CCPS Science Unit Plan

<table>
<tr><td>Grade</td><td>10-12</td><td>Subject</td><td>Chemistry</td><td>Unit #</td><td>4</td></tr>
<tr><td>Unit Name</td><td colspan="2">Oxidation and reduction (REDOX) Reactions</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 Objectives for this unit are to determine the Oxidation and Reduction Reactions, balance the Oxidation Reaction (Redox), and determine molarity and concentrations using Titration of redox reactions.</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">
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<tr><th>GSE</th><th>Science and Engineering Practices</th><th>Crosscutting Concepts</th></tr>
<tr><td>SC3. Obtain, evaluate, and communicate information about how the Law of Conservation of Matter determines chemical composition in compounds and chemical reactions.
a. Use mathematics and computational thinking to balance chemical reactions (i.e., synthesis, decomposition, single replacement, double replacement, and combustion) and construct an explanation for the outcome of a simple chemical reaction based on the outermost elect</td><td>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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<tr><td>NGSS Alignment</td><td colspan="5">NGSS Alignment to Disciplinary Core Ideas</td></tr>
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Week 1					
GSE: SC3.a,b	**Focused Concept:** • **How do you balance redox reactions?** • **Differentiate between oxidation and reduction reactions.** • **What are oxidizing and reducing agents?**				
Phenomenon: Daily Phenomenon are found in the opening			**DQ: What is oxidation in terms of electron numbers?** • **What is a reduction in terms of electron numbers?** • **What is a reducing agent?** • **What is an oxidizing agent?** • **What happens when a substance is oxidized?** • **What happens when a substance is reduced**		
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Learning Target	**SWBAT** define oxidation and reduction in terms of increase or decrease in oxidation numbers. **Focus Question:** Why do some metals tend to corrode?	**SWBAT** use the diagram to explain visually the oxidation and reduction reaction using the oxidation number. **Focus Question:** What defines oxidation and reduction?	**SWBAT** describe and identifies oxidizing agents and reducing agents. **Focus Question:** What are oxidizing and reducing agents?	**SWBAT** apply knowledge of oxidation and reduction to predict the products of chemical reactions. **SWBAT** use equations to discuss and predict the product using oxidation numbers. **Focus Questions:** How does electronegativity affect redox reaction?	**SWBAT** balance redox reactions using the half-reaction method. **SWBAT** Observe and identify redox reactions and understand the transfer of electrons between substances. **Focus Question:** How do you identify and balance the redox equation?
Opening	• 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	• TTW show the phenomenon • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: Why is the water glowing? • 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	• TTW show students 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	• TTW show students 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	• TTW show students 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.	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. Assign redox KWL(online science notebook) for students to complete KWL REDOX	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.	questions. • 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 (20 minutes) **Key Vocabulary** **Spectator ion** **Oxidation** **Reduction** **Oxidation number** **Reducing agent** **Oxidizing agent**	**TTW** provide direct instruction by introducing the concepts of oxidation and reduction reactions. *Give more examples of oxidation and reductions. *Use the PowerPoint to explain oxidation numbers. *Explain oxidation and reduction in terms of electron loss or gain. REDOX POWERPOINT	**TTW** analyze various chemical reactions to identify redox reactions. *Group activity to practice identifying oxidation and reduction page 601. REDOX NOTES	**TTW** Discuss the definition of oxidizing and reducing agents and the importance of understanding their functions in chemical reactions. *Provide examples of common oxidizing and reducing agents to give students a practical understanding. Refer to pg 605.	**TTW** use the electronegativity table to predict the redox equation ELECTRONEGATIVITY TABLE **TTW** Use more examples on pg 605 to Determine the oxidation numbers using the number of electrons.	**TTW** use the Balancing Redox Equation PPT to explain the process of balancing redox equation. **TTW** review the lab safety for using chemicals, CUSO4 and AgNO3 in the lab. **TTW** explain the lab expectations. LAB MATERIALS
Independent Practice	**TSW** work in groups to practice identifying oxidation numbers and reduced and oxidized substances REDOX WORKSHEETS **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** complete the Lab Series activity (online textbook) to understand redox reactions from the science notebook under lesson 1 redox. **TSW** complete practice questions on page 607. **TTW** circulate the room to provide support by asking probing questions to guide	**TSW** work in groups of three to research and identify oxidizing and reducing agents in different chemicals. REDOX Reactions ws **TTW** circulate the room to provide support by asking probing questions to guide student thinking. **TTW** Discuss real-world	**TSW** work in groups of 3-4 students to complete a research project. REDOX **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** complete redox reactions lab. REDOX REACTION LAB **TTW** circulate the room to provide support by asking probing questions to guide student thinking.

