

BPS Science Department Chemistry – Unit 13

Chemistry Unit 13 – Oxidation and Reduction

Unit Overview: In this unit, students will learn how to determine the oxidation states of elements in compounds and use this information to identify a redox reaction. Students will then be able to write oxidation and reduction half reactions for the redox reactions. Students will learn about an application of redox - electrochemical cells. The ability to identify the components and functions of an electrochemical cell will be explained and students will then be able to classify if an electrolytic cell is voltaic or electrolytic. The use reference table J to predict if a reaction is spontaneous will be employed.

Essential Questions:

- How do you identify a redox reaction?
- What are the steps to write oxidation and reduction half reactions for redox reactions?
- What are they components and functions of the components of an electrochemical cell?
- What is the difference between a voltaic cell and an electrolytic cell?
- How do you determine if a reaction is spontaneous?

MST Standard 4 - Science

Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

New York State Science Learning Standards Performance Expectations:

HS-PS 1-12 Use evidence to illustrate that some chemical reactions involve the transfer of electrons as an energy conversion occurs within a system.

HS-PS 3-5 Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

HS-PS 3-6 Analyze data to support the claim that Ohm's Law describes the mathematical relationship among the potential difference, current, and resistance of an electric circuit.

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Time Frame	Skills, Practices, or Expectations	Specific Standards / Performance Indicators	Resources	Content Vocabulary	Measurement of Student Learning
<p>3.27.23 - 4.14.23</p> <p>04.03.23 - 04.07.23 Spring Recess</p>	<p>Classifying Redox Reactions</p> <p>Recognize an oxidation reduction reaction.</p> <p>Determine the oxidation state of an element alone, as part of a polyatomic ion or a compound.</p> <p>Identify and write half reactions for oxidation and reduction.</p> <p>Recognize and apply the Laws of Conservation of Mass, Energy, and Charge.</p> <p>Electrochemical Cells</p> <p>Describe function of an anode, a cathode, and a salt bridge or power source in voltaic and electrolytic cells.</p> <p>Draw the flow of electrons in a cell.</p> <p>Describe the change of mass and ion concentration at each electrode.</p> <p>Use activity series to determine if a reaction is spontaneous.</p>	<p>MST Standard 4 Science Key Idea 3</p> <p>3.2 – Use atomic molecular models to explain common chemical reactions.</p> <p>3.2d – An oxidation-reduction (redox) reaction involves the transfer of electrons (e⁻).</p> <p>3.2e – Reduction is the gain of electrons.</p> <p>3.2f – A half-reaction can be written to represent reduction.</p> <p>3.2g – Oxidation is the loss of electrons.</p> <p>3.2h – A half-reaction can be written to represent oxidation.</p> <p>3.2i – Oxidation numbers (states) can be assigned to atoms and ions. Changes in oxidation numbers indicate that oxidation and reduction have occurred.</p> <p>3.2j – An electrochemical cell can be either voltaic or electrolytic. In an electrochemical cell, oxidation occurs at the anode and reduction at the cathode.</p> <p>3.2k – A voltaic cell spontaneously converts chemical energy to electrical energy.</p> <p>3.2l – An electrolytic cell requires electrical energy to produce a chemical change. This process is known as electrolysis</p> <p>3.3 – Apply the principle of conservation of mass to chemical reactions.</p> <p>3.3b – In a redox reaction the number of electrons lost is equal to the number of electrons gained.</p>	<p>Castle Learning- Access through Clever</p> <p>BPS Science Department Recommended Virtual Labs – must be logged into BPS google document account through BPS Gmail account to access</p> <p><i>Holt NY Chemistry Textbook</i> Chapters 17</p> <p>Regents Chemistry Reference Tables</p> <p>Dynamic Periodic Table</p> <p>BPS Science K-12 Schoology Folder 9-12 Resources Chemistry Resources</p> <p>Virtual PPTs:</p> <ul style="list-style-type: none"> Electrochemistry – Comprises redox reactions and electrochemical cells <p>CK12:</p> <p>Batteries – Interactive - Observe batteries using a redox reaction to generate electricity; identify anode and cathode as site of oxidation reduction; half-reactions</p> <p>Electrochemical Cells - Change the electrodes, solutions, concentration and measure voltage</p>	<ul style="list-style-type: none"> anode cathode dry cell electrochemical cell electrode electrolysis electrolytic cell fuel cells galvanic cell half-reaction net equation oxidation redox reactions reduction salt bridge spontaneous voltaic cell wet cell 	<ul style="list-style-type: none"> Ticket Out Think-Pair –Share Formative Assessment Weekly Quiz Unit Test Homework Review Questions DDI process using data from Edoctrina & Castle Learning to generate data <p>Higher Level Questions:</p> <p>Regents Exams: January 2020 Questions 83-84 January 2019 Question 64</p>

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Resources

<http://ngss.nsta.org/Classroom-Resources.aspx> - Searchable NYSSL/NGSS aligned resources curated by NSTA

[Buffalo Public Schools Science Department Chemistry Webpage](#) – BPS chemistry curriculum resource hub

[BPS Science Department Recommended Virtual Labs](#) – Virtual lab resources with embedded links to virtual labs and student sheets. Must be logged into BPS google document account through BPS Gmail account to access.

