CPS Science Unit Plan

Grade	10-12	**Subject**	Physics	**Unit #**	4
Unit Name	Waves and Light		**Timeline**	3 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 all abbreviations used with this framework.				
Unit Overview	In this unit, students will seek to answer the question "How do waves affect our everyday lives?" The modules in this unit each provide part of the answer to this question. • **Module 13:** Students will learn about periodic motion and develop an understanding of the basic properties and behaviors of waves. • **Module 14:** Students will learn about the generation, manipulation, detection, and applications of sound waves. • **Module 15:** Students will learn that light allows us to see and that its wave properties are responsible for effects like color and polarization. • **Module 16:** Students will learn mirrors and lenses can be used to reflect and refract light in ways that are helpful to humans. • **Module 17:** Students will learn that the interference and diffraction of light are responsible for optical effects such as thin-film interference, iridescence, and diffraction patterns.				
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
SP4. Obtain, evaluate, and communicate information about the properties and applications of waves. a. Develop and use mathematical models to explain mechanical and electromagnetic waves as a propagating disturbance that transfers energy. (Clarification statement: Mathematically describe how the velocity, frequency, and wavelength of a propagating wave are related.) b. Develop and use models to describe and calculate characteristics related to the interference and diffraction of waves (single and double slits). c. Construct an argument that analyzes the production and characteristics of sounds waves. (Clarification statement: Includes, but not limited to, Doppler Effect, standing waves, wavelength,	**Asking Questions and Defining Problems** Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. **Using Mathematics and Computational Thinking** Mathematical and computational thinking in 9-12 builds on K-8 and experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data.	**Patterns**. Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them. **Cause and Effect:** Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering. **Systems and System Models:** A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

	the relationship between amplitude and the energy of the wave, and the relationship between frequency and pitch.) d. Plan and carry out investigations to characterize the properties and behavior of electromagnetic waves. (Clarification statement: Properties of waves include, but not limited to, amplitude, frequency, wavelength, and the relationship between frequency or wavelength and the energy of the wave.) e. Plan and carry out investigations to describe common features of light in terms of color, polarization, spectral composition, and wave speed in transparent media. • Analyze experimentally and mathematically aspects of reflection and refraction of light waves and describe the results using optical ray diagrams. • Perform calculations related to reflections from plane surfaces and focusing using thin lenses. f. Plan and carry out investigations to identify the behavior of light using lenses. (Clarification statement: Investigations concerning Snell's Law, optical ray diagrams, and thin lens equation should be conducted.) g. Plan and carry out investigations to describe changes in diffraction patterns associated with geometry and wavelength for mechanical and electromagnetic waves.	Simple computational simulations are created and used based on mathematical models of basic assumptions. **Developing and Using Models** Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s). **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs. **Engaging in Argument from Evidence** Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). **Planning and Carrying Out Investigations:** Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.	**Energy and Matter** Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.
NGSS Alignment	NGSS Alignment to Disciplinary Core Ideas		

Weekly Lesson Tasks

Week 1	
GSE: SP4.a.	**Focused Concept: Vibrations and Waves**
Phenomenon: How can this pendulum save a building from earthquake damage?	**DQ:**

SEP: Developing and Using Models, Using Mathematics and Computational Thinking			**CCC:** Patterns, Cause & Effect, Energy & Matter		
	Day 1 13.1	**Day 2 13.2**	**Day 3 13.3**	**Day 4 Lab**	**Day 5 Mod Test**
Learning Targets	**Students will explore periodic motion, including the specific cases of masses on springs, pendulums, and resonance.** **Focus Question:** **What are some types of repetitive motion?**	**Students will explore the properties of mechanical waves, including amplitude, wavelength, frequency, wave speed, and period.** **Focus Question:** **What are some common types of waves?**	**Students will explore how the reflection, refraction, and interference of waves occurs.** **Focus Question:** **What happens when two waves meet?**	**Students will explore the factors that affect wave power, including amplitude, frequency, tension, and density of the medium.** **Focus Question:** **What determines wave speed and wave power?**	**Students will culminate their learning about periodic motion and developed understanding of the basic properties and behaviors of waves.**
Opening (Teacher: The Lesson Resource can`be launched or assigned with Know/Want to Know Activity on digital textbook platform)	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.** **• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.** **• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.** **• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.** **• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**How can this pendulum save a building from earthquake damage?** Revisit The Phenomenon (Claim, Evidence, Reasoning) TE Page 358 **phenomenon card** Students will create a CER based on the question and using information obtained from Days 1-3, present evidence and reasoning to support the claim.
Guided Practice/ Transition TTW, provide 15-20 minutes of direct instructions. PPT presentations are available for every section of every chapter in the online textbook resources.	**The Teacher Will:** **Periodic Motion Presentation** **Facilitate how to solve Spring constant problems and Energy of a Spring (pg 341).** **Essential Vocabulary** *amplitude *simple harmonic motion *Hooke's Law	**The Teacher Will:** Instructor will facilitate discussion on Pendelums. Students will look at figure 4 (pg 342) and consider the factors upon which the restoring force of pendulum, $\mathbf{F}_{net}$ depends. Ask students to explain why the period of a pendulum is independent of the mass of the bob.	**The Teacher Will:** **Get it?:** (TE Page 352) Compare the wave medium's displacement at a node and at an antinode. [Students and Teacher will engage in academic discourse] **Essential Vocabulary** *incident wave *reflected wave *principle of superposition	**The Teacher Will:** **Explore Learning: Waves** Teachers and students will access the Explore Learning (Gizmo) Application through Clever. **TTW** assign the Gizmo to classes and walk students through the Prior Knowledge Questions.	**The Teacher Will:** **Wave Behavior Presentations:** **Instructor will facilitate the use of scientific journal to record the evidence you collected as you complete the readings and activities in this lesson.**

