CCPS Science Unit Plan

Grade	10-12	**Subject**	Science	**Unit #**	1
Unit Name	Structure and Properties of Matter		**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	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.**				
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
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	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	Patterns Cause and effect Systems and system models Structure and function

	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 to understand SI and base units** **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 solicits 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.**	**Show students the phenomenon and ask students to write on the chart paper what ideas come to their minds when looking at the image** **TTW Use Chalk Talk protocol to gauge student thinking**	**Show students the phenomenon and ask the question," How can the structure of the atoms be connected to a colorful firework display?** **Use the See-Think-Wonder protocol to guide student thinking.** **Teachers should provide students with opportunities to share observations and develop questions while guiding students to connect their ideas to prior knowledge.**	**Show students the phenomenon and ask the question," How can the structure of the atoms be connected to a colorful fireworks display?** **Use the See-Think-Wonder protocol to guide student thinking.** **Teachers should provide students with opportunities to share observations and develop questions while guiding students to connect their ideas to prior knowledge.**
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.** **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 pp.18** **TSW take notes in their science notebook.** **The teacher will conduct a tool talk and discuss the expectations of the lab investigation.** **TTW group the students for the Density lab**	**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** **Allow students groups and research their scientists using the reference pages**	**TTW engage students in direct instruction to explain the structure of the atom.** **TSW will take notes in their science notebook**	**TTW engage students in direct instruction to explain the structure of the atom.** **TSW take notes in their science notebook.** **Suggested quiz day**

			TSW complete part 1 of the student guide while they research their assigned scientist. **TTW facilitate 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 work 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**	**TSW will take turns contributing information from their scientist/model to the discussion while completing part II of the student handout.** **After the debate, students will work to 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**	
Assessment Summary	**Identify the prefix that would be used to express 2,000,000,000 bytes of computer memory.**	**Have students write about times they disagreed with someone only to realize later they meant the same thing but**	**Ask students to develop a model on the whiteboards that shows how three isotopes of oxygen (O-16, O-17, and**	**Students will use their knowledge of the atom to develop a claim to revisit the phenomenon and answer the question**	**Students will work in groups of two on the CCC on pp. 88 to answer the questions.**

	Suggested Homework assignment **metric conversion**	**used different language to say it. Ask them how SI units can solve that problem among scientists.**	**O-18) are the same and how they are different.**	**"How can the structure of 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 evaluates and determines the wave particles of an atom, identify the various white light spectrum, calculate the energy of waves, frequency, and wavelength of waves** **Focus Question: How are the types of waves and their properties using a slinky?**	**SWBAT use simulations to determine the frequency of longitudinal waves** **Focus Question: How are electromagnetic waves used in everyday life and technology?**	**SWBAT uses a model to write the electron configuration of atoms, *determine the valence electron of an atom *predict the chemical reaction of anatomy using valence electron** **Focus Question: Why do revolve around the nucleus and not the protons and neutrons?**	**SWBAT to write Bohr model of atoms *Identify the valence electron of atoms *predict the chemical reaction of an atom using valence electron** **Focus Question: How do electrons move in an atom?**	**SWBAT to identify two unknown salts from the lists of salts using flame test *Write electron configuration of the elements * Calculate the energy of the lights** **Focus Question: How do the electrons spark the fireworks?**
Opening	**The students are shown the phenomenon to answer the question: How do we know what stars are made of? Phenomenon Use the See-Think-Wonder protocol to guide student thinking.**	**Show the phenomenon card and complete the see think wonder**	**Show the phenomenon image. Ask the following question:** **How are electrons arranged in atoms?**	**Show the students a model of Bohr in the lab** **Allow students to discuss and observe what they notice**	**The teacher shows the students some fireworks and ask students to describe the colors they observe** **FIREWORKS**

Guided Practice/Transition to Work Session **Key Vocabulary** Amplitude Crest Trough Wavelength Quantum Orbital Frequency	**The teacher will 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	**The teacher uses PowerPoint to explain the parts of the waves and electromagnetic waves.**	**Provide 15-20 minutes of direct instructions. Lead the students to use the diagonal rule model to write the electron configuration.** **ELECTRONS IN ATOM** **Powerpoint Notes on Aufbau Principle and Hund's Rule** **Allow students to complete practice problems in groups on the whiteboard**	**Explain the Bohr Model, Lewis Dot Structure, and Noble Gas Electron Configuration using the PowerPoint lessons with examples.** **BOHR MODEL** **Allow students to practice drawing the Bohr model on the whiteboard in groups.** **Materials needed:** Whiteboards/Chart Paper Dry Erase Markers/Poster Markers	**The teacher reviews the lab safety protocol for using chemicals and flame before the lab** **LAB SAFETY**
Independent Practice	**TSW conduct the Wave Characteristics Lab**	**TSW work with a partner to complete the Light and**	**TSW will practice electron configurations**	**TTW create student groups of 4 and assigns 4**	**The teacher assigns students the chemical**

