LESSON NINE

What is the difference between chemical and physical change?

SCIENCE

Asking Questions, Investigating, Analyzing Data, Constructing Explanations, Engaging in Argument and Obtaining, Evaluating, and Communicating Information

ENGLISH LANGUAGE ARTS Reading Informational Text, Writing an Explanation **GRADE 8** Two to Three

> 45-60 minute sessions



The difference between chemical and physical change might by confusing to students. In this lesson, students continue to learn about chemical reactions and evidence that indicates a chemical reaction has occurred. Students use text to gather information, write an explanation, engage in an investigation, and analyze and write a conclusion where they demonstrate their understanding of chemical reactions.



Common Core State Standards

- Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. CCSS.ELA-LITERACY.RST.6-8.3
- <u>Compare and contrast the information gained from experiments,</u> <u>simulations, video, or multimedia sources with that gained from reading</u> <u>a text on the same topic</u>. CCSS.ELA-LITERACY.RST.6-8.9
- Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. CCSS.ELA-LITERACY.WHST.6-8.2.B
- <u>Use precise language and domain-specific vocabulary to inform about or</u> <u>explain the topic</u>. CCSS.ELA-LITERACY.WHST.6-8.2.D





Common Core State Standards

- <u>Gather relevant information from multiple print and digital sources</u>, using search terms effectively; assess the credibility and accuracy of each source; <u>and quote or paraphrase the data and conclusions of others</u> while avoiding plagiarism and following a standard format for citation. CCSS.ELA-LITERACY.WHST.6-8.8
- Draw evidence from informational texts to support analysis, reflection, and research. CCSS.ELA-LITERACY.WHST.6-.8.9

Next Generation Science Standards

- Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. MS-PS-1-2
- Structures and Properties of Matter. PS1.A

Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.

• Chemical Reactions. PS1.B

Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of reactants.

Science and Engineering Practices

- <u>Asking questions</u> and defining problems
- Planning and carrying out investigations
- Analyzing and interpreting data
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and <u>communicating information</u>





LEARNING GOALS

- Understand the difference between chemical and physical change.
- Explain evidence of chemical change.



SUCCESS CRITERIA

- 1 Identify and describe chemical and physical change differences.
- 2 Construct an explanation of chemical change.

SUMMARY OF LESSON TASKS

- **1** Record initial thinking.
- 2 Read: Chemical Changes Versus Physical Changes.
- **3** Complete Double Entry Journal and discuss.
- 4 Write an explanation.
- **5** Conduct investigation.
- 6 Write a conclusion.



CULMINATING TASK

Conduct an exploration of chemical reactions and write an investigation analysis and conclusion. Use your Science Notebook to record your hypotheses, observations, and conclusion. Be sure to include the different forms of evidence of chemical change that you observed during the chemical reaction(s). Use information from the text, Double Entry Journal, discussions, demonstration, and exploration activity to support your analysis and conclusion.





PART I: INTRODUCTION

ACTIVATE PRIOR KNOWLEDGE Briefly review physical changes in matter with students, if necessary. Explain that understanding physical changes in matter is key to understanding chemical change.

INTRODUCE THE TOPIC Ask students, "What is chemical change?" Gives students time to think about what they have learned about chemical reactions in previous lessons and consider that learning in relation to this question. After a few minutes of thinking time, students write a brief response to the question in their Science Notebooks.

RECORD INITIAL THINKING Conduct a brief demonstration of a chemical reaction. See <u>Elephant Toothpaste</u> as one example

(http://chemistry.about.com/od/chemistrydemonstrations/a/elephanttooth.htm) of a chemical reaction. Use this brief demonstration to stimulate discussion and student thinking. You may wish to repeat the demonstration to support student thinking. Ask students to review their initial responses and refine them based on what they have just observed.



ANTICIPATED RESPONSE PEDAGOGICAL ACTION

If you notice students have difficulty making sense of what they have just observed, pose questions to support student thinking. Consider the following examples:

- What did you notice?
- What might be going on here?
- What do you think is causing this?

PART II: GUIDED PRACTICE

READ Provide students with access to the online text <u>Chemical Changes Versus Physical</u> <u>Changes</u> (http://www.chem4kids.com/files/matter_chemphys.html). The text gives students information about the differences between chemical and physical changes. Students read the first three sections: Chemical Change Versus Physical Change, No Change to Molecules, and Changing the Molecules.