	*simple pendulum *resonance	Teacher can use any mass hanging from a string as a demo for students to get a better visual as the phenomena is being discussed. Ask a Question: Do you have other questions about the phenomenon? If so, add them to the driving question board for discussion. **Essential Vocabulary** *wave/wave pulse *transverse wave *periodic wave *longitudinal wave *surface wave *trough/crest *wavelength *frequency *conductor	*interference *node/antinode *standing wave *wavefront *normal *law of reflection *refraction	**Essential Vocabulary** *compression *rarefactions *wave power	
Independent Practice (TTW, circulate to monitor student performance and will clarify instructions as needed.)	Student will: Option 1: Practice Problems (pg. 341). **TTW circulate to monitor student performance and will clarify instructions as needed.**	Student will: Claim, Evidence, Reasoning: Go online to access your CER chart and explore resources that can help you collect evidence. **(pg. 337)** **TTW circulate to monitor student performance and will clarify instructions as needed.**	Student Will: **Phet: Explore and Explain what is Periodic motion** Student Directions for Pendulum Lab	Student Will: Explore Learning: Waves Student Exploration Sheet **TTW circulate to monitor student performance and will clarify instructions as needed.**	Student Will: Check Your Progress (pg. 355). **TTW circulate to monitor student performance and will clarify instructions as needed.**
Assessment Summary (Teachers should maximize the use of all	**TE Page 343** **Task:** Students will find the height of a silo per the	**TE Page 349** **Task:** Students will create and label a transverse	**TE Page 355** **Task:** Students will create three diagrams per the	**TE Page 356** **TTW:** Direct students to the activity Engineering &	**TE Page 358** **Task: GO Further** - (How does the strength of gravity

the extended learning/assessment tasks if time permits.)	scenario presented and calculate the impulse from the Formative Assessment Check. **Extended:** >Progress Check Questions (Textbook or Online Science Notebook) >Access the online additional resources for a pre-made Lesson Check to assign students.	waver per the instructions from the Formative Assessment Check. **Extended:** >Progress Check Questions (Textbook or Online Science Notebook) >Access the online additional resources for a pre-made Lesson Check to assign students.	instructions presented and calculate from the Formative Assessment Check. **Extended:** >Progress Check Questions (Textbook or Online Science Notebook) >Access the online additional resources for a pre-made Lesson Check to assign students.	Technology: Harnessing the Motion of the Ocean. **Task:** Students will answer guided questions as they read and complete the Illustrate task.	affect periodic motion?) Students will create a CER based on the scenario presented. **Extended:** >Access the online additional resources for a pre-made Chapter/Module Test to assign students.
Small Group Tasks (TBA)					

Week 2					
GSE: SP4.c., SP4.e.	**Focused Concept: Sound & Fundamentals of Light**				
Phenomenon: Why does a fire truck's siren change pitch as it passes you? What does the light from a distant star or supernova tell us about it?			**DQ: Why do we hear so many different sounds?**		
SEP: Developing and Using Models, Using Mathematics and Computational Thinking, Planning and Carrying Out Investigations			**CCC:** Patterns, Cause & Effect, Systems & System Models		
	Day 6 14.1	**Day 7 14.2**	**Day 8 Mod Test**	**Day 9 15.1**	**Day 10 Lab**
Learning Targets	**Students will explore the properties of sound waves, how humans perceive them, and the doppler effect.** **<u>Focus Question:</u>** **What factors affect the pitch of a sound?**	**Students will explore how sound is created and how musical instruments work.** **<u>Focus Question:</u>** **How is pitch controlled in a musical instrument?**	**Students will culminate their learning about the generation, manipulation, detection, and applications of sound waves.**	**Students will explore the ray model of how light travels, illumination, and the speed of light.** **<u>Focus Question:</u>** **How does distance affect how bright a star appears?**	**Students will predict the effect of distance on light's intensity and determine the relationship between intensity and distance from a light source.**