	TTW provide support to student groups by asking probing questions to guide student thinking	**Electrons Choice Board task.** **TTW provide support to student groups by asking probing questions to guide student thinking** **Suggested Homework Electromagnetic Spectrum**	**with a partner to work on the ELECTRON CONFIGURATION** **TTW facilitate the students while working on writing the electron configuration of atoms**	**elements from the periodic table. Each group creates a Bohr model of their assigned elements. After groups have drawn their models, smaller groups will partner with another group to discuss similarities and differences between the models.** **Suggested Homework Writing Electron Configurations.** **Periodic Table of Elements**	**samples and conducts a flame test demo with them before allowing them to complete the lab. FLAME TEST LAB**
Assessment/Summary (5-10 minutes)	**Closing questions: on the powerpoint**	**Closing questions: Answer: Get it? Question on page 127.**	**Students will answer the questions on pp. 151 #11-14 to demonstrate an understanding of electron configuration.**	**To check for content mastery, students work on practice problems on pp.130 #19-23**	**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)					

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 explain the periodic table & periodic trends 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 calculate the number of protons, electrons, and neutrons for ions Focus question Where do the charges come from?	SWBAT write the electron configuration of ions Focus question: How do you identify an element and an ion configuration?
Opening (10-15 minutes)	Use the phenomenon card and allow students to use A/B Partner Talk • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups.	Use the phenomenon using Turn and Talk to discuss the information they see • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups. Connect to the phenomena with the questions.	Use the phenomenon card and use the Think, Puzzle, Explore strategy • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups. Connect to the phenomena with the questions.	Use the phenomenon card and use the Chalk Talk strategy • Teachers should provide students with opportunities to share observations and develop questions. -The students can record questions in whole groups or small groups.	Use the phenomenon card use The Explanation Game • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.
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	Teacher will play the video from the ebook that is on the phenomenon card and provide direct instructions on periodic table The teacher will ask students how they will arrange their closet or desk and relate it to the periodic table.	Teacher will provide direct instructions to explain periodic trends and students will write key points in their notebooks The teacher will perform a demonstration on pp. 156	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 show the video on protons, electrons, and neutrons for ions. While students watch the video, they write down notes in their notebook.	TTW provide direct instructions on the process of writing the electron configuration of ions and how ions are formed Suggested Unit Assessment Day

			TTW allow students to fill the graphic organizer of the classification of the periodic table while providing instructions		
Independent Practice (45-50 minutes)	Students will work on POGIL ACTIVITY on cracking the periodic table code in groups of two 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 provide instructions about the choice board and create groups of four to work on the choice board. Students will work in groups of four on the Periodic Trends Choice Board. The teacher should ask how the periodic trends are seen on the periodic table.	TSW engage in the Go Further Data Analysis Lab to predict the properties of an element. TTW support students by addressing questions, or clearing up misconceptions as they complete the lab.	Students will work in pairs to complete the POGIL ACTIVITY on ions TTW provide support to student groups by asking probing questions to guide student thinking. The teacher should time the sections between the stops of the Pogil to check for understanding (CFU)	TSW assemble into their groups from Day 8, create a Bohr Model of their assigned ions, and add it to the poster from Day 8. After groups have drawn their models, smaller groups will partner with another group to discuss similarities and differences between the models.
Assessment/Summary (5-10 minutes)	Students will answer the CCC on pp. 141 Students will answer practice problems on pp. 154 Q#16-19	Students will work on demonstrating understanding on pp.160 Q#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 the classification of the periodic table to clear up misconceptions	Students will answer the question on Get It? on pp. 170 and the graphic organizer on pp. 171 with a partner TTW facilitate each group to answer any questions students may have	Write the noble gas electron configuration of the Bromine atom and ion on a sticky note and place it on the white chart on the board to assess student learning on electron configuration Based on the students' responses, TTW reteach, remediate, or enrichment.
Small Group Tasks (TBA)					

Week 4	
GSE:	Focused Concept:
Phenomenon:	DQ:

	Day 16	Day 17	Day 18	Day 19	Day 20
Opening					
Guided Practice/Transition					
Independent Practice					
Assessment/Summary					
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