

# LESSON ELEVEN

What happens to matter when thermal energy is added or removed?

## SCIENCE

Asking Questions, Developing Models  
and Constructing Explanations

## ENGLISH LANGUAGE ARTS

Reading Informational Text, Writing an Explanation

GRADE 8

45-90  
minutes



## PURPOSE

In this lesson, students gain a deeper understanding of particle motion in chemical reactions. Students continue to use texts to gather information, participate in discussions to refine their understandings, and use models to support written explanations.



## STANDARDS

### ● Common Core State Standards

- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). CCSS.ELA-LITERACY.RST.6-8.7
- 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
- Use precise language and domain-specific vocabulary to inform about or explain the topic. CCSS.ELA-LITERACY.WHST.6-8.2.D
- Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. CCSS.ELA-LITERACY.WHST.6-8.8



## STANDARDS CONTINUED

### ● Next Generation Science Standards

- Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. MS-PS-1-4
- Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. MS-PS-1-5
- 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.

The total number of each type of atom is conserved, and thus the mass does not change.

### ● Science and Engineering Practices

- Asking questions and defining problems
- Developing and using models
- Constructing explanations and designing solutions



- Understand particle motion is directly related to the presence or absence of thermal energy.



- 1 Explain what happens to matter (particles) when thermal energy is added or removed.
- 2 Reference relevant and appropriate evidence from text(s) and discussions to support explanation.

What happens to matter when thermal energy is added or removed?



- 1 Read: [Collision Theory and Rates of Reaction](#).
- 2 Complete Double Entry Journal and discuss.
- 3 Generate a model and write an explanation.



### CULMINATING TASK

Write a one to two-paragraph explanation describing how matter is affected in the presence or absence of thermal energy. Generate a model of this effect, clearly labeling the components in your model. Support your explanation with information from the video, discussions, and previous readings. Cite your sources.

**INTRODUCE THE TOPIC** Explain that in today's lesson, students will explore particle motion in matter when thermal energy is added or removed. At the end of the lesson, students will write an explanation that responds to the question: What happens to matter when thermal energy is added or removed?

## PART II: GUIDED PRACTICE



## ANTICIPATED RESPONSE PEDAGOGICAL ACTION

If you notice that students have difficulty understanding the assumptions of the model or the model itself, give support by pausing periodically. Provide time for discussion in partnerships or groups and check for understanding. Giving students with time to think and talk about the concepts before moving forward is helpful for all students. Questions to ask include:

- What do you think will happen when we increase the temperature?
- How do you know?
- What is your evidence?

**RECORD INITIAL THINKING** Create a whole-class Double Entry Journal. Initiate a whole group discussion of the question, “What happens to matter when thermal energy is added or removed?” Chart student responses in a whole class Double Entry Journal. Probe students’ thinking by asking questions that include:

- What’s happening here?
- What did you observe? How do you know?
- What’s causing this?



- Explain what happens to matter when thermal energy is added or removed.

During the whole class discussion, check students’ developing understanding of the particle motion in the presence and absence of heat. Note the language students use to describe particle motion. At this point, students might strictly rely on the [Changing Matter](#) model, referencing observations to support their explanations.



## ANTICIPATED RESPONSE PEDAGOGICAL ACTION

If students limit their support for explanations to the model they observed, push students to also consider information they learned in previous lessons. You might consider prompting students by presenting them with topics that they have studied previously with connections to the current lesson topic. Examples might include:

- chemical versus physical change
- characteristics of chemical reactions
- simple and complex molecules

**READ** Provide students with access to the online text [Collision Theory and Rates of Reactions](http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway_pre_2011/rocks_metals/7_faster_slower1.shtml)

([http://www.bbc.co.uk/schools/gcsebitesize/science/ocr\\_gateway\\_pre\\_2011/rocks\\_metals/7\\_faster\\_slower1.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway_pre_2011/rocks_metals/7_faster_slower1.shtml)). The text, available on the BBC website, gives students information about the particle motion and rates of reaction. It is important for students to have access to the online version of the text because there are animations that will support them with comprehension. You may instead choose to project the online version of the text and read the text together. In this case, stop at key points to discuss the main ideas and supporting details in the text. Also complete the Double Entry Journal as a whole class. Note that this will add time to your lesson

**COMPLETE DOUBLE ENTRY JOURNAL AND DISCUSS** After students read the text, they complete a Double Entry Journal where they use information from the text and observation to respond to the opening question, “What happens to matter when thermal energy is added or removed?” Students also provide support for their responses and cite the source of information. Give students time to discuss their Double Entry Journals in pairs or small groups to compare responses and supporting evidence.



- Explain what happens to matter when thermal energy is added or removed.
- Reference relevant and appropriate evidence from text(s).

What happens to matter when thermal energy is added or removed?

Conduct spot checks while students complete their Double Entry Journal. Check that students use content vocabulary when appropriate. You can also observe and listen to students' use of the Double Entry Journal as an aid to support them in engaging in pair and small group discussions.



What happens to matter when thermal energy is added or removed?

DOUBLE ENTRY JOURNAL

What happens to matter when thermal energy is added or removed?	How do you know? What is your evidence? Cite your sources.