

Marietta City Schools
2025-2026 District Unit Planner

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| Teacher(s) | Audrey Wakeley | Subject Group and Course | Group 4 - Chemistry | | |
| Course Part and Topic | UNIT 5 - Electron Sharing Reactions R3.3 Electron Sharing Reactions R3.4 Electron-Pair Sharing Reactions | SL or HL / Year 1 or 2 | SL / Year 2 | Dates | 02/12 - 03/12 (3 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 05 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 making medicines or fragrances, chemists often use nucleophilic substitution reactions to modify molecules. For example, converting a compound containing a chlorine atom into an alcohol can happen very quickly or slowly depending on the molecular structure. This is because the rate at which the nucleophile donates electrons to the carbon and replaces the halide depends on whether the carbon is attached to primary, secondary, or tertiary groups. Investigating this reveals how electron sharing during bond forming, steric effects, and reaction conditions influence the mechanisms and speeds of these important reactions in industry.

Statement of Inquiry: Electron sharing reactions shape the structure and properties of molecules, enabling the development of materials, medicines, and biological systems essential to modern life and technological advancement.

- Students can** identify and represent radicals, e.g. $\bullet\text{CH}_3$ and $\text{Cl}\bullet$.
- Students can** explain, including with equations, the homolytic fission of halogens, known as the initiation step in a chain reaction.
- Students can** explain, using equations, the propagation and termination steps in the reactions between alkanes and halogens.
- Students can** recognize nucleophiles in chemical reactions.
- Students can** deduce equations with descriptions and explanations of the movement of electron pairs in nucleophilic substitution reactions.
- Students can** explain, with equations, the formation of ions by heterolytic fission.

7. **Students can** recognize electrophiles in chemical reactions.
8. **Students can** deduce equations for the reactions of alkenes with water, halogens, and hydrogen halides.

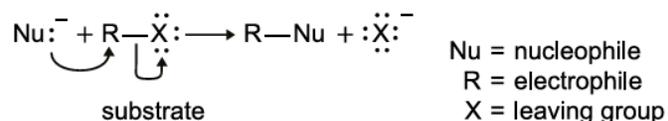
ACTION: teaching and learning through inquiry

| Content / Skills / Concepts - Essential Understandings | Learning Process |
|---|--|
| <p>Reactivity 3.3.1 A radical is a molecular entity that has an unpaired electron. Radicals are highly reactive. <i>Identify and represent radicals, e.g. $\bullet\text{CH}_3$ and $\text{Cl}\bullet$.</i></p> <p>Reactivity 3.3.2 Radicals are produced by homolytic fission, e.g. of halogens, in the presence of ultraviolet (UV) light or heat. <i>Explain, including with equations, the homolytic fission of halogens, known as the initiation step in a chain reaction.</i></p> <ul style="list-style-type: none"> ● The use of a single-barbed arrow (fish hook) to show the movement of a single electron should be covered. <p>Reactivity 3.3.3 Radicals take part in substitution reactions with alkanes, producing a mixture of products. <i>Explain, using equations, the propagation and termination steps in the reactions between alkanes and halogens.</i></p> <ul style="list-style-type: none"> ● Reference should be made to the stability of alkanes due to the strengths of the C-C and C-H bonds and their essentially non-polar nature. <p>Reactivity 3.4.1 A nucleophile is a reactant that forms a bond to its reaction partner (the electrophile) by donating both bonding electrons. <i>Recognize nucleophiles in chemical reactions.</i></p> <ul style="list-style-type: none"> ● Both neutral and negatively charged species should be included. | <p><i>Check the boxes for any pedagogical approaches used during the unit. Aim for a variety of approaches to help facilitate learning.</i></p> <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 <input type="checkbox"/> Interdisciplinary learning <p>Details:</p> <p><i>Students will learn through a combination of presentations, small group work, practice problems, and lab work.</i></p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Other(s): <i>practice problems, lab work</i> |

Reactivity 3.4.2

In a nucleophilic substitution reaction, a nucleophile donates an electron pair to form a new bond, as another bond breaks producing a leaving group.

Deduce equations with descriptions and explanations of the movement of electron pairs in nucleophilic substitution reactions.



- Further details of the mechanisms are not required at SL.

Reactivity 3.4.3

Heterolytic fission is the breakage of a covalent bond when both bonding electrons remain with one of the two fragments formed.

Explain, with equations, the formation of ions by heterolytic fission.

- Curly arrows should be used to show the movement of electron pairs during reactions.

Reactivity 3.4.4

An electrophile is a reactant that forms a bond to its reaction partner (the nucleophile) by accepting both bonding electrons from that reaction partner.

Recognize electrophiles in chemical reactions.

- Both neutral and positively-charged species should be included.

Reactivity 3.4.5

Alkenes are susceptible to electrophilic attack because of the high electron density of the carbon-carbon double bond. These reactions lead to electrophilic addition.

Deduce equations for the reactions of alkenes with water, halogens, and hydrogen halides.

- The mechanisms of these reactions will not be assessed at SL.

Formative assessment(s):

Short closer quizzes for each lesson
Practice with Tools and Inquiries
Daily formative checks

Summative assessments:

Unit Exam - Paper 1 and 2 questions modeled after the real IB Exam Papers (2025 syllabus)

Laboratory Assignment - assessing Tools and Inquiries practices in the Unit

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

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> |
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| <input checked="" type="checkbox"/> Activating background knowledge | <input type="checkbox"/> Personal and shared knowledge | <input type="checkbox"/> Creativity |

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|---|--|--|
| <input checked="" type="checkbox"/> Scaffolding for new learning <input checked="" type="checkbox"/> Acquisition of new learning through practice <input checked="" type="checkbox"/> Demonstrating proficiency Details: <i>Content and vocabulary introduced in previous science courses will be used in this unit.</i> <i>Students will acquire new vocabulary.</i> <i>Students will continually demonstrate proficiency with chemistry vocabulary in class discussions and group work.</i> | <input checked="" type="checkbox"/> Ways of knowing <input type="checkbox"/> Areas of knowledge <input type="checkbox"/> The knowledge framework Details: <i>TOK knowledge questions will be included as discussion options for each lesson.</i> | <input type="checkbox"/> Activity <input type="checkbox"/> Service Details: N/A |
| 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 <i>List the portions of the unit (content, assessment, planning) that were successful</i> | What didn't work well <i>List the portions of the unit (content, assessment, planning) that were not as successful as hoped</i> | Notes / Changes / Suggestions <i>List any notes, suggestions, or considerations for the future teaching of this unit</i> |
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| <ul style="list-style-type: none"> • | <ul style="list-style-type: none"> • | <ul style="list-style-type: none"> • |