Opening (Teacher: The Lesson Resource can`be launched or assigned with Know/Want to Know Activity on digital textbook platform)	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.** **• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.** **• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**Why does a fire truck's siren change pitch as it passes you?**Revisit The Phenomenon (Claim, Evidence, Reasoning) TE Page 382 phenomenon card	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.** **• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**TTW provide students with lab instructions.** **TSW read the lab introduction and familiarize themselves with the procedures and safety precautions.** phenomenon card
Guided Practice/Transition TTW, provide 15-20 minutes of direct instructions. PPT presentations are available for every section of every chapter in the online textbook resources.	**The Teacher Will:** Engage students by accessing the Explore and Explain interactive content for Doppler Effect. Have students Ask the question: Do you have questions about the phenomenon? if so, add them to the driving question board for discussion. **Essential Vocabulary** *sound wave *pitch *loudness *sound level *decibel *Doppler Effect	**The Teacher Will:** Take students through the steps for solving word problems using sample problems (pg. 367) **Essential Vocabulary** *closed-pipe resonator *open-pipe resonator *fundamental *harmonics *dissonance *consonance *beat	**The Teacher Will:** Select or create a set of review questions. Options: Kahoot Quizizz Blooket **The Student Will:** participate using the platform selected by the teacher.	**The Teacher Will:** Use the presentation to Explore and Explain How light travels. Segway into the concept of "How does distance affect how bright a star appears?" Facilitate student engagement with interactive content: How light travels. Use guiding questions to lead students to a basal level understanding of how light move through space. **Essential Vocabulary** *ray model of light	**The Teacher Will:** **Probware Lab** **Essential Vocabulary** *luminous intensity *irradiance

				*luminous sources *opaque *translucent *transparent *luminous flux *illuminance	
Independent Practice (TTW, circulate to monitor student performance and will clarify instructions as needed.)	**The Student Will:** **Get it?** **Estimate the speed of sound through air at sea level if the temperature is 25 degrees celsius (pg. 362)** **Identify: What characteristic of waves is pitch most closely related to?** **Compare: How much more intense is a sound that regenerates 80 dB than one of 40 dB? (pg 366)** **Compare the wavelength and frequency heard by an observer in front of the moving fire engine at the beginning of the module with the wavelength and frequency heard by an observer behind the fire engine.**	**The Student Will:** **Explain and Explore the sound of Music** **Select the circles to explore how different instruments create sound with vibrations (pg369).**	**The Student Will: complete the Module/Chapter Test**	**The Student Will:** **Conduct a quick investigation with the students. Use the relationship among the frequency, wavelength and speed of a wave to calculate the speed of light.** **Students will demonstrate their understanding of the content by completing practice problems from the text (pg 391).**	**The Student Will:** **Probware Lab** **Light Intensity & Distance**
Assessment/Summary (Teachers should maximize the use of all the extended learning/assessment tasks if time permits.)	**TE Page 367-368** **Task:** Students will predict frequency per the scenario presented and calculate the impulse from the	**TE Page 379** **Task:** Students will develop an explanation of physics of music per the scenario presented and	**TE Page 382** **Task: GO Further** - (Can you test the Doppler effect?) Students will create a CER based on the	**TE Page 392** **Task:** Students will perform the laser pointer demo and answer questions per the instructions	**TE Page 393** **Task:** Progress Check Questions (Textbook or Online Science Notebook) **Extended:**

	Formative Assessment Check. **Extended:** >Progress Check Questions (Textbook or Online Science Notebook) >Access the online additional resources for a pre-made Lesson Check to assign students.	calculate the impulse from the Formative Assessment Check. **Extended:** >Progress Check Questions (Textbook or Online Science Notebook) >Access the online additional resources for a pre-made Lesson Check to assign students.	scenario presented.	presented from the Formative Assessment Check. **Extended:** >Progress Check Questions (Textbook or Online Science Notebook) >Access the online additional resources for a pre-made Lesson Check to assign students.	>Access the online additional resources for a pre-made Lesson Check to assign students.
Small Group Tasks (TBA)					

