

# Mineral Basics & Properties

## WORKSHEET A

You will explore rocks, minerals, and crystals.

### STOP 1 Find the large wall interactive periodic table (“Minerals are Elementary!”)

Minerals are made of elements. These elements form bonds that hold a mineral together.

Look at a diagram of the periodic table (on the wall to the left of the screen). It shows the diversity of atoms that can make up minerals. How many elements do you recognize? \_\_\_\_\_

Explore the wall interactive to combine different atoms to make different kinds of minerals. Record the name and the chemical formula of one mineral that you formed: \_\_\_\_\_

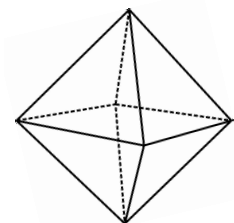
### STOP 2 Go to the “Crystal Basics” area of the hall

The arrangement of atoms affects the structure of a crystal. In the “Crystal Systems” section (on the right), look at the line drawings and touchable models. They represent the unit cells of the minerals on the wall above them. A unit cell is the microscopic basic building block of a mineral’s crystal structure. Look at the minerals on the wall. What connections do you observe between these minerals and their unit cells?

### STOP 3 Go to the “Mineral Basics” area of the hall, “What Is a Crystal?” section (left)

In Stop 1, you explored how atoms bond together to form minerals. In Stop 2, you saw how the atoms form unit cells. Here, in Stop 3, you’ll see how unit cells repeat and bond together to form crystal shapes.

Each kind of mineral has a unique, repeating three-dimensional (3-D) shape. Look at the colorful plastic stick-and-ball model. It shows how a unit cell repeats over and over again to form a mineral’s crystal shape. One magnesium (Mg) atom, two aluminum (Al) atoms, and four oxygen (O) atoms bond together to form the mineral spinel ( $\text{MgAl}_2\text{O}_4$ ). This combination, repeated, forms an octahedral shape.



octahedron

Examine both the plastic model and the real crystal. What do the model, the crystal, and the octahedron have in common?

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**STOP 4** Explore the rest of “Mineral Basics” (center and right sections)

In the “What Is a Rock?” section, examine the granite rock (#1). Describe what you see and feel:

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Look at the four objects below the granite rock (#2-5). What are they? How are they related to the granite?

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Next, explore the “What Is a Mineral?” section.

Compare these minerals. What do they have in common?

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How are they different?

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Pick your favorite mineral. Draw it:

Think about all that you have seen so far. What is the relationship between a rock, a mineral, and a crystal? Support your answer with your observations.

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**EXPLORE MORE**

1. Go to the “Minerals Properties and Uses” area to see what makes minerals useful to humans.
2. Visit the Hall of Gems. People use tools to turn rough crystals into cut and polished crystals we call gems. To be used in jewelry, the ideal gem must have certain properties. For example, it must be hard enough to resist scratching and durable enough to resist breaking.

# Igneous Environments

## WORKSHEET B1

You will explore rocks, minerals, and crystals that form in igneous environments.

### STOP 1 Find the two giant geodes near the hall entrance

Pick one of the giant geodes and observe it. How would you describe the geode and its crystals to someone who has never seen them?

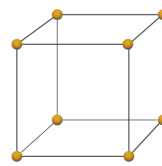
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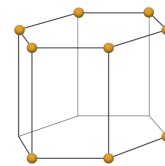
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Compare a few of the purple quartz crystals.  
Do you see a **repeating 3-D shape**?

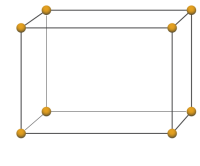
Which shape do you think it might be? Circle it:



cubic



hexagonal



orthorhombic

### STOP 2 Go to the "Igneous Environment" video

**Watch the video.** What interesting things did you learn about this environment? How do different conditions in this environment form different kinds of minerals? Draw or write about it:

**STOP 3** Go to the “Cooling Above and Below” case

A rock’s observable traits—such as color, texture, shape, and crystal size—are clues to how it formed.

**Extrusive Igneous Rocks (#1–7)**

Observe and compare these rocks. What traits do they have in common?

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What do these traits tell you about the conditions under which these rocks formed?

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**Intrusive Igneous Rocks (#11–19)**

Observe and compare these rocks. What traits do they have in common?

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What do these traits tell you about the conditions under which these rocks formed?

