

Marietta City Schools

2025–2026 District Unit Planner

Teacher(s)	Audrey Wakeley	Subject Group and Course	Group 4 - Chemistry		
Course Part and Topic	UNIT 4 - Electron Transfer Reactions Reactivity 3.2 - Electron Transfer Reactions	SL or HL / Year 1 or 2	SL / Year 2	Dates	01/07 - 02/11 (5 weeks)
Unit Description and Texts		DP Assessment(s) for Unit			
<ul style="list-style-type: none"> Chemistry for the IB Diploma Third Edition, Hodder Education 		<ul style="list-style-type: none"> Unit 04 Summative Assessment - <i>Paper 1 and 2 questions modeled after the real IB Exam Papers (2025 syllabus)</i> 			

INQUIRY: establishing the purpose of the unit
Transfer Goals

List here one to three big, overarching, long-term goals for this unit. Transfer goals are the major goals that ask students to “transfer” or apply their knowledge, skills, and concepts at the end of the unit under new/different circumstances, and on their own without scaffolding from the teacher.

Phenomenon: When iron and copper are exposed to the same humid environment, iron rusts rapidly while copper remains largely untarnished. This difference arises from distinct electron transfer reactions involved in the corrosion processes of each metal and their varying electrode potentials. Exploring this phenomenon uncovers how redox reactions, protective oxide layers, and electrochemical series explain the varying corrosion rates and their impact on material durability.

Statement of Inquiry: Electron transfer reactions drive essential processes in both natural systems and technological application, from cellular respiration and corrosion to energy storage in batteries and the development of sustainable energy solutions.

- Students can** deduce oxidation states of an atom in a compound or an ion.
- Students can** identify the oxidized and reduced species and the oxidizing and reducing agents in a chemical reaction.
- Students can** deduce redox half-equations and equations in acidic or neutral solutions.
- Students can** predict the relative ease of oxidation of metals.
- Students can** predict the relative ease of reduction of halogens.
- Students can** interpret data regarding metal and metal ion reactions.
- Students can** deduce equations for reactions of reactive metals with dilute HCl and H₂SO₄.

8. **Students can** identify electrodes as anode and cathode and identify their signs/polarities in voltaic cells and electrolytic cells based on the type of reaction occurring at the electrode.
9. **Students can** explain the direction of electron flow from anode to cathode in the external circuit and ion movement across the salt bridge.
10. **Students can** deduce the reactions of the charging process from given electrode reactions for discharge and vice versa.
11. **Students can** explain how current is conducted in an electrolytic cell.
12. **Students can** deduce the products of the electrolysis of a molten.
13. **Students can** deduce equations to show changes in the functional groups during oxidation of primary and secondary alcohols, including the two-step reaction in the oxidation of primary alcohols.
14. **Students can** deduce equations to show reduction of carboxylic acids to primary alcohols via the aldehyde and reduction of ketones to secondary alcohols.
15. **Students can** deduce the products of the reactions of hydrogen with alkenes and alkynes.

ACTION: teaching and learning through inquiry

Content / Skills / Concepts - Essential Understandings	Learning Process
<p><u>Reactivity 3.2.1</u> Oxidation and reduction can be described in terms of electron transfer, change in oxidation state, oxygen gain/loss or hydrogen loss/gain. A radical is a molecular entity that has an unpaired electron. Radicals are highly reactive. <i>Deduce oxidation states of an atom in a compound or an ion.</i> <i>Identify the oxidized and reduced species and the oxidizing and reducing agents in a chemical reaction.</i></p> <ul style="list-style-type: none"> ● Include examples to illustrate the variable oxidation states of transition element ions and of most main group non-metals. ● Include the use of oxidation numbers in the naming of compounds. 	<p>Learning experiences and strategies/planning for self-supporting learning:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Socratic seminar <input checked="" type="checkbox"/> Small group/pair work <input checked="" type="checkbox"/> PowerPoint lecture/notes <input checked="" type="checkbox"/> Individual presentations <input checked="" type="checkbox"/> Group presentations <input checked="" type="checkbox"/> Student lecture/leading

<p>Reactivity 3.2.2 Half-equations separate the processes of oxidation and reduction, showing the loss or gain of electrons. <i>Deduce redox half-equations and equations in acidic or neutral solutions.</i></p> <p>Reactivity 3.2.3 The relative ease of oxidation and reduction of an element in a group can be predicted from its position in the periodic table. The reactions between metals and aqueous metal ions demonstrate the relative ease of oxidation of different metals. <i>Predict the relative ease of oxidation of metals.</i> <i>Predict the relative ease of reduction of halogens.</i> <i>Interpret data regarding metal and metal ion reactions.</i></p> <ul style="list-style-type: none"> The relative reactivity of metals observed in metal/metal ion displacement reactions does not need to be learned; appropriate data will be supplied in examination questions. <p>Reactivity 3.2.4 Acids react with reactive metals to release hydrogen. <i>Deduce equations for reactive metals with dilute HCl and H₂SO₄.</i></p> <p>Reactivity 3.2.5 Oxidation occurs at the anode and reduction occurs at the cathode in electrochemical cells. <i>Identify electrodes as anode and cathode and identify their signs/polarities in voltaic cells and electrolytic cells based on the type of reaction occurring at the electrode.</i></p> <p>Reactivity 3.2.6 A primary (voltaic) cell is an electrochemical cell that converts energy from spontaneous redox reactions to electrical energy. <i>Explain the direction of electron flow from anode to cathode in the external circuit and ion movement across the salt bridge.</i></p> <ul style="list-style-type: none"> Construction of primary cells should include: half-cells containing metal/metal ion, anode, cathode, electric circuit, salt bridge. 	<p><input type="checkbox"/> Interdisciplinary learning</p> <p>Details: <i>Students will learn through a combination of presentations, small group work, practice problems, and lab work.</i></p> <p><input checked="" type="checkbox"/> Other(s): <i>practice problems, lab work</i></p> <hr/> <p>Formative assessment(s):</p> <p><i>Short closer quizzes for each lesson</i> <i>Practice with Tools and Inquiries</i> <i>Daily formative checks</i></p> <hr/> <p>Summative assessments:</p> <p><i>Unit Exam - Paper 1 and 2 questions modeled after the real IB Exam Papers (2025 syllabus)</i></p> <p><i>Laboratory Assignment - assessing Tools and Inquiries practiced in the Unit</i></p>
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Reactivity 3.2.7

Secondary (rechargeable) cells involve redox reactions that can be reversed using electrical energy.

