CCPS Science Unit Plan

<table>
<tr><td>Grade</td><td>10-12</td><td>Subject</td><td>Science</td><td>Unit #</td><td>1</td></tr>
<tr><td>Unit Name</td><td colspan="2">Structure and Properties of Matter</td><td>Timeline</td><td colspan="2">3 weeks</td></tr>
<tr><td>How to use the Framework</td><td colspan="5">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.</td></tr>
<tr><td>Unit Overview</td><td colspan="5">Learning Objective for this unit: Determine the relationship between the mass number of an atom, its atomic number, its atomic mass, and its number of subatomic particles
In this unit, students will learn about the development of atomic theory, the structure of the atom, and how this structure, along with the periodic table, can be used to predict the properties of elements.

NOTE** An atom is the smallest unit of matter that retains all of an element's chemical properties. Atoms combine to form molecules, interacting to form solids, gases, or liquids. For example, water is composed of hydrogen and oxygen atoms that have combined to form water molecules. Many biological processes are devoted to reassembling molecules into different, more useful molecules.

*Students and their parents must review, sign, and submit the following safety acknowledge form prior to the first lab.</td></tr>
<tr><td>Lesson Plan guidance document and template</td><td colspan="5">CCPS Lesson Plan Template Day View
Lesson Plan Template Week View
Department of Science Guidance Document</td></tr>
<tr><td>3Dimensional Instruction</td><td colspan="5">
<table>
<tr><th>GSE</th><th>Science and Engineering Practices</th><th>Crosscutting Concepts</th></tr>
<tr><td>SC1. Obtain, evaluate, and communicate information using modern atomic theory and periodic law to explain the characteristics of atoms and elements.

a. Evaluate the merits and limitations of different atom models regarding the relative size, charge, and position of protons, neutrons, and electrons in the atom.

b. Construct an argument to support the claim that the proton (and not the neutron or electron) defines the element’s identity.

d. Construct an explanation that relates the relative abundance of isotopes of a particular</td><td>• Asking questions and defining problems
• Developing and using models
• Planning and carrying out investigations
Constructing explanations and designing solutions
• Engaging in argument from evidence
Obtaining, evaluating, and communicating information</td><td>• Patterns
• Cause and effect
• Systems and system models
• Structure and function</td></tr>
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	element to the atomic mass of the component. e. Construct an explanation of light emission and the movement of electrons to identify elements. f. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms (i.e., including atomic radii, ionization energy, and electronegativity). g. Develop and use models, including electron configuration of atoms and ions, to predict an element's chemical properties.		

NGSS Alignment	NGSS Alignment to Disciplinary Core Ideas

Weekly Lesson Tasks

Week 1					
GSE: SC1 a,b		**Focused Concept: Measurements, Density, & Atomic Structure**			
Phenomenon: Daily phenomena are found in the Opening.			**DQ:** Why are various colors produced when different salts are burned? How are naturally occurring atoms made? How has our understanding of atoms changed over time? What particles make up an atom? What decides the properties of a substance?		
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Learning Target	**SWBAT** understand SI , base units and significant figures **Focus Question:** Why do scientists use Standardized units?	**SWBAT** identify the units for mass, volume, and density. **Focus Question:** Why do scientists use standardized units?	**SWBAT** explain the modern atomic theory. **Focus Question:** How has the concept of a proton, neutron and electron changed across the atomic models?	**SWBAT** explain the roles of protons, neutrons, and electrons in an atom's structure. **Focus Question:** What does an atom look like?	**SWBAT** explain the roles of protons, neutrons, and electrons in an atom's structure. **Focus Question:** How small is an atom?