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**STOP 4** Putting it all together: Go back to the giant geode

Observe the geode again and read the panels. Under what conditions do you think the geode and its crystals formed? Support your inference with your observations and what you learned in Stops 2 and 3.

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**EXPLORE MORE**

1. In nearby cases, look for other minerals that formed in igneous environments. Observe their shapes, textures, and other traits. What do these clues tell you about how they form?
2. Play the “What is a Mineral?” interactive game to explore the traits that make a mineral a mineral.

# Pegmatitic Environments

## WORKSHEET B2

You will explore rocks, minerals, and crystals that form in pegmatitic environments.

### STOP 1 Find and observe large beryl crystals

Pick one of the beryl crystals and observe it closely. How would you describe it to someone who has never seen it?

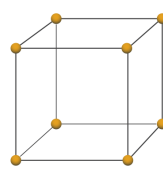
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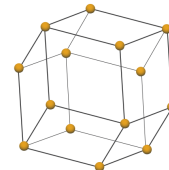
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Compare the three smaller beryl crystals.  
Do you see a **repeating 3-D shape**?

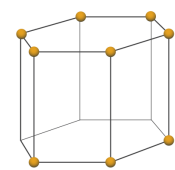
Which shape do you think it might be? Circle it:



cubic



dodecahedron



hexagonal

### STOP 2 Go to the "Pegmatitic Environment" video

**Watch the video.** What interesting things did you learn about this environment? How do different conditions in this environment form different kinds of minerals? Draw or write about it:

**STOP 3** Go to the “Simple Pegmatites” and “Complex Pegmatites” cases

A rock’s observable traits—such as color, texture, shape, and crystal size—are clues to how it formed.

Simple Pegmatites	Complex Pegmatites
<p>Observe and compare these rocks. What traits do they have in common?</p>	<p>Observe and compare these rocks. What traits do they have in common?</p>
<p>_____</p> <p>_____</p> <p>_____</p>	<p>_____</p> <p>_____</p> <p>_____</p>
<p>What do these traits tell you about the conditions under which these rocks formed?</p>	<p>What do these traits tell you about the conditions under which these rocks formed?</p>
<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

**STOP 4** Putting it all together: Go back to the large beryl crystals

Observe the beryls again and read the panels. Under what conditions do you think the beryls formed? Support your inference with your observations and what you learned in Stops 2 and 3.

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**EXPLORE MORE**

- In nearby cases, look for other minerals that formed in pegmatitic environments. Observe their shapes, textures, and other traits. What do these clues tell you about how they form?
- Play the “What is a Mineral?” interactive game to explore the traits that make a mineral a mineral.

# Metamorphic Environments **WORKSHEET B3**

You will explore rocks, minerals, and crystals that form in metamorphic environments.

## STOP 1 Find and observe a giant rock slab with garnet crystals

How would you describe this rock slab and its garnets to someone who has never seen them?

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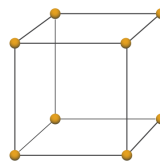


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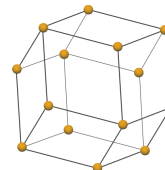
Compare a few of the garnets.  
(Tip: Also look at ones in a nearby case titled  
“Garnets: Beautiful, Durable, Useful”)

Do you see a repeating 3-D shape?

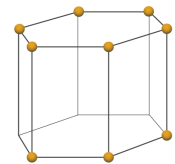
Which shape do you think it might be? Circle it:



cubic



dodecahedron



hexagonal

## STOP 2 Watch a video about metamorphic environments and explore nearby specimens

**Watch the video.** What interesting things did you learn about this environment? How do different conditions in this environment form different kinds of minerals? Draw or write about it:

**STOP 3** Go to the “Metamorphism Great and Small” case

A rock’s observable traits—such as color, texture, shape, and crystal size—are clues to how it formed.

**Contact Metamorphism (#1-18)**

Observe and compare these rocks. What traits do they have in common?

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What do these traits tell you about the conditions under which these rocks formed?

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**Regional Metamorphism (#19-34)**

Observe and compare these rocks. What traits do they have in common?

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What do these traits tell you about the conditions under which these rocks formed?

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**STOP 4** Putting it all together: Go back to the giant rock slab with garnet crystals

Observe the giant rock slab with garnet crystals again and read the panels. Under what conditions do you think they formed? Support your inference with your observations and what you learned in Stops 2 and 3.

