with energy: radioactivity; the relationship among force, mass and motion; and the understanding that waves transfer energy.**				
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
SPS7. Obtain, evaluate, and communicate information to explain transformations and flow of energy within a system. **SPS7a.** Construct explanations for energy transformations within a system. (*Clarification statement:* Types of energy to be addressed include chemical, mechanical, electromagnetic, light, sound, thermal, electrical, and nuclear.)	• Planning and carrying out investigations • Analyzing and interpreting data • Engaging in argument from evidence • Obtaining, evaluating, and communicating information	• Energy and matter • Systems and system models • Stability and change • Cause and Effect • Patterns

	SPS7b. Plan and carry out investigations to describe how molecular motion relates to thermal energy changes in terms of conduction, convection, and radiation. **SPS7c**. Analyze and interpret specific heat data to justify the selection of a material for a practical application (e.g., insulators and cooking vessels). **SPS7d**. Analyze and interpret data to explain the flow of energy during phase changes using heating/cooling curves.		
NGSS Alignment	NGSS Alignment to Disciplinary Core Ideas		

Weekly Lesson Tasks

Week 1	
GSE: **SPS7a.** Construct explanations for energy transformations within a system. (*Clarification statement:* Types of energy to be addressed include chemical, mechanical, electromagnetic, light, sound, thermal, electrical, and nuclear.) **SPS7b.** Plan and carry out investigations to describe how molecular motion relates to thermal	**Focused Concept:** Energy Transformations & Heat Transfer

energy changes in terms of conduction, convection, and radiation.					
Phenomenon: Turning on your classroom lights requires many transformations of energy https://goo.gl/9IIwL0			**DQ:** How does the energy conversion process always result in energy conversions? What are the similarities and differences in conduction, convection and radiation?		
SEP: • Ask Questions. • Develop and Use Models. • Plan and Carry out Investigations. • Analyze and Interpret Data. • Obtain, Evaluate, and Communicate Information.			**CCC:** • Cause and Effect • Stability and Change • Systems and System Models • Energy and Matter • Patterns		
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Learning Target	SWBAT identify the various forms of potential and kinetic energy.	SWBAT identify the energy transformations occurring within a system.	SWBAT explain how the phet demonstration supports the law of conservation of energy.	SWBAT identify energy conversions with a system.	SWBAT explain conduction, convection and radiation.
Opening	Show students the phenomenon and have them engage in a see-think-wonder **Inspire Physical Science Module 4: Lesson 2: Describing Energy** Engage: Launch the Lesson: Describing Energy (from textbook) Go through the Teacher PowerPoint: Describing Energy for this lesson in your textbook resources. As the teacher moves through the information students should be taking notes.	Show the students the phenomenon again and now have them add to their see-think-wonder chart from Day 1. Review the forms of energy with some examples using this video. -Teacher should pause the video as the various forms of energy are shown on the screen. -Students should write down the forms of energy and list some examples from the video.	**Inspire Physical Science Module 4: Lesson 3: Conservation of Energy** Engage: Launch the Lesson: Conservation of Energy (from textbook) Go through the Teacher PowerPoint: Conservation of Energy for this lesson in your textbook resources. -Teachers will identify key points from the PowerPoint -Students will record notes in their notebook.	Introduce the Energy Conversion in a System Gizmo and complete the first page as a whole class. The teacher should model how to access the student exploration sheet and how to manipulate the Gizmo so students can be successful in later Gizmo activities.	**Inspire Physical Science Module 5: Lesson 2: Conduction, Convection & Radiation** Engage: Launch the Lesson: Conduction, Convection & Radiation (from textbook) Go through the Teacher PowerPoint: Conduction, Convection & Radiation for this lesson in your textbook resources. As the teacher moves through the information students should be taking notes.
Guided Practice/ Transition	Have students read and take notes on this article. Students should be	Have students navigate to the Energy Forms and Changes Phet (simulation	Inspire Physical Science Module 4: Lesson 3: Conservation of	Once students understand how to manipulate the Gizmo, allow them to	Put your class into nine groups. Three of the groups complete the