Opening (10-15 minutes)	**TTW** ask the question: How might you convert between units, and why would you want to know? **TSW** write what they know and want to know about units and operations on post-it notes and places them on chart paper in the classroom. **TTW** provides opportunities for students to share what they have written on the Post-it notes.	**TTW** ask the question: Why is it easier to lift a backpack filled with gym clothes than the same backpack filled With books? **TTW s**olicits volunteers to lift two bags containing different materials. **After watching the demo, TSW** Turn and Talk to discuss why one bag was easier to lift than the other. .	**TTW** show the phenomenon. **TTW** use Chalk Talk protocol to gauge student thinking **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions. **TTW** record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	**TTW** show the phenomenon. **TTW** Use the See-Think-Wonder protocol to guide student thinking. **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions. **TTW** record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	**TTW** show the phenomenon. **TTW** Use the See-Think-Wonder protocol to guide student thinking. **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions. **TTW** record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.
Guided Practice/ Transition to Work Session **Key Vocabulary** Atoms Electrons Protons Neutron Mass Volume Density SI Units Base Units Derived Unit	**TTW** provide direct instructions on metric conversions. and significant figures **TSW** take notes in their science notebook.	**TTW** provide direct instruction on mass, volume, and density. **TTW** ask students to complete “In class” example questions on pg. 18 **TSW** take notes in their science notebook. **TTW** conduct a tool talk and discuss the	**TTW** explain and discuss expectations of student behavior during a class debate. **TTW** divide the class into four groups and assign each group one of the four scientists and their atomic models to research. • Dalton • Thomson • Rutherford • Bohr	**TTW e**ngage students in direct instruction to explain the structure of the atom. **TSW** will take notes in their science notebook.	**TTW** ask: How can the structure of the atoms be connected to a colorful fireworks display? **TTW** engage students in direct instruction to explain the structure of the atom. **TSW** take notes in their science notebook.

		expectations of the lab investigation. **TTW** group the students for the Density lab.	**TSW** research their scientists using the reference pages. **TSW** complete part 1 of the student guide while they research their assigned scientist. **TTW f**acilitate the debate by asking questions to keep the conversation moving and encouraging different students to be the contributor for their group so that each student has a chance to talk. **Note: Students may have to utilize their cell phones for additional research**		
Independent Practice	**TSW w**ork on Significant Digits and Measurement **TTW** provide support to student groups by asking probing questions to guide student thinking.	**TSW** collect the materials to perform the lab on Density **TTW** circulate the room and provide support to students by asking probing questions to guide student thinking.	**TSW** will take turns contributing information from their scientist/model to the discussion while completing part II of the student handout. **TTW** circulate the room and provide support to students by asking probing questions to guide student thinking. **TSW** complete the reflections and conclusions document.	**TSW** work in pairs to complete the Chemistry POGIL and will use evidence from the POGIL to create a CER to answer the guiding question "How do atoms combine to make different types of matter?" **TTW** model the required components of the CER. **TTW** model Q# 1-3 whole group, and then students will complete the remaining questions with a partner.	**Suggested quiz day**
Assessment Summary	**TSW** identify the prefix that would be used to express 2,000,000,000 bytes of computer memory.	**TSW** write about times they disagreed with someone only to realize later they meant the same thing but used different	**TSW** develop a model on the whiteboards that shows how three isotopes of oxygen (O-16, O-17, and O-18) are the same and	**TSW** use their knowledge of the atom to develop a claim for the phenomenon and answer the question "How can the structure of	**TSW** will work in pairs to complete the CCC on pg. 88.

	Suggested Homework assignment metric conversion	language to say it. Ask them how SI units can solve that problem among scientists.	how they are different.	the atoms be connected to a colorful firework display?"	
Small Group Tasks (TBA)					

Week 2					
GSE: SC1e		**Focused Concept: Isotopes, Wavelength, Frequency, Electron configurations**			
Phenomenon: Daily phenomena are found in the Opening.			**DQ: Why don't electrons in an atom enter the nucleus? What does an electron look like?**		
	Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
Learning Target	**SWBAT** explain periodic trends on the periodic table. **Focus question:** How are the elements on the periodic table arranged?	**SWBAT** identify the periodic trends. **Focus question:** How does understanding periodic trends allow us to predict properties of different elements?	**SWBAT** classify the periodic table of elements. **Focus question:** How is the periodic table classified?	**SWBAT** determine the relative atomic mass using the isotopes of the atoms. **Focus Question:** How did the chemist arrive at the atomic mass on the periodic table?	**SWBAT** write the electron configuration of ions. **Focus question:** How do you identify an element and an ion configuration?
Opening	**TTW** show the phenomenon. **TTW** Use the A/B Partner Talk to guide student thinking. **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions.	**TTW** show the phenomenon. **TTW** Use the Turn and Talk to guide student thinking. **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions.	**TTW** show the phenomenon. **TTW** use the Think, Puzzle, Explore to guide student thinking. **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions.	**TTW** show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: why two numbers are on the symbol, and one has a decimal. What do you see? What do you think about what you are seeing? What does it make you wonder? • TTW provide students opportunities to share	**TTW** show the phenomenon. **TTW** Use the The Explanation Game to guide student thinking. **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions.