Week 3					
GSE: SP4.e., SP4.f., SP4.b.		**Focused Concept: Fundamentals of Light, Reflection and Refraction, & Interference and Diffraction**			
Phenomenon: What does the light from a distant star or supernova tell us about it? How does light transmit information through a communication network? What makes this hummingbird's feathers appear shiny and shimmery?			**DQ: How does light behave in various everyday situations?**		
SEP: Obtaining, Evaluating and Communicating Information			**CCC:** Patterns, Cause & Effect, Systems & System Models		
	Day 11 15.2	**Day 12 16.1**	**Day 13 16.3**	**Day 14 17.1**	**Day 15 17.2**
Learning Targets	**Students will explore how the wave nature of light explains diffraction, color, polarization, and the Doppler shift of light.** **<u>Focus Question:</u>** **How do scientists use the Doppler shift to determine how stars and galaxies are moving?**	**Students will explore the law of reflection and images formed by plane mirrors.** **<u>Focus Question:</u>** **Why does light reflected from a mirror make an image while light reflected from a piece of paper does not?**	**Students will explore Snell's law of refraction, total internal reflection, and the dispersion of light.** **<u>Focus Question:</u>** **What happens to light when it enters a new medium?**	**Students will explore double-slit interference and thin-film interference.** **<u>Focus Question:</u>** **How do bubbles produce a rainbow effect?**	**Students will explore single-slit diffraction and diffraction gratings.** **<u>Focus Question:</u>** **How do DVDs produce a rainbow effect?**
Opening (Teacher: The Lesson Resource can`be launched or assigned with Know/Want to Know Activity on digital textbook	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.**	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.**	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.**	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.**	**• Show students the phenomenon card and/or embedded video** **• Use the See-Think-Wonder protocol to guide student thinking.**

platform)	**• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**	**• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.**
Guided Practice/Transition TTW, provide 15-20 minutes of direct instructions. PPT presentations are available for every section of every chapter in the online textbook resources.	**The Teacher Will:** Presentation: Wave Nature of Light to introduce the content to the students. Open discussion about how light bends around objects; in this case the human body. Attempt to generate interest by raising questions and connecting past knowledge. Get It? Use scientific journals to record the evidence the student collects as they complete the readings and activities in the lesson. Students and teacher will engage in academic discourse. Distinguish the difference between color by subtraction and color by addition. (pg. 396) Draw a diagram, with text explanations, showing nonpolarized light (pg 398). Draw a second diagram, with text explanation, showing nonpolarized light	**The Teacher Will:** Lab Instructor will use presentation: Reflection of light to introduce the content to the students. **Identify Cross cutting concepts:** Create a table of the crosscutting concepts and fill in examples you find as you read (pg. 409) Allow students to use scientific journals to record the evidence they collect as you complete the readings and activities in the lesson **Essential Vocabulary** *specular reflection *diffuse reflection *plane mirror *object *image *virtual image	**The Teacher Will:** Use presentation: Refraction of Light to introduce the content to the students. Review Snell's Law (pg 426) by explicitly giving step by step instructions on how to model, mathematically, the solutions to Example problem 4 (pg 427) **Essential Vocabulary** *index of refraction *critical angle *total internal reflection *dispersion	**The Teacher Will:** Use presentation: Interference to introduce the content to the students. Open discussions with solutions to: **Get It (Page 451)** **Describe** how the pattern on the hummingbird at the beginning of this module formed. [Students and teacher will engage in academic discourse.] **Essential Vocabulary** *incoherent light *coherent light *interference fringes *monochromatic light *thin-film interference	**The Teacher Will:** Use presentation Diffraction to introduce the content to the students. Students will use their scientific journals to record the evidence they collect as the complete the readings and activities in the lesson: Get it? (Page 457) Identify the type of interference of Huygen's wavelets that creates a dark band on the screen. [Students and teacher will engage in academic discourse.] Describe the assumption that is made concerning W and L for the single-slit diffraction equation. **Essential Vocabulary** *diffraction pattern *diffraction grating *Rayleigh criterion

