

LESSON FOUR

What is the periodic table?

SCIENCE

Constructing Explanations
Obtaining, Evaluating, and Communicating Information

ENGLISH LANGUAGE ARTS

Reading Informational Text, Writing an Explanation

GRADE 8

Three to Four
45-minute
sessions



PURPOSE

The periodic table is displayed in many science classrooms. Yet, not all students have an understanding of the information these organizers display. In this lesson, students learn about the periodic table and the relationships between the groups of elements. Students use two texts to gather information about the elements in the periodic table, engage in a research task, and prepare a group presentation where they demonstrate their understanding of the relationship between the elements and their arrangements.



STANDARDS

● Common Core State Standards

- Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
CCSS.ELA-LITERACY.RST.6-8.2
- 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

● Common Core State Standards

- Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. CCSS.ELA-LITERACY.SL.8.4
- Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. CCSS.ELA-LITERACY.SL.8.5

● 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.

● Science and Engineering Practices

- Constructing explanations and designing solutions
- Obtaining, evaluating, and communicating information



LEARNING GOALS

- Understand that atoms of the same element have shared characteristics.
- Understand the relationship between the elements and their arrangements in a periodic table (columns & rows).



SUCCESS CRITERIA

- 1 Identify shared characteristics for the same group of elements.
- 2 Describe the predictive power of a good model and name the periodic table as one example.
- 3 Identify main ideas and supporting details from text.
- 4 Reference relevant and appropriate evidence from the texts to support summarization of current understanding.
- 5 Prepare and deliver group presentation.



SUMMARY OF LESSON TASKS

- 1 Discuss and report initial understandings.
- 2 Read and annotate: [A Historic Overview: Mendeleev and the Periodic Table](#).
- 3 Write summary.
- 4 Read and annotate: [The Modern Periodic Table](#).
- 5 Complete Double Entry Journal.
- 6 Research a group of elements.
- 7 Create presentation for the research.
- 8 Group presentations.



CULMINATING TASK

Work with your peers to learn about one group of elements. In your groups, research the assigned element group and prepare a presentation. As part of your work, each group member is responsible for individually studying one element within the assigned element group. This will help you gather information to help your group understand the shared characteristics of the elements that are in your assigned group (alkali, alkaline, metals, etc.). Group presentations should follow a logical structure, include relevant and accurate information, and make use of appropriate visuals to support text-based information.

PART I: INTRODUCTION

INTRODUCE THE TOPIC Ask students, “What is the periodic table? What kind of information can we gather from it? How might it be useful to our study of atoms?”

DISCUSS AND REPORT INITIAL UNDERSTANDINGS Students participate in brief small group discussions to elicit initial understandings to the three questions and report their discussions to the whole group. Divide students into small groups and have them self-select group roles, including recorder and reporter. Additional group roles may include facilitator and timekeeper. The recorder keeps track of the small group discussion and records notes corresponding to each of the three questions using a Triple Entry Journal format, with one column corresponding to each question. Ask the reporter for each group to share their group discussion points. As students share their corresponding discussion points, you might choose to record these in a whole class Triple Entry Journal. This could be projected and used to model, record, and display small group responses.

PART II: GUIDED PRACTICE

READ AND ANNOTATE Provide students with a copy of the text [A Historic Overview: Mendeleev and the Periodic Table](http://genesmission.jpl.nasa.gov/educate/scimodule/UnderElem/UnderElem_pdf/HistOverST.pdf) (http://genesmission.jpl.nasa.gov/educate/scimodule/UnderElem/UnderElem_pdf/HistOverST.pdf). This text gives students background about the periodic table, introduces important content vocabulary, and describes the importance of having good models. It is a lengthy text and might be challenging for students. You may choose to read and annotate the text together if your students would benefit from that level of support.



ANTICIPATED RESPONSE PEDAGOGICAL ACTION

If students require assistance with clarifying meaning or keeping track of main ideas, use the following prompts to support reading and annotating:

- What does that mean?
- What do we know? What’s our evidence?
- How can we combine these ideas?

WRITE A SUMMARY Students write a one to two-paragraph summary of the reading. Summaries demonstrate understanding of the reading by including the main idea(s) of the text along with *relevant* details that support the main idea(s).



SUCCESS CRITERION

EVIDENCE-GATHERING OPPORTUNITY

- Identify main ideas and supporting details from text.
- Reference appropriate and relevant evidence from the texts to support summarization.

Check that summaries include the main ideas of the text and include the following: description of the periodic table, discussion of Mendeleev and his contribution, and an explanation of how Mendeleev's periodic table fits the definition of a good model.

READ AND ANNOTATE Provide students with access to the text [The Modern Periodic Table](http://genesission.jpl.nasa.gov/educate/scimodule/UnderElem/UnderElem_pdf/ModPerTableST.pdf)

(http://genesission.jpl.nasa.gov/educate/scimodule/UnderElem/UnderElem_pdf/ModPerTableST.pdf). This text compares the modern periodic table to Mendeleev's periodic table. It introduces important organizing concepts about the elements, their arrangement in the periodic table, and key content vocabulary. Remind students of the original question for the lesson: What is the periodic table? Students read and annotate the text for main idea and supporting details, also using the lesson question to guide their reading.



