American Museum *of* Natural History

Mignone Halls of Gems and Minerals

GRADES 6–8 Activity Sequence

Natural Phenomenon

Minerals can have different properties, including colors, shapes, and sizes.

Investigation Question

What do minerals tell us about the environments in which they formed?

Overview: Minerals are Earth's natural marvel. In this activity sequence, students will observe the seemingly endless colors, shapes, and sizes of mineral crystals, and investigate how scientists use these properties to learn about the environments in which the minerals formed.

1. **Before the Visit:** Through a photo slideshow, students observe five specimens and generate questions about these specimens and how they might have formed.
2. **At the Museum:** Students use worksheets first to examine basic information about the atomic structure, properties, and uses of minerals, and then to explore their assigned mineral-forming environment.
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

- **MS-ESS2-1 Earth's Systems**
  Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

Disciplinary Core Ideas

- **PS1.A: Structure and Properties of Matter**
  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. Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).

  Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- **PS1.B: Chemical Reactions**
  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 the reactants.
- **ESS2.A: Earth's Materials and Systems**
  All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.

Crosscutting Concepts

- **Stability and Change**
  Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale.
- **Developing and Using Models**
  Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.
- **Structure and Function**
  Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

Science & Engineering Practices

- **Developing and Using Models**
  Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop and use a model to describe phenomena.
- **Obtaining, Evaluating, and Communicating Information**
  Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods. Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or now supported by evidence

This activity can serve as a connector to the following Next Generation Science Standards:

Performance Expectations

- **MS-PS1-3 Matter and its Interactions**
  Develop models to describe the atomic composition of simple molecules and extended structures.
- **MS-PS1-3 Matter and its Interactions**
  Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Before the Visit

Through a photo slideshow, students observe five specimens from the Mignone Halls of Gems and Minerals. Students then generate questions about the specimens and how they might have formed; they will revisit these questions after the trip.

TIME One class period

PREPARATION Teacher:

- Review the Educator's Guide to get an advance look at the major themes of the hall 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. NOTE: This sequence uses a jigsaw strategy, in which students are divided into home groups of five students per group (see next page) .

PROCEDURE

1. **Students are introduced to the featured phenomenon**—that minerals can have different properties, including colors, shapes, and sizes—by exploring Part 1 of a two-part photo slideshow (downloadable at amnh.org/gems-minerals-educators):
    - **Part 1: Before the Museum Visit** features five specimens that formed in five different kinds of environments. This engagement activity uses the Visual Thinking Strategy (VTS) to help students practice observation, thinking, listening, and communication skills.
2. **Students generate questions about minerals and their colors, shapes, and sizes.** Questions can be recorded on a class or group chart so that students can revisit the questions after their trip to the Museum (see "Back in the Classroom" section). Suggested prompts (included in slideshow):
    - Each of these specimens formed in a different kind of environment. What questions do you have about them and how they might have formed?
3. **Teacher prepares students for the Museum visit.** (See next page.)

At the Museum

At highlighted locations in the hall, students use worksheets first to examine basic information about the atomic structure, properties, and uses of minerals, and then to explore their assigned mineral-forming environment.

TIME 45 to 60 minutes

PREPARATION

Teacher:

- Become familiarized with the student worksheets, the answer key, the notes to educator, and the map of the halls (downloadable at amnh.org/gems-minerals-educators).
- Organize home groups of five students per group.
- Assign worksheets to students within each home group:
  - Worksheet A: all students
  - Worksheets B1 to B5: one sheet per student in each home group
- Distribute the worksheets and map to students. Review them with students.

PROCEDURE

1. **All students examine basics about the atomic structure, properties, and uses of minerals** (Worksheet A).

2. **Each student investigates their assigned mineral-forming environment** (Worksheets B1 to B5):
   - Observe a large specimen to identify traits such as color, size, and shape.
   - Watch a video about their assigned environment.
   - Compare specimens to observe similarities and differences in traits and infer how these traits provide clues to how the specimens formed.
   - Revisit the initial large specimen to apply their understanding of mineral formation.

   If there is time, students can also:
   - Look for additional minerals that formed in the same environment.

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.

TIME One class period

PREPARATION Teacher:

- Review the answer key to worksheets.
- Plan how students will surface, analyze and interpret, and share information gathered at the Museum.

PROCEDURE

1. **Students first gather with other students who investigated the same mineral-forming environment.** They share the information they collected on their worksheets to compare and discuss findings about that environment. Each student consolidates findings on a four-column chart (see sample headers in step 2 below) to bring back to their home group.

2. **Students go back to their home group to share findings about all environments.** Students synthesize information on a four-column chart. Sample chart:

Mineral-Forming Environment	a mineral that formed in this environment	processes that form minerals in this environment (e.g. heat, pressure, weathering)
Igneous		
Pegmatitic		
Metamorphic		
Hydrothermal		
Weathering		

3. **Students analyze and discuss the chart.** Suggested prompts:
    - How do the minerals' traits provide clues to how they formed in their environments?
    - Compare the mineral-forming environments. What is similar or different about how minerals form in each environment?

4. **Students revisit the five specimens from the pre-visit photo slideshow** (downloadable at amnh.org/gems-minerals-educators) by exploring:
    - **Part 2: After the Museum Visit.** In this matching game, students use their observations and what they've learned at the Museum and in the group discussions to pair each specimen with the environment in which it formed.

5. **Students revisit the list of questions they generated before their Museum trip** to see which questions have been answered and which unanswered ones they would like to investigate further.

ADDITIONAL RESOURCES

- If Rocks Could Talk (amnh.org/explore/ology/earth/if-rocks-could-talk2)
  Every rock has a story to tell. Students can "meet" six rocks to find out the clues they provide about the history of Earth.
- Being a Geologist: Ed Mathez
  (amnh.org/explore/ology/earth/being-a-geologist-ed-mathez)
  In this interview, students can read about what we can learn from studying rocks.
- 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.
- 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.
- Start a Rock Collection (amnh.org/explore/ology/earth/start-a-rock-collection2)
  Students can collect, observe, sort, and display their own collections of rocks.