Deduce the reactions of the charging process from given electrode reactions for discharge and vice versa.

- Include discussion of advantages and disadvantages of fuel cells, primary cells, and secondary cells.

Reactivity 3.2.8

An electrolytic cell is an electrochemical cell that converts electrical energy to chemical energy by bringing about non-spontaneous reactions.

Explain how current is conducted in an electrolytic cell.

Deduce the products of the electrolysis of a molten salt.

- Construction of electrolytic cells should include: DC power source connected to anode and cathode, electrolyte.

Reactivity 3.2.9

Functional groups in organic compounds may undergo oxidation.

Deduce equations to show changes in the functional groups during oxidation of primary and secondary alcohols, including the two-step reaction in the oxidation of primary alcohols.

- Include explanation of the experimental set-up for distillation and reflux.
- Include the fact that tertiary alcohols are not oxidized under similar conditions.
- Names and formulas of specific oxidizing agents and the mechanisms of oxidation will not be assessed.

Reactivity 3.2.10

Functional groups in organic compounds may undergo reduction.

Deduce equations to show reduction of carboxylic acids to primary alcohols via the aldehyde and reduction of ketones to secondary alcohols.

- Include the role of hydride ions in the reduction reaction.
- Names and formulas of specific reducing agents and the mechanisms of reduction will not be assessed.

Differentiation:

- Affirm identity - build self-esteem
- Value prior knowledge
- Scaffold learning
- Extend learning

Details:

- *SWD/504 – Accommodations Provided*
- *ELL – Reading & Vocabulary Support*
- *Intervention Support*
- *Extensions – Enrichment Tasks and Project*

Tools and Inquiries:

Reactivity 3.2.2

Tool 1, Inquiry 2 - Why are some redox titrations described as “self-indicating”?

Reactivity 3.2.3

Tool 1, Inquiry 2 - What observations can be made when metals are mixed with aqueous metal ions and solutions of halogens are mixed with aqueous halide ions?

Reactivity 3.2.11

Reduction of unsaturated compounds by the addition of hydrogen lowers the degree of unsaturation.

Deduce the products of the reactions of hydrogen with alkenes and alkynes.

Approaches to Learning (ATL)

Check the boxes for any explicit approaches to learning connections made during the unit. For more information on ATL, please see [the guide](#).

Thinking

Social

Communication

Self-management

Research

Details:

Students will be continuously challenged to develop higher-order thinking skills as they take prior knowledge, combine it with new content, and synthesize new understandings and connections.

Students will build social groups through group work and intentional reflection activities.

Students will communicate their findings to their peers in the form of small-group presentations.

Students will continue to work on self-management and organization skills.

Students will complete background research to develop and extend their learning.

Language and Learning <i>Check the boxes for any explicit language and learning connections made during the unit. For more information on the IB's approach to language and learning, please see the guide.</i>	TOK Connections <i>Check the boxes for any explicit TOK connections made during the unit</i>	CAS Connections <i>Check the boxes for any explicit CAS connections. If you check any of the boxes, provide a brief note in the "details" section explaining how students engaged in CAS for this unit.</i>
<input checked="" type="checkbox"/> Activating background knowledge <input checked="" type="checkbox"/> Scaffolding for new learning <input checked="" type="checkbox"/> Acquisition of new learning through practice <input checked="" type="checkbox"/> Demonstrating proficiency <p>Details:</p> <p><i>Content and vocabulary introduced in previous science courses will be used in this unit.</i></p> <p><i>Students will use many of the concepts from this unit in future units throughout the course.</i></p> <p><i>Students will acquire new vocabulary.</i></p> <p><i>Students will continually demonstrate proficiency with chemistry vocabulary in class discussions and group work.</i></p>	<input type="checkbox"/> Personal and shared knowledge <input checked="" type="checkbox"/> Ways of knowing <input type="checkbox"/> Areas of knowledge <input type="checkbox"/> The knowledge framework <p>Details:</p> <p><i>TOK knowledge questions will be included as discussion options for each lesson.</i></p>	<input checked="" type="checkbox"/> Creativity <input type="checkbox"/> Activity <input type="checkbox"/> Service <p>Details:</p> <p><i>Students will be encouraged to consider the creativity involved in scientific experimentation. Students can explore alternative ways (visual, for example) to express and explain this creativity to others.</i></p>
Resources <i>List and attach (if applicable) any resources used in this unit</i>		
<ul style="list-style-type: none"> ● Chemistry for the IB Diploma Third Edition, Hodder Education ● IB Chemistry Guide First Assessment 2025 ● InThinking IB subject site for Chemistry ● IB Chemistry Schoology Course 		

REFLECTION: considering the planning, process, and impact of the inquiry

What worked well	What didn't work well	Notes / Changes / Suggestions
<i>List the portions of the unit (content, assessment, planning) that were successful</i>	<i>List the portions of the unit (content, assessment, planning) that were not as successful as hoped</i>	<i>List any notes, suggestions, or considerations for the future teaching of this unit</i>