	familiar with the different forms of potential and kinetic energies. ***This article uses the phrase mechanical energy opposed to elastic energy. Tell the students to use the word elastic to make the lesson less confusing.**	lab). -Have students select the Systems box when accessing the website. Create a system whole class and identify the energy transformations occurring.	EnergyExplore and Explain: Mechanical Energy Transformations The teacher should circulate as students are working on this task and address misconceptions. Ensure all students are successful prior to allowing them to move onto independent practice.	work in pairs to complete Activity A from the Gizmo	**Explore & Explain:** Conduction activity, three of the groups complete the Explore & Explain Convection activity and the remaining three groups complete the Explore & Explain Activity. Groups should be given 5 - 7 minutes to complete their activity then 2 minutes to share their findings. (*All activities are from the online textbook)
Independent Practice	Have students write down the following forms of energy: -Chemical -Elastic -Gravitational -Nuclear -Radiant/light -Thermal -Sound -Electrical From here, have students come up with a **real world example** for each type of energy.	Independently: -Students should use the simulation to create their own system. -Students should sketch the system in their notebooks and identify the transformations occurring at each point. **Repeat (students should create at least 2 different systems and identify the transformations occurring in each)**	Have students access the energy skate park PhET Students should turn on the pie chart and/or bar graph. Students write a CER: How does this simulation support the law of conservation of energy? **BONUS:** How does adjusting the mass impact the system? Resource: What is a CER and why is it crucial to science instruction?	Independently, students should complete Activity B from the Gizmo	Textbook Virtual Investigation: Thermal Energy (Students can complete this mini lab in pairs or independently)
Assessment Summary	TOTD: Lesson Check: Describing Energy (from online textbook)	TOTD: Did you create any energy during your simulation? Was any energy destroyed in your simulation? Where does the energy go?	Class Discussion: What energy transformations are present in turning on your classroom lights?	TOTD: What is the relationship between mass and GPE (Gravitational Potential Energy)? ***Answer:** As mass increases so does GPE, (Gravitational Potential Energy) this is a directly proportional relationship.	Students independently complete the textbook Lesson Check: Conduction, Convection, Radiation
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	Do not do Activity C. We will do Activity C for this Gizmo on a later date when we discuss specific heat. Additional Supports for Struggling Learners DOE Teacher Notes	. Additional Supports for Struggling Learners DOE Teacher Notes

Week 2	
GSE: **SPS7a.** Construct explanations for energy transformations within a system. (*Clarification statement:* Types of energy to be addressed include chemical, mechanical, electromagnetic, light, sound, thermal, electrical, and nuclear.) **SPS7b.** Plan and carry out investigations to describe how molecular motion relates to thermal energy changes in terms of conduction, convection, and radiation. **SPS7c**. Analyze and interpret specific heat data to justify the selection of a material for a practical application (e.g., insulators and cooking vessels). **SPS7d**. Analyze and interpret data to explain the flow of energy during phase changes using heating/cooling curves.	**Focused Concept:** Heat Transfer & Specific Heat
Phenomenon: Turning on your classroom lights requires many transformations of energy https://goo.gl/9IIwL0	**DQ: What is specific heat?** **How do I read a heating/cooling curve?**

SEP: • Ask Questions. • Develop and Use Models. • Plan and Carry out Investigations. • Analyze and Interpret Data. • Use Mathematics and Computational Thinking. • Obtain, Evaluate, and Communicate Information.			**CCC:** • Cause and Effect • Systems and System Models • Stability and Change • Energy and Matter • Patterns		
	Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
Learning Target	SWBAT explain specific heat.	SWBAT interpret heating and cooling curves.		SWBAT review all concepts from the unit.	SWBAT score a 75% or higher on the unit assessment.
Opening	Go through the following presentation with students for specific heat. -Teacher will identify and share key points from the PowerPoint presentation -Students will take notes and work on the embedded practice problems.	Introduce heating/cooling curves with this presentation. **On slide 6** allow students to predict which words they should put in the blanks. Play the video on slide 7. Pause the video and discuss the key concepts.	*Use this day to catch up on pacing. OR *Use this day to address misconceptions as evidenced by student work.	Review all elements from this unit as a guideline for what students should know. Present SPS7a, SPS7b, SPS7c, SPS7d and go over key vocabulary from each element using the annotation guide.	Review the annotated elements from the previous day.
Guided Practice/Transition	Have students go back to the Energy Conversion in a System Gizmo. In groups, students should complete the first page of Activity C	Have students draw a heating curve and a cooling curve in their notebooks and label which phase change is occurring at each point.		Students complete a Unit 4 Study Guide	Go over these practice questions with students and address misconceptions. Unit 4 Assessment Presentation
Independent Practice	Students can continue working in groups or independently to complete the second page of Activity C.	Have students work in pairs to complete the heating and cooling curve activity *It is recommended that you let students complete the activity digitally. When they are finished they can check their answers by clicking "Finish"		Go over the study guide and allow students time to make corrections as needed.	Unit 4 Assessment
Assessment/Summary	Energy Conversion in a System Gizmo Quiz	After students click "Finish" have them raise		Students should study the study guide in preparation	Review test data from Illuminate

	*Review quiz data prior to the next class and address any misconceptions apparent from the data at the start of the next class.	their hands and take notes of any common misconceptions students are experiencing then briefly discuss these items.		for the assessment.	
Small Group Tasks (TBA)					
Teacher Notes	Extension: Conduction & Convection Gizmo Activity C 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 4 Assessment 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 the question, review it 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: **Physical Science** Lab 18. Radiation and Energy Transfer: What color should we paint a building to reduce cooling costs? *Virtual resource: Gizmo, :Heat Absorption" ADI: **Physical Science** Lab 15. Thermal Energy and Specific Heat. Which material has the greatest specific heat? ADI: **Physical Science** Lab 14. Potential Energy: How can you make an action figure jump higher?	**Energy Conversion in a System** **Phase Changes** **Calorimetry Lab** **Potential Energy on Shelves**	**PhET Simulation: Energy Forms and Changes** **PhET Simulation: Energy Skate Park**

Additional Resources/Tasks	
Supplemental Resources	Energy Transformation **Energy STEM Activity** Solar Oven