	TTW record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	**TTW** record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question	**TTW** record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	observations and develop questions.	**TTW** record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.
Guided Practice/Transition to Work Session **Key Vocabulary** Amplitude Crest Trough Wavelength Quantum Orbital Frequency	**TTW** play the video from the ebook that is on the phenomenon card and provide direct instructions on the periodic table . **TTW** ask: How will they arrange their closet or desk and relate it to the periodic table?	**TTW** provide direct instructions to explain periodic trends and students will write key points in their notebooks **TTW** perform a demonstration on pg. 156. **TTW** provide instructions about the choice board and create groups of four to work on the choice board.	**TTW** use the video on the periodic table and ask questions. **TTW** show the image from Day 12 to provide direct instruction on the classification of the periodic table. **TTW** ask questions while the video is played. a. What are the names of each group of the periodic table? b. Why is the periodic table classified in a certain way? **TTW** allow students to fill the graphic organizer of the classification of the periodic table while providing instructions.	**TTW** review the periodic table with students **TTW** lead students to determine the Relative Atomic Mass of atoms using the PowerPoint and assigns group work RAM.	**TTW** provide direct instructions on the process of writing the electron configuration of ions and how ions are formed **Suggested Unit Assessment Day**
Independent Practice	**TSW** work in pairs to complete the POGIL ACTIVITY on cracking the periodic table code.	**TSW** work in groups of four to complete the Periodic Trends Choice Board.	**TSW** engage in the Go Further Data Analysis Lab to predict the properties of an element.	**TSW** complete practice problems RAM PRACTICE PROBLEM	**TSW** students will take their unit 1 assessment in Illuminate. **TTW** circulate the room

	TTW conduct a brief discussion with students to answer the question "Why do you think it's important to learn the periodic table of elements?" **TTW** circulate the room and provide support to students by asking probing questions to guide student thinking.	**TTW** ask: How are periodic trends seen on the periodic table? **TTW** circulate the room and provide support to students by asking probing questions to guide student thinking.	**TTW** support students by addressing questions, or clearing up misconceptions as they complete the lab.	**TTW** circulate the room to provide support struggling	and provide support to students by asking probing questions to guide student thinking.
Assessment/Summary (5-10 minutes)	**TSW** answer the CCC on pg. 141. **TSW** answer practice problems on pp. 154 #s 16-19.	**TSW** work on demonstrating understanding on pg.160 #s 20-24.	**TSW** respond via post-it notes to the following question "How would you classify the periodic table? **TTW** conduct a brief discussion on the classification of the periodic table to clear up misconceptions.	**TSW** complete the exit ticket s	**TTW** check students' mastery in Illuminate. **TSW** reflect in their data notebook.
Small Group Tasks (TBA)					

Week 3					
GSE: SC1a,b,d,f		**Focused Concept: Periodic table, valence electrons, periodic trends, protons, electrons & neutrons for ion**			
Phenomenon: Daily phenomena are found in the Opening.			**DQ: Why is the periodic table arranged in a certain order?** **What are the patterns seen on the periodic table?** **What does the periodic trend look like?** **How do you determine the electron configuration of ions?**		
	Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
Learning Target	**SWBAT** evaluates and determines the wave particles of an atom. **SWBAT** identify the various white light spectrum**.**	**SWBAT** determine the frequency of longitudinal waves. **Focus Question:** How are electromagnetic waves used in everyday life	**SWBAT** use a model to write the electron configuration of atoms. **SWBAT** determine the valence electron(s) of an atom.	**SWBAT** draw a Bohr model of atoms. **SWBAT** Identify the valence electrons of atoms. **Focus Question:**	**SWBAT** to identify two unknown salts from the lists of salts using flame test. **SWBAT** calculate the energy light.