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**EXPLORE MORE**

1. In nearby cases, look for other minerals that formed in metamorphic environments. Observe their shapes, textures, and other traits. What do these clues tell you about how they form?
2. Play the “What is a Mineral?” interactive game to explore the traits that make a mineral a mineral.



# Hydrothermal Environments WORKSHEET B4

You will explore rocks, minerals, crystals that form in hydrothermal environments.

## STOP 1 Find and observe the stibnite

Observe this stibnite and its crystals. How would you describe it to someone who has never seen it?

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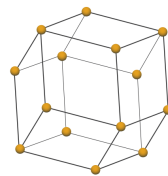
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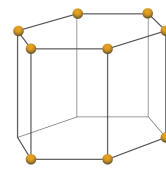
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Compare a few of the stibnite crystals.  
Do you see a **repeating 3-D shape**?

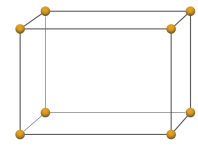
Which shape do you think it might be? Circle it:



dodecahedron



hexagonal



orthorhombic

## STOP 2 Go to the "Hydrothermal Environment" video

**Watch the video.** What interesting things did you learn about this environment? How do different conditions in this environment form different kinds of minerals? Draw or write about it:

### STOP 3 Go to the “Veins and Pockets of Crystals” case

A rock’s observable traits—such as color, texture, shape, and crystal size—are clues to how it formed.

#### Crystals That Grew In Veins (#1–14)

Observe and compare these crystals. What traits do they have in common?

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What do these traits tell you about the conditions under which these rocks formed?

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#### Crystals That Grew In Pockets (#15–26)

Observe and compare these crystals. What traits do they have in common?

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What do these traits tell you about the conditions under which these rocks formed?

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### STOP 3 Putting it all together: Go back to the stibnite

Observe the stibnite again and read the panels. Under what conditions do you think the stibnite crystals formed? Support your inference with your observations and what you learned in Stops 2 and 3.

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#### EXPLORE MORE

1. In nearby cases, look for other minerals that formed in hydrothermal environments. Observe their shapes, textures, and other traits. What do these clues tell you about how they form?
2. Play the “What is a Mineral?” interactive game to explore the traits that make a mineral a mineral.

# Weathering Environments

## WORKSHEET B5

You will explore rocks, minerals, and crystals that form in weathering environments.

### STOP 1 Find and observe the Singing Stone

Observe this rock. How would you describe it to someone who has never seen it?

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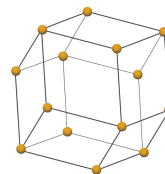


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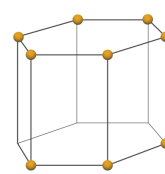
The blue mineral in this rock is called azurite.  
Find and compare this mineral in a nearby case titled "An Enriching Process" (# 16, 18).

Do you see a repeating 3-D shape?

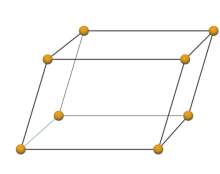
Which shape do you think it might be? Circle it:



dodecahedron



hexagonal



monoclinic

### STOP 2 Go to the "Weathering Environment" video

**Watch the video.** What interesting things did you learn about this environment? How do different conditions in this environment form different kinds of minerals? Draw or write about it:

### STOP 3 Go back to the “An Enriching Process” case

A rock’s observable traits—such as color, texture, shape, and crystal size—are clues to how it formed.

	Observe and compare the minerals. What traits do they have in common?	What do these traits tell you about the conditions under which these rocks formed?
<b>Leached Zone</b> (# 1–10)		
<b>Oxidized Zone</b> (# 11–21)		
<b>Enriched Sulfide Zone</b> (# 26–36)		

### STOP 4 Putting it all together: Go back to the Singing Stone

Observe the Singing Stone again and read the panels. Under what conditions do you think this rock formed? Support your inference with your observations and what you learned in Stops 2 and 3.

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#### EXPLORE MORE

- In nearby cases**, look for other minerals that formed in weathering environments. Observe their shapes, textures, and other traits. What do these clues tell you about how they form?
- Play the “**What is a Mineral?**” interactive game to explore the traits that make a mineral a mineral.