		student thinking.	examples where understanding oxidizing and reducing agents is crucial, such as in environmental or industrial applications		
Assessment Summary	**TSW** complete an exit ticket from the ebook assessment section. REDOX WORKSHEET KEYS	**TSW** complete a module test assessment on ebook.	**TSW** complete an exit ticket on identifications of oxidizing and reducing agents from chemical reactions ebook.	**TSW** work on problems from page 608.	**TSW** complete redox reaction sheet as homework from pages 316-324
Small Group Tasks (TBA)					

Week 2					
GSE: SC2.g SC3.a, b,	**Focused Concept:** • **Electrolysis** • **Electrolytic cell**				
Phenomenon: Daily Phenomenon are found in the opening.			**DQ:** • **How do electrolytic cells use energy to drive nonspontaneous reactions?** • **How is coat plating performed?** • **What are the main functions of electrolysis parts?**		
	Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
Learning Target	**SWBAT** Identify the component of galvanic cells and its functions **Focus Question:** How do voltaic cells harness energy from chemical reactions?	**SWBAT** explain the process of how batteries work in voltaic cells by understanding the chemical reactions involved. **SWBAT** demonstrate their understanding through hands-on experiments. **Focus Question:** How do voltaic cells improve or cause problems in our daily lives?	**SWBAT** differentiate between galvanic cells and electrolytic cells. **SWBAT** calculate cell potential. **Focus Question :** How do electrolytic cells use energy to drive nonspontaneous reactions?	**SWBAT** respond to a scenario of a stem case to show the relationship between electrons and chemical reactions. **Focus Question:** How do cameras get their power?	**SWBAT** balance the redox reactions on electrolytic cells. **Focus Question:** Explain the electrolysis of brine.
Opening	• TTW show the phenomenon.	• TTW show the phenomenon and the	• TTW show the phenomenon.	• TTW show the phenomenon.	• TTW show the phenomenon.

	• TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: Where do cameras get their power? 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.	video. • 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 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 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 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 **Key Vocabulary** **Galvanic cell** **Electrolytic cell** **Cell Potentials** **Voltaic cell**	**TTW** lead students in the Interactive activity to build a galvanic cell. pg 644-645. **TTW** lead students in group discussion. What do you notice? **TTW** use PowerPoint, slides 1-9, to explain the parts of voltaic and electrolytic cells.	**TTW** use the PowerPoint Battery to explain the parts of batteries and corrosion and galvanization	**TTW** lead students to identify Galvanic Cell and Electrolytic cells. **TTW** use the PowerPoint, slides 10-15, to guide students' understanding of how Galvanic and Voltaic cells work and calculate the cell potentials.	**TTW** explain the scenario and guides students on using the GIZMO (Electron and Chemical Reactions) STEMcase to solve the problem.	**TTW** leads students to explain the electrolysis of brine on page 646. **TTW** use the teacher's notes to explore and explain the Applications of electrolysis in the ebook.
Independent Practice	**TSW** complete explore and explain redox in the electrochemistry virtual lab in groups ebook. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** work in groups of 3-4 students to complete the Recycle BATTERY PROJECT. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** complete the Electrolysis of water on pivot interactives. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	**TSW** complete the STEM case on electron and chemical reactions. **TTW** monitor students' progress in real time.	**TSW** complete the practice problems from pg 630. **TSW** complete balancing redox reaction (science notebook). REDOX REACTION 2 **TTW** circulate the room to provide support by asking

					probing questions to guide student thinking.
Assessment/Summary	**TSW complete questions 1-4, page 630**	**TSW** describe the half-reaction that occurs in a hydrogen fuel cell. **TSW** write the equation for the overall reactions**.** **TSW** explain what happens when a battery is recharged.	**TSW** complete an exit ticket from ebook assessment page 631**.**	**TSW** write a CER: How do cameras get their power?	**TSW c**omplete assessment lesson check on electrolysis on ebook assessment**.**
Small Group Tasks (TBA)					