	SWBAT calculate the energy of waves, frequency, and wavelength of waves. **Focus Question:** How are the types of waves and their properties used in a slinky?	and technology?	**Focus Question:** Why do electrons revolve around the nucleus and not the protons and neutrons?	How do electrons move in an atom?	**Focus Question:** How do the electrons spark the fireworks?
Opening (10-15 minutes)	**TTW** show the phenomenon. **TTW** Use the See-Think-Wonder protocol to guide student thinking. **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions. **TTW** record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	**TTW** show the phenomenon. **TTW** Use the See-Think-Wonder protocol to guide student thinking. **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions. **TTW** record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	**TTW** show the phenomenon. **TTW** Use the See-Think-Wonder protocol to guide student thinking. **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions. **TTW** record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question.	**TTW** show the phenomenon. **TTW** Use the See-Think-Wonder protocol to guide student thinking. **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions. **TTW** record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question. .	**TTW** show the phenomenon. **TTW** Use the See-Think-Wonder protocol to guide student thinking. **TTW** ask students: What do you see? What do you think about what you are seeing? What does it make you wonder? **TTW** provide students opportunities to share observations and develop questions. **TTW** record students' questions to direct instruction. Based on the guiding question, ask students to generate claims for the focus question. **FIREWORKS**

Guided Practice/Transition to Work Session (20 minutes) **Key Vocabulary** **Atomic number** **Electron** **Valence electron** **Electron** **Nuclear charge** **Cation** **Anion** **Excited state** **Ground state** **Electronegativity** **Atomic radius** **Ionization energy** **Electron affinity**	**TTW** conduct a tool talk and discuss the expectations of the investigation, Wave Characteristics Lab. **Materials needed for the lab:** Slinky spring or rope Stopwatch Meter stick	**TTW** use PowerPoint to explain the parts of the waves and electromagnetic waves**.**	**TTW** provide 15-20 minutes of direct instructions. **TTW** model the diagonal rule model to write the electron configuration. ELECTRONS IN ATOM Aufbau Principle and Hund's Rule **TSW** complete practice problems in groups on the whiteboard.	**TTW** explain the Bohr Model, Lewis Dot Structure, and Noble Gas Electron Configuration using the PowerPoint lessons with examples. BOHR MODEL **TSW** practice drawing the Bohr model on the whiteboard in groups. **Materials needed:** Whiteboards/Chart Paper Dry Erase Markers/Poster Markers	**TTW** review the lab safety protocol for using chemicals and flame. **LAB SAFETY**
Independent Practice (45-50 minutes)	**TSW** conduct the Wave Characteristics Lab. **TTW** circulate the room and provide support to students by asking probing questions to guide student thinking	**TSW** work with a partner to complete the Light and Electrons Choice Board task. **TTW** circulate the room and provide support to students by asking probing questions to guide student thinking.	**TSW** work in pairs to complete electron configurations worksheet ELECTRON CONFIGURATION. **TTW** circulate the room and provide support to students by asking probing questions to guide student thinking.	**TTW** create student groups of 4 and assigns 4 elements from the periodic table. **TSW** create a Bohr model of their assigned elements. **TSW** rotate to another group to discuss similarities and differences between the models. **TTW** circulate the room and provide support to students by asking probing questions to guide student thinking.	**TTW** conduct a flame test demo with students before allowing them to complete the lab. **TSW** conduct flame tests. FLAME TEST LAB **TTW** circulate the room and provide support to students by asking probing questions to guide student thinking.
Assessment/Summary (5-10 minutes)	**TSW** answer the assessment questions on characteristics of waves	**TSW** answer: Get it? Question on page 127. **Suggested Homework** Electromagnetic Spectrum	**TSW** answer the questions on pg. 151 #11-14.	**TSW** practice problems on pg. 130 #19-23. **Suggested Homework** Writing Electron Configurations. Periodic Table of Element	**TSW** revisit the phenomenon to answer the question, "How do fireworks get their colors?" and will post their responses on Post-it notes. TSW share their responses

					via the turn-and-talk strategy.
Small Group Tasks (TBA)					

Assessment Prep

Prepare students for assessment by reviewing the following topics

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

Additional Resources/Tasks	
Supplemental Resources	Utilizing Properties of Matter in Construction STEM Unit Project