

# Mignone Halls of Gems and Minerals



## GRADES 9–12 • Physical Science Activity Sequence

### Natural Phenomenon

Minerals have unique physical, optical, and chemical properties.

### Investigation Question

How do the properties of a mineral determine how humans might use it?

**Overview:** Students will make connections between the properties of minerals and how humans design gems.

1. **Before the Visit:** Through a photo slideshow, students observe four specimens from the Mignone Halls of Gems and Minerals. Students then generate questions about minerals and their properties that make them suitable for human use.
2. **At the Museum:** At seven highlighted stops in the halls, students use worksheets to first examine their birthstones, and then—through a series of observations—explore basic information about the periodic table and the different properties of minerals.
3. **Back in the Classroom:** Students share and process what they've learned at the Museum, and then revisit the pre-visit photo slideshow and questions.

# Correlation to Standards

This activity supports the following Next Generation Science Standards:

## Performance Expectations

### HS-PS2-6 Motion and Stability: Forces and Interactions

Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

## Disciplinary Core Ideas

### PS2.B: Types of Interactions

Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.

## Crosscutting Concepts

### Structure and Function

Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

## Science & Engineering Practices

### Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).

# Before the Visit

Through a photo slideshow, students observe four specimens from the Mignone Halls of Gems and Minerals. Students then generate questions about minerals and their properties that make them suitable for human use.

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**TIME** One class period

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**PREPARATION**

Teacher:

- Review the Educator’s Guide to get an advance look at the major themes of the halls and what students will encounter.
  - Review this three-part activity sequence and decide how students will engage with the content before, during, and after the visit.
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**PROCEDURE**

1. **Students are introduced to the featured phenomenon**—that minerals have unique physical, optical, and chemical properties—by exploring Part 1 of a two-part photo slideshow (download at [amnh.org/gems-minerals-educators](https://amnh.org/gems-minerals-educators)):
    - **Part 1: Before the Museum Visit** features four specimens from the hall. This engagement activity uses the Visual Thinking Strategy (VTS) to help students practice observation, thinking, listening, and communication skills.
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2. **Students generate questions** about how humans might use these minerals in everyday life, as well as the information humans need to figure out how to use them. Questions can be recorded on a class or group chart so that students can revisit the questions after their trip to the Museum.

Tell students that at the Museum, they will investigate mineral properties through an exploration of birthstones and then apply that to other uses post-visit.

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3. **Teacher prepares students for the Museum visit.** (See next page.)

# At the Museum

At seven highlighted stops in the halls, students use worksheets to first examine their birthstones, and then—through a series of observations—explore basic information about the periodic table and the different properties of minerals.

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**TIME** 45 to 60 minutes

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**PREPARATION** Teacher:

- Become familiarized with the student worksheet, the answer key, the notes to educator, and the map (download at [amnh.org/gems-minerals-educators](https://amnh.org/gems-minerals-educators)).
  - Distribute and review worksheets with students.
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- PROCEDURE**
1. All students investigate their birthstone and mineral properties. They will:
    - Learn about how people transform minerals into gems.
    - Observe their birthstone and the mineral from which the gem is derived.
    - Play an interactive to explore elements on the periodic table and how atoms of different elements combine to form minerals.
    - Examine different types of bonds and how the strength of a bond impacts a mineral.
    - Explore the physical and optical properties of minerals.
    - Revisit the birthstone to apply their understanding.

# Back in the Classroom

Students share and process what they’ve learned at the Museum, and then revisit the pre-visit photo slideshow and questions.

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**TIME** One class period

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**PREPARATION** Teacher:

- Review the answer key to worksheets.
  - Plan how students will surface, analyze and interpret, and share information gathered at the Museum.
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**PROCEDURE** 1. Each student pairs with someone with a different birthstone and uses “Think, Pair, Share” to compare and discuss the information they collected on their worksheets. Suggested prompts:

- What are this specimen’s observable traits?
  - Based on these observable traits and other information gathered in your worksheets, what does or does not make your birthstone a good gem?
  - What mineral properties are important for gem/birthstone use?
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2. Students record findings on a chart (sample below), and analyze and discuss it. Suggested prompts:

- Compare the specimens. Which is better suited for a gem? Why?

	Student 1 birthstone: _____	Student 2 birthstone: _____
Observable Traits: Gem		
Observable Traits: Mineral		
Chemical Composition		
Hardness		
Cleavage/Fracture		
Tenacity *		

\* Students can research any missing information from suggested websites in the “Additional Resources” section.

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3. **Students revisit the specimens** from the pre-visit photo slideshow by exploring:
    - **Part 2: After the Museum Visit.** Students use their observations and what they've learned at the Museum and in the group discussions to figure out the connections between each mineral's usage and its properties and chemical composition.
  4. **Students revisit the list of questions** they generated before their Museum trip to see which ones they can explain and which ones need further investigation.
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**EXTENSION  
IDEAS**

Students investigate additional minerals and their properties and use by humans.

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**ADDITIONAL  
RESOURCES**

- [Minerals Education Coalition: Mineral Resource Database](https://mineralseducationcoalition.org/mining-minerals-information/minerals-database/)  
([mineralseducationcoalition.org/mining-minerals-information/minerals-database/](https://mineralseducationcoalition.org/mining-minerals-information/minerals-database/))  
This database contains minerals and ores of specific elements; individual, highlighted minerals; a limited number of rocks; and a few, key industrial materials for reference.
- [Hudson Institute of Mineralogy: Mindat](https://mindat.org) (mindat.org)  
An open database of minerals, rocks, meteorites and the localities they come from.
- [Amazing Mundo](https://amnh.org/explore/ology/earth/the-amazing-mundo) (amnh.org/explore/ology/earth/the-amazing-mundo)  
Students can take a quiz to find out about everyday objects that come from rocks and minerals.
- [All About Jade](https://amnh.org/explore/ology/earth/all-about-jade) (amnh.org/explore/ology/earth/all-about-jade)  
Students can explore a virtual scrapbook about jade to discover why people all over the world love this tough and beautiful rock.