COMPLETE DOUBLE ENTRY JOURNAL AND DISCUSS After reading

the text, students work with a partner to complete a joint Double Entry Journal where they record main ideas and supporting details from the text. Bring class together to engage in a whole class discussion. Remind students to use their notes and Double Entry Journal to support their discussion in response to the question, "What is chemical change?"



SUCCESS CRITERION EVIDENCE-GATHERING OPPORTUNITY

• Identify and describe evidence that a chemical reaction has taken place.

The information that students need to answer this question is on page 684 of the text. Gather evidence of learning by checking in with student pairs/triads as they work together to construct Double Entry Journals. As students work together to paraphrase and record evidence of chemical change, listen to student talk and look for evidence of understanding.



ANTICIPATED RESPONSE PEDAGOGICAL ACTION

If you notice students state evidence that a chemical reaction has taken place but demonstrate incomplete understanding, press for clarity and specificity. You might ask:

- How does this connect to what we have previously learned?
- What evidence do you have?
- What is an example?

WRITE AN EXPLANATION Write a one to two-paragraph explanation in response to the question, "What is evidence that a chemical reaction has taken place?" Include information that shows your understanding of these indicators. Be sure to include the different forms of evidence of chemical change during a chemical reaction and show how this differs from physical change. Support your explanation with evidence from the demonstration, texts, discussions, and other sources.





What is the difference between chemical and physical change?

SUCCESS CRITERION EVIDENCE-GATHERING OPPORTUNITY

- Identify and describe evidence that a chemical reaction has taken place.
- Construct a written explanation.

Check that explanations demonstrate understanding of the indicators. Also, check that students use information from the demonstration, texts, discussions, and other sources to support their explanations. Explanations include the following:

- accurate descriptions of the indicators of chemical change (gas production, formation of a precipitate, color change, temperature change)
- appropriate use of content vocabulary
- reference relevant and appropriate evidence to support explanation

CONDUCT INVESTIGATION In this investigation students will continue to explore chemical reactions. Choose one of the following investigation activities to support your students. Remind students to use their Science Notebooks to record their observations and any notes related to the investigation.

Option 1 Guide students in an exploration activity like the one described in <u>Middle</u> <u>School Chemistry Chapter 6 Lesson 1</u>

(http://www.middleschoolchemistry.com/lessonplans/chapter6/lesson1). Here, students work independently to complete an exploration of chemical reactions using what they have learned. The <u>Middle School Chemistry lesson activity guide</u> (http://www.middleschoolchemistry.com/pdf/chapter6/6.1_student.pdf) that accompanies the Middle School Chemistry lesson supports students in formulating hypotheses, performing a series of investigations, recording observations, drawing conclusions, and formulating a written analysis.

Option 2 In the second option, provide students with the <u>Inquiry in Action</u>, <u>Activity Guide 5.1, pp. 254-259</u>. This lab guide supports students as they investigate the question, "How can you use the ways substances react to tell similar-looking substances apart?" Students work with simple substances and explore chemical reactions. Like Option 1, students will use what they have learned to formulate hypotheses, perform investigations, record observations, draw conclusions, and formulate a written analysis and interpretation of their findings.



Option 2 is also available at the following link: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ah UKEwiHjZm9kqvNAhUXz2MKHUo2AeMQFggeMAA&url=http%3A%2F%2Fwww.i nquiryinaction.org%2Fpdf%2Fchapter5%2F5.1_teacher.pdf&usg=AFQjCNHS0_oQG 9TuZB8ZPqyWYRTJqusZMA&sig2=w9VPug6lUSAaXQo0mYPDHA

Regardless of the option selected, remind students that the work the record in their Science Notebooks must make specific connections to the evidence of chemical change they have learned about in this lesson.

PART III: CULMINATING TASK

WRITE A CONCLUSION In the final task, students conduct an exploration of chemical reactions and write an investigation analysis and conclusion. Students use their Science Notebooks to record their hypotheses, observations, analyses, and conclusion. Written conclusions should include the different forms of evidence of chemical change that were observed during the chemical reaction(s) investigation. Students should also use information from the text, Double Entry Journal, discussion, demonstration, and investigation to support their explanations. The conclusion includes evidence that students can:

- link observations to evidence of chemical change
- accurately use of key content vocabulary
- reference relevant and appropriate evidence to support conclusion



Background

 <u>Middle School Chemistry Teacher Guide</u> http://www.middleschoolchemistry.com/lessonplans/chapter6/lesson3





DOUBLE ENTRY JOURNAL:

CHEMICAL CHANGES VS PHYSICAL CHANGES

Main ideas	Supporting details