[NYS Regents Chemistry Exams 2012-2020](#) NYSED’s Office of State Assessment webpage for released Regents Chemistry Examinations

[NYS MST Science Learning Standards Physical Setting/Chemistry](#) – Current NYS Physical Setting/Chemistry Standards

[NYS P-12 Science Learning Standards \(HS\)](#) – NYSSL High School Standards

[Regents Chemistry Reference Tables](#) – Reference Tables for Regents Chemistry

<p>ELL Enhancements To access hyperlinked material, you must be logged into your BPS Google Drive</p>	<p>Listening</p> <ul style="list-style-type: none"> ● Cross- Linguistic Practices: Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates.) ● Build background knowledge ● Activating Prior Knowledge Activating prior knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content ● Activating Prior Knowledge ● Visuals - GIFs, pictures- will assist students in understanding what they are listening to. Use visual thinking strategies to set the lens for learning. ● Video to review or introduce a topic – use closed captioning to help students see the words and pronunciations while they listen to the content. ● Word stretching / Vowel stretching when instructing allows student to listen closely to the pronunciation of the word ● Performance Level Descriptors this document provides teachers with a description of what output they can expect from students based 	<p>Speaking</p> <ul style="list-style-type: none"> ● Sentence Frames - to begin a sentence - such as <i>Evolution is...</i> or <i>I think that evolution is...</i> ● Academic Conversation Starters: Have a visual of a list of academic sentence starters that students can refer to in a discussion. Examples include- I expect ____ to happen. My data shows that... This helps students have a more science focused dialogue. ● Choral Reading - To build fluency, self-confidence and motivation with reading/speaking ● Create movement to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning ● Performance Level Descriptors This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in 	<p>Reading</p> <ul style="list-style-type: none"> ● Supplementary Text to help reinforce concepts. If necessarily, use lower Lexile levels to ensure comprehension. ● Visual Aids - Pictures or models to support vocabulary words and concepts ● Video to review or introduce a topic - use closed captioning to help students read along while they listen to the content ● 4 Square / Frayer models to help students gain a deeper understanding of vocabulary. ● Highlighting important text to assist students in answering questions after the reading. ● Chunking-Break reading of text into chunks or paragraphs ● Vocabulary Morphology- Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student’s vocabulary ● Performance Level Descriptors this document provides teachers with a description of what output they can expect from students based on earned 	<p>Writing</p> <ul style="list-style-type: none"> ● Sentence Frames - to begin a sentence- such as <i>Biodiversity is...</i> or <i>An example of competition is....</i> ● Cloze passages with word banks ● Word banks ● Graphic Organizers to help break down the writing process and organize thoughts ● Standards-based sentence stems ● Performance Level Descriptors this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of writing. Scroll for grades 9-12. 	<p>Instructional Accommodations (depending on the student’s needs)</p> <ul style="list-style-type: none"> ● Extended time for tests in class, projects and assignments ● Directions read. Broken down as necessary ● Model how to complete the activity in the lesson ● Oral simplification of directions or questions ● Translated version of test when available. Student may have both version English and native language version ● Use of approved bilingual glossaries from NYS in each subject
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Special Education Modifications Special Education students must have accommodations as per Individual Educational Plan (IEP)	<u>Instructional</u> <ul style="list-style-type: none"> ● Pre-teach vocabulary ● Use picture vocabulary ● Scaffold Depth of Knowledge questions ● Provide copy of notes/notes in “cloze” form ● Use of Think, Pair, and Share strategy to help process information ● Scaffold written assignments with the use of graphic organizers ● Allow for multiple ways to respond (verbal, written, response board) ● Provide model of performance task ● Modify informational text to fit the needs of the students ● Provide a digital or paper interactive notebook ● Present complex tasks in multiple ways ● Provide mnemonic strategies for Chemistry concepts 		<u>Technology:</u> <ul style="list-style-type: none"> ● Audio reading of text ● Text to type functions ● Videos to clarify/visualize Chemistry concepts ● Record class lecture/discussions and make accessible to student ● Nearpod- interactive presentations of notes ● Playposit - show a video clip about the topic and add your own questions for them to answer as they watch ● Allow students to type answers in chat on Teams <u>Other:</u> <ul style="list-style-type: none"> ● Arrange seating for maximum engagement and minimum distraction ● Accessible lab space (counter level) 		<u>In Class Assessments</u> <ul style="list-style-type: none"> ● Provide review packet or review sheet of concepts covered on the test ● Practice similar questions prior to the test ● Provide multiple options for projects ● Give a timeline of when things are due and remind them of the process often. ● Use of timer in class ● Break all complex tasks into chunks
Step Up to Writing Step Up to Writing materials can be found in BPS Science K-12 Schoology Folder 9-12 Resources Chemistry Resources Curriculum Materials	<u>SUTW Strategy</u> <ul style="list-style-type: none"> ● Informal Outline ● Color-Coding – Informative/Explanatory Text ● Two-column notes ● I-V-F Topic Sentence progressing to Four Step Summary Paragraph ● CUPS – Capitalization, Usage, Punctuation, Spelling ● Transitions 				
Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom	Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications <ul style="list-style-type: none"> ● Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population ● All students are given an opportunity to engage in science discourse ● Teacher demonstrates high expectations for all students CLRT resources which align to Science content are denoted with a *				