

7TH GRADE • UNDERSTAND

Rocks and Minerals



01 Minerals come in many colors and crystal shapes, each with its own chemical fingerprint.

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01 Minerals come in many colors and crystal shapes, each with its own chemical fingerprint.

Why Isn't There Gold in Your Backyard?

Grab whatever's nearby right now — a paperclip, your phone, a pencil. Many everyday objects depend on mineral resources that were mined from Earth, including metals, glass-making materials, and graphite. But those resources don't show up everywhere. That's the mystery we're cracking today: why do useful minerals show up in some places and not others, and how do scientists even tell one mineral from another in the first place?

Minerals vs. Rocks: What's the Difference?

A **mineral** is a naturally occurring solid with a specific chemical makeup and an orderly, repeating crystal structure — think of quartz, salt (halite), or diamond. A **rock**, on the other hand, is usually a mixture of one or more minerals bonded together. Granite, for example, is a rock made of interlocking mineral crystals, commonly quartz, feldspar, and mica.



02 Rising molten material can concentrate valuable minerals into veins deep underground.

Rocks come in three families based on how they form: **igneous** (cooled from molten rock), **sedimentary** (formed from compacted layers of sediment), and **metamorphic** (changed by intense heat and pressure). Over long periods, any rock can be broken down, buried, heated, melted, or cooled into another rock type — a process called the rock cycle. We'll dig deeper into that transformation in our next lesson.

Identifying Minerals Like a Geologist

Since minerals have consistent internal structures, they also have consistent physical properties, which scientists use like a fingerprint kit. One of the most useful is **hardness**, measured on the Mohs scale from 1 (softest) to 10 (hardest). Geologists love a simple field test: can the mineral scratch ordinary window glass, which sits at about 5.5 on the scale?



03 Testing whether a mineral scratches glass helps geologists estimate its hardness quickly.

Mineral	Mohs Hardness	Scratches Glass?	Everyday Product
Talc	1	No	Baby powder
Gypsum	2	No	Drywall
Calcite	3	No	Toothpaste (mild abrasive)

Mineral	Mohs Hardness	Scratches Glass?	Everyday Product
Fluorite	4	No	Source material for fluorine compounds
Apatite	5	Usually no	Fertilizer; phosphate in teeth and bones
Quartz	7	Yes	Glassmaking sand, electronics, countertops
Topaz	8	Yes	Jewelry
Corundum	9	Yes	Sandpaper, rubies/sapphires
Diamond	10	Yes	Cutting tools

Notice the pattern: once hardness climbs past that 5.5 threshold, minerals reliably scratch glass. Below it, they can't manage it. That single test helps geologists sort unknown samples fast, right in the field.

Scientists also classify useful elements by physical properties.

Metals, such as copper and iron, are shiny and conduct electricity well.

Nonmetals, such as sulfur, are often dull or brittle. **Metalloids**, including silicon, have properties between metals and nonmetals and are essential in computer chips. **Rare**

Earth elements help build strong magnets, phone speakers, screens, and electric motors.



04 Mineral deposits cluster in specific regions instead of spreading evenly across Earth.

Why Isn't Everything Everywhere?

Valuable mineral deposits, called **ores** when they contain enough useful material to be worth mining, don't form randomly. Earth's internal heat drives melting and the rise of molten rock, while energy from the Sun drives weathering, erosion, and the movement of water — together cycling Earth's materials. Rising molten material and mineral-rich fluids can concentrate metals like copper or gold into veins as they cool, especially near **plate tectonics** boundaries where plates collide, separate, or slide. Other deposits form when water evaporates, groundwater carries minerals, or weathering concentrates materials near the surface.

The hardness data above are evidence that minerals have distinct physical properties. Maps of mines provide another kind of evidence: deposits often line up with volcanic regions, mountain belts, ancient seabeds, or cracks where mineral-rich water once flowed. Rare Earth elements occur in many places, but large mineable deposits and processing facilities are concentrated in relatively few regions. This unevenness matters for everyone, shaping economies and global relationships.

So that pencil you grabbed earlier? The graphite in its core comes from a mineral that often forms when carbon-rich rocks are changed by heat and pressure deep underground — proof that Earth's hidden processes shape the objects in your hands every single day.

