Lesson 2-4: Organic Chemistry Reactions	
Curriculum Expectations	• A1.4 • A1.5 • A1.6 • A1.8 • A1.10 • A1.12 • A1.13 • B2.1 • B2.2 • B2.4 • B3.3 • B3.4
Learning Goals	By the end of this lesson you will: • know the various types of chemical reactions involving organic compounds • Be able to predict the products of a reaction based on the reactants • Understand how the structure of an organic compound affects its reactivity
Success Criteria	I know I have achieved the learning goals when I can describe the different types of chemical reactions that organic compounds undergo and predict the products of different reactions based on the nature and type of the reactants
Teacher Prep	• Check Aspirin synthesis lab works.

Minds On

Goal: This activity will help review with students the basics of chemical reactions.

1. Class Discussion

Instructions:

1. Prompt 1: Put the following prompt for the class to see: “What is a chemical reaction?”.
2. Lead a class discussion on what classifies something as a chemical reaction. Emphasize this isn’t a test, just an exercise to see how students interpret what a chemical reaction is.
3. Record student responses. Repeat the steps above for the following promt questions:
    a. “How do you know if a chemical reaction has occurred?”
    b. “Can a chemical reaction be undone? (can it go backwards)

Action

****Refer to the Differentiation Resources link for additional practice worksheets, and to enrich your classroom teaching using different tools throughout the lesson. ****

1. Student Notes: Have students create a set of notes for this lesson outlining different chemical reactions that occur to produce the different classes of organic compounds as well as the different reactions that the classes of organic compounds are involved in.

2. 2-4A: Chemical and Physical Changes

- Use the Powerpoint pdf to guide students through a lecture on chemical and physical changes.
- **Points of emphasis:**
    - how to distinguish between chemical and physical changes
    - evidence of a chemical change.
    - ask students to provide their own examples of physical and chemical changes.
- After the class lecture have students review the presentation with audio on their own. Students should prepare a set of notes for their own reference.
- Encourage questions from students.

3. **2-4B: Chemical Reactions – Hydrocarbons & Polymers**

- Begin by playing the video showing a rocket ship taking off. This is meant to provide context to the lesson, showing a chemical reaction in progress and how it can be used for the betterment of humanity.
- Use the pdf presentation at the top of the page to deliver a lecture to the class. As you work through the presentation, make sure to encourage questions and have students give examples of each type of reaction that they know of from their previous knowledge.
- Use the videos embedded in the lecture to guide students through the step-by-step processes of the different reactions.
- Repeat this process for each of the different reactions described.
- **Points of Emphasis:**
    - Organic chemical reactions are prevalent and important in our everyday lives.
    - Different classes of organic compounds undergo different types of reactions.
    - The structure of organic compounds plays a large role in determining what types of reactions they can undergo.
    - Polymerization reactions involve monomers binding to each other to form large structures.
- Have students review the material on their own, producing and refining a set of notes to summarize important points and identify which classes of compounds undergo which reactions.

4. **2-4C: Chemical Reactions – Alcohols & Ethers.**
    - Use the images from the learning activity to demonstrate the different examples of reactions involving alcohols & ethers.
    - Use the videos to demonstrate these different reactions and to describe the mechanisms of how these reactions occur.
    - **Points of Emphasis:**
        - Different classes of organic compounds undergo different types of reactions.
        - Alcohols are produced by addition reactions.
        - Addition reactions require the presence of a multiple bond on the reactant.
        - The structure of organic compounds plays a large role in determining what types of reactions they can undergo.
        - Dehydration & hydration reactions are reverse of each other.
        - Ethers are produced from the condensation of multiple alcohols.
    - Have students review the material on their own, producing and refining a set of notes to summarize important points and identify which classes of compounds undergo which reactions.

5. **2-4D: Chemical Reactions – Aldehydes & Ketones**
    - Use the images from the learning activity to demonstrate the different examples of reactions involving aldehydes & ketones
    - Use the videos to demonstrate these different reactions and to describe the mechanisms of how these reactions occur.

- **Points of Emphasis:**
    - Aldehydes are produced through controlled oxidation.
    - The nature of the alcohol (primary, secondary, tertiary) determines the reaction that will occur and what type of product will be produced.
    - This relates to accessibility of carbon atoms as well as the number of H atoms bound to the C.
    - Aldehydes are produced in controlled oxidation with primary alcohols, ketones with controlled oxidation of secondary.
    - Esters produced through esterification and the process of how they are formed will determine the name.
- Have students review the material on their own, producing and refining a set of notes to summarize important points and identify which classes of compounds undergo which reactions.

6. **Reaction Route Synthesizer Group Activity**
    - Have groups of students use the route synthesizer to produce different organic compounds. Give groups a starting reactant molecule and have them synthesize a product of your choice using different reactions mechanisms.
    - This activity will help students reinforce their knowledge of the different types of reactions that organic compounds can undergo.

7. **2-4E: Aspirin Screen Experiment.**
    - This can be done individually, in groups or as a class.
    - The activity involves going through a set of trials.
    - Have students begin with level 1 and follow the instructions on the screen.
    - Students should complete all components of the simulator including videos, questions, etc.
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Consolidation

1. **2-4F,G –** Practice worksheets for students, can be done, individually or in groups. This can be assigned as homework or completed in class. If completed in class, teacher should circulate around to make sure students are completing the work and answering any questions that arise. Answers should be taken up as a class, making sure to address all student questions and encouraging students to clarify any issues they are having.

2. **Homework assignment.** Have students research and identify one common chemical reaction involving organic compounds. The following class, each student should present their reaction, including the complete reaction equation and briefly describe

where the reaction is used (ie commercial application, natural, etc.) and why the reaction is important to humanity.

3. **2-4H: Organic Chemistry Reactions lab.** To be completed individually. Go over the assignment with the class emphasizing where marks are allocated, reminding students of proper submission protocols (file type, naming). **Emphasize,** answers to analysis questions must be written as full sentences and must have depth (ie justification for each answer) to receive the full marks. This must be completed individually.

****Refer to Differentiation Resources for additional practice worksheets, and to enrich your classroom teaching using different tools. ****