	passing through a filter as polarized light. (pg 398) Explained how the wavelength, frequency, and speed of light are mathematically related. (pg 400) **Essential Vocabulary** *diffraction *primary colors *secondary colors *complementary colors *primary pigment *secondary pigment *polarization *Malus's Law				
Independent Practice (TTW, circulate to monitor student performance and will clarify instructions as needed.)	**The Student Will:** Students should be allowed to work collaboratively. Phet Simulation: Color Vision Student Exploration Sheet	**The Student Will:** **Lab** **Forensics Lab: A Little Time to Reflect** **Carry out an investigation** into the relationship between the angle of incident and the angle of reflection for light off a plane mirror.	**The Student Will:** Students will complete practice problems (pg 427)	**The Student Will:** Carry out an investigation to discover te patterns produced when light shines on a soap film Use your scientific journal to record the evidence you collect as you complete the readings in this lesson.	**The Student Will:** Students will complete the Physics Challenge (pg 458) You have several unknown substances and wish to use a single slit diffraction apparatus to determine what each one is. You decide to place a sample of an unknown substance in the region between the slit and the screen and use the data you obtain to determine the identity of each of the substances by calculating its index of refraction. Students will work on the Practice problems (pg 459)
Assessment/Summary (Teachers should maximize the use of all the extended learning/assessment tasks if time permits.)	**TE Page 402-403** **Task:** Students will imagine an astronaut shining a laser per the scenario presented and answer questions from the	**TE Page 414** **Task:** Students will predict an image formed and test their prediction per the scenario presented from the Formative Assessment	**TE Page 430-431** **Task:** Students will study reflection and refraction separately per the instructions from the Formative Assessment	**TE Page 454-455** **Task:** Students will conduct the bubble demo per the instructions and answer questions from the Formative Assessment	**TE Page 463-464** **Task:** Students will conduct the laser pointer demo per the instructions and answer questions from the Formative Assessment

	Formative Assessment Check. **Extended:** >Progress Check Questions (Textbook or Online Science Notebook) >Access the online additional resources for a pre-made Lesson Check to assign students.	Check. **Extended:** >Progress Check Questions (Textbook or Online Science Notebook) >Access the online additional resources for a pre-made Lesson Check to assign students.	Check. **Extended:** >Progress Check Questions (Textbook or Online Science Notebook) >Access the online additional resources for a pre-made Lesson Check to assign students.	Check. **Extended:** >Progress Check Questions (Textbook or Online Science Notebook) >Access the online additional resources for a pre-made Lesson Check to assign students.	Check.(Students can write a CER to show their understanding.) **Extended:** >Progress Check Questions (Textbook or Online Science Notebook) >Access the online additional resources for a pre-made Lesson Check to assign students.
Small Group Tasks (TBA)					

Week 4					
GSE:		**Focused Concept: Waves and Light (Unit 4)**			
Phenomenon:			**DQ:**		
SEP:			**CCC:**		
	Day 16 Review	**Day 17 Unit Test**	**Day 18**	**Day 19**	**Day 20**
Learning Targets	**Students will culminate their learning of all Unit 4 learning targets.**				
Opening (Teacher: The Lesson Resource can`be launched or assigned with Know/Want to Know Activity on digital textbook platform)	**How do waves affect our everyday lives?** Revisit The Phenomenon (Claim, Evidence, Reasoning) **phenomenon card** Students will create a CER based on the question and using information obtained, present evidence and reasoning to support the claim.				
Guided	**TTW select module(s)**	**Unit 4 Test**			

Practice/Transition TTW, provide 15-20 minutes of direct instructions. PPT presentations are available for every section of every chapter in the online textbook resources.	**read and write activity and use provided guided questions** **Module 15**: Scientific Breakthroughs TE 404 **Module 16:** Engineering & Technology TE 442 **Module 17:** Scientific Breakthroughs TE 465				
Independent Practice (TTW, circulate to monitor student performance and will clarify instructions as needed.)	**TTW select or create a set of review questions. (Kahoot, Quizizz, Blooket)** **TSW participate using the platform selected by the teacher.**	**Unit 4 Test**			
Assessment/Summary (Teachers should maximize the use of all the extended learning/assessment tasks if time permits.)	**The Teacher Will:** **select module(s) read and write activity and use provided guided questions** **Module 17**: Scientific Breakthroughs TE 465	**Unit 4 Test**			
Small Group Tasks (TBA)					

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

Labs / Investigations		
Mandatory Labs	**Explore Learning Gizmo**	**Pivot Interactives/Phet**

Explore Learning Gizmo: Waves	**- Simple Harmonic Motion** **- Waves** **- Doppler Shift** **- Refraction** **- Hearing: Frequency and Volume** **- Color Absorption** **- Basic Prism**	**PhET: Hooke's Law** **PhET: Pendulum Lab** **PhET: Wave on a String** **PhET: Wave Interference** **PhET: Sound** **PhET: Color Vision** **PhET: Bending Light**
Additional Resources/Tasks		
Supplemental Resources	☐ McGRAW ONLINE ☐ DRIVING QUESTIONS BOARD & SUMMARY TABLE (TE Page 334B) ☐ STEM UNIT PROJECT (TE Page 335) ☐ LEARNSMART	