Week 3					
GSE: SC1c,d; SC5a		**Focused Concept:** • **Nucleus, Isotopes, Radiation, Half-life, Relative Atomic Mass**			
Phenomenon: Use the Phenomenon to capture students' interest; start the class with a short video showing a nuclear reaction (e.g., nuclear fission or fusion).			**DQ: How can atoms change?** • **What is fusion, and how is it formed?** • **What is fission, and how is it formed?** • **Explain the byproducts of a fission event.** • **Explain how a chain reaction works and describe the requirements for a sustained chain reaction large enough to make a bomb.** • **Explain how a nuclear reactor works and how controlling rods can slow the reaction.**		
	Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
Learning Target	**SWBAT** build a model to characterize the particles formed by different radiation. **SWBAT** connect radioactive decay to energy **Focus Question:** How was radioactivity discovered?	**SWBAT** explain nuclear reactions. **SWBAT** identify isotopes. **SWBAT** understand radiation. **SWBAT** determine the half-life of the substance. **Focus Question:** Why are	**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** explain and describe the applications of nuclear reactions. **Focus Question:** What are some applications of nuclear reactions?	**SWBAT** answer unit 4 questions 80% correct. **Focus Question:** Unit 4 assessment test

		some nuclei radioactive?			
Opening	• TTW show the phenomenon. • TTW Use the See-Think-Wonder protocol to guide student thinking. • TTW ask students: Where does the sun get all its energy?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: 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 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 **Key Vocabulary** **Radiation** **Radioactive** **Decay** **Half-life** **Relative atomic mass** **Nuclear reaction** **Chemical reaction**	**TTW** begin with a thought-provoking question, "How is nuclear energy used in our daily lives?". **TTW** use the PowerPoint to explain nuclear reactions, such as fusions and fissions. **NUCLEAR CHEMISTRY PPT** **TTW** lead the students to complete the practice on the ppt.	**TTW** Conduct a quick review of basic atomic structure and the concept of protons, neutrons, and electrons by showing a model of the nuclear structure to students. **TSW** use build an atom phet to review parts of an atom. **TTW** lead students to determine the half-life reactions using the ppt HALF-LIFE NOTES	**TTW** review the periodic table with students with questions and answers session. **TTW** lead students to determine the Relative Atomic Mass of atoms using the PowerPoint and assigns group work RAM.	**TTW** lead the students to discuss the different applications of nuclear reaction. **TTW** use the explore and explain, “Using Radiation to Treat Cancer” video clips on the ebook NUCLEAR APPLICATION NOTES.	**TTW** assign the students the Illuminate Assessment Test Code.
Independent Practice	**TSW** complete “Types of	**TSW** complete #’s 1-6	**TSW** complete practice	**TSW** work to complete a	**TSW** complete the Unit 4

	Nuclear Radiation" in pivot interactives. **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	from the Half-Life Worksheet (using pivot interactives). HALF-LIFE WORKSHEET **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	problems RAM_PRACTICE PROBLEM **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	project on nuclear radiation application **TTW** circulate the room to provide support by asking probing questions to guide student thinking.	test **TTW** circulate the room.
Assessment/Summary	**TSW** be assigned the Lesson Check Nuclear radiation on the ebook.	**TSW** complete #7 from Half-Life worksheet.	**TSW** complete the exit ticket.	**TSW** explain one way in which nuclear chemistry is used to diagnose or treat cancer.	**TTW** check the students' responses for mastery and run item analysis. **TSW** reflect and record in their data notebook.
Small Group Tasks (TBA)					

Assessment Prep

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

- Definitions of reduction and oxidations
- Oxidations using oxidation numbers
- Redox reaction examples
- Differences between voltaic and electrolytic cells
- Calculations of potential cells
- Balancing redox reactions using oxidation numbers

Labs / Investigations		
Mandatory Labs	**Explore Learning Gizmo**	**Pivot Interactives/Phet**
Redox reactions	Chemical reaction STEMcase	**Nuclear reactions**
Additional Resources/Tasks		

Supplemental Resources	McGraw Online Assessments Learnsmart pHet simulations