ANTICIPATED RESPONSE

PEDAGOGICAL ACTION

If you anticipate students will experience difficulty reading and annotating the text independently, use the text as a shared reading and annotating opportunity. Depending on the degree of support your students require, you may choose to guide students in reading and annotating a couple of paragraphs of the text together, then releasing responsibility and allowing students to practice annotation independently, pulling them back based on how well students progress through the task.

COMPLETE DOUBLE ENTRY JOURNAL Students return to the text to review what they have just learned and complete a Double Entry Journal where they record the main ideas and supporting details of each section (i.e., groups, periods, classification, metals, nonmetals, metalloids) paraphrasing the information. This supports students in solidifying their understandings about elements and the information that they can glean from the periodic table in preparation for the research activity.



SUCCESS CRITERION

EVIDENCE-GATHERING OPPORTUNITY

- Paraphrase important information.

Gather evidence of learning by checking students Double Entry Journals as they paraphrase important information (e.g., main ideas and supporting details) from the text.

RESEARCH A GROUP OF ELEMENTS Introduce the research activity Study a Group of Elements. Students work in their small groups to conduct a short study of a selected group of elements. Show students how they can use the periodic table and interactive website(s) to learn about a group of elements, identify its properties, and gather information about a specific element within that group. Students record information related to group and specific element studied in their Science Notebooks.

Note: Although students will be working in small groups, each student is responsible for researching an individual element on their own. Students require a laptop/tablet that they can use to access the following websites and explore an interactive periodic table: <http://www.chemeddl.org/resources/ptl/> or <http://www.rsc.org/periodic-table/trends>. If no laptop or tablet is readily available, alternatively prepare a group element handout for each group so that students might engage in their own study of the elements. This will require a bit more time for preparation of materials.



SUCCESS CRITERION

EVIDENCE-GATHERING OPPORTUNITY

- Identify shared characteristics for the same group of elements.

Describe the predictive power of a good model and name the periodic table as one example. As students research, check-in with individual groups and students and review the descriptive notes about group of elements and specific element under study. Student notes serve as an indicator of learning

progress and are used to identify areas where students might benefit from additional sources or support.

CREATE PRESENTATION FOR THE RESEARCH Students work in their groups to prepare a multimedia or poster presentation showcasing their findings. See Culminating Task section below for more on what should be included in the presentation.

PART III: CULMINATING TASK

GROUP PRESENTATIONS Student groups make learning public by sharing their research in short class presentations. Group presentations follow a logical structure, include relevant and accurate information, and make use of appropriate visuals to support text-based information. Additional criteria include:

- logical structure: introduction of group, shared characteristics, and periodic trend information
- relevant and accurate information (atomic number, element names/discovery information)
- precise language and content vocabulary
- appropriate use of visuals to support text-based information
- maintenance of eye contact
- speaking in clear voice
- use of appropriate tone
- description of group member roles



SUCCESS CRITERION

EVIDENCE-GATHERING OPPORTUNITY

- Identify shared characteristics for the same group of elements.
- Reference relevant and appropriate evidence from the texts
- Prepare group presentation

Review individual students' Science Notebooks to gather additional evidence of student learning.



ADDITIONAL LESSON RESOURCES

Article

- [Four New Element Names Are On the Table](http://www.sciencemag.org/news/2016/06/four-new-element-names-are-table?utm_campaign=news_daily_2016-06-08&et rid=51376168&et_cid=545916) – June 8, 2016
http://www.sciencemag.org/news/2016/06/four-new-element-names-are-table?utm_campaign=news_daily_2016-06-08&et rid=51376168&et_cid=545916

Element Cards

- [Experiments in Character Design Flash Cards](http://kcd-elements.tumblr.com/) – Designed by artist Kaycie D. and available at <http://kcd-elements.tumblr.com/>

TRIPLE ENTRY JOURNAL (WHOLE GROUP CHART)

What is the periodic table?	What kind of information can we gather from it?	How might it be useful to our study of atoms?



DOUBLE ENTRY JOURNAL

Main ideas	Supporting details

STUDY A GROUP OF ELEMENTS

PART I: GROUP STUDY

As a group, you will first work together to:

- Learn about the group of elements you have been assigned (alkali, alkaline, etc.)
- Identify the elements that belong to your assigned group of elements
- Identify and describe the shared properties, or characteristics, of your assigned group of elements
- Other relevant and accurate information about the elements in the group

PART II: GROUP STUDY

Individually, select one element in your group to study. The element should be different from that of any of your team members. Find information about your element online including information about how your element was discovered and its atomic number. Record all information in your Science Notebook.

PART III: GROUP PRESENTATION

Prepare a group presentation (poster or multimedia). You may use PowerPoint, Google Slides, Prezi, etc. Be sure to meet the following criteria:

- Presentation follows a logical structure (beginning, middle, and end)
- Describe group members and their role in your group
- Introduce group of elements, shared characteristics, and periodic trend information
- Include relevant and accurate information about the group of elements, including atomic number, element names, and discovery information
- Use precise language and appropriate vocabulary
- Use appropriate visuals to support text-based information
- Maintain eye contact
- Speak in clear voice