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01 Lesson Objective

In this lesson, you will explain how Earth's internal heat and energy from the Sun work together to create mineral, energy, and groundwater resources in some places but not others. You will also use physical properties, like hardness on the Mohs scale, to identify minerals the way a geologist does.

Standard: NGSS MS-ESS3-1

Bloom's Level: Understand

Bloom's Goal: Explain in your own words why mineral resources are unevenly distributed across Earth and how their physical properties reveal their identity.

Explanation: This objective asks you to understand and summarize the connection between geoscience processes and resource distribution, rather than just memorize facts about minerals.

Standard

NGSS MS-ESS3-1 (primary) — Explain from evidence how geoscience processes produce uneven distributions of mineral, energy, and groundwater resources.; NGSS MS-ESS2-1 (supporting) — Model the cycling of Earth's materials and the energy flow that drives it.; TEKS 6.10C (primary) — Describe how metamorphic, igneous, and sedimentary rocks form and change through the rock cycle.; TEKS 6.6C (supporting) — Identify metals, nonmetals, metalloids, and rare Earth elements by physical properties and import

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02 Vocabulary



03 Testing whether a mineral scratches glass helps geologists estimate its hardness quickly.

Define the terms in your own words.

Hardness (Mohs scale) *Explain in your own words:*

Igneous rock *Explain in your own words:*

Metal *Explain in your own words:*

Metalloid *Explain in your own words:*

Metamorphic rock *Explain in your own words:*

Mineral *Explain in your own words:*

Ore *Explain in your own words:*

Rock *Explain in your own words:*

Rock cycle *Explain in your own words:*

Sedimentary rock *Explain in your own words:*

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03 Multiple Choice

Read each question carefully and choose the best answer based on the article 'Why Isn't There Gold in Your Backyard?'



02 Rising molten material can concentrate valuable minerals into veins deep underground.

1. What is the main difference between a mineral and a rock?

- A.** A mineral is a naturally occurring solid with a specific chemical makeup and crystal structure, while a rock is usually a mixture of minerals
- B.** A mineral is always man-made, while a rock is always natural
- C.** A mineral is a type of rock found only underground
- D.** There is no difference; the words mean the same thing

2. Granite is made of interlocking crystals of which minerals?

- A.** Diamond, topaz, and corundum
- B.** Quartz, feldspar, and mica
- C.** Talc, gypsum, and calcite
- D.** Copper, iron, and sulfur

3. Which of the following is NOT one of the three main rock families?

- A.** Igneous
- B.** Sedimentary
- C.** Metamorphic
- D.** Crystalline

4. According to the Mohs hardness scale test described in the article, what hardness value does window glass sit near?

- A.** 1
- B.** 3
- C.** 5.5
- D.** 10

5. Based on the table, which mineral can scratch glass?

- A.** Talc
- B.** Gypsum
- C.** Calcite
- D.** Quartz

6. Which property is typical of metals, according to the article?

- A.** Dull and brittle
- B.** Shiny and conducts electricity well
- C.** Always softer than talc
- D.** Never found in nature

7. What is an 'ore'?

- A.** Any rock found near a volcano
 - B.** A mineral deposit containing enough useful material to be worth mining
 - C.** A synthetic material used in electronics
 - D.** A type of sedimentary rock only
-

8. Why do valuable mineral deposits often form near plate tectonic boundaries?

- A.** Because plates absorb all minerals and prevent them from spreading
 - B.** Because rising molten material and mineral-rich fluids can concentrate metals as they cool near these boundaries
 - C.** Because plate boundaries are always covered in ice, which preserves minerals
 - D.** Because minerals only form when plates are completely still
-

9. What evidence do maps of mines provide about mineral deposits?

- A.** Deposits are spread perfectly evenly across every country
- B.** Deposits often line up with volcanic regions, mountain belts, ancient seabeds, or cracks where mineral-rich water flowed
- C.** Deposits are found only in deserts
- D.** Deposits have no connection to Earth's geologic history

10. The graphite in a pencil often forms when carbon-rich rocks are changed by heat and pressure underground. This is an example of which rock-forming process?

- A.** Sedimentary formation from compacted layers
- B.** Metamorphic change
- C.** Evaporation of surface water
- D.** Cooling of molten rock at the surface

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04 True / False

Read each statement carefully. Decide whether it is True (T) or False (F) based on what you learned about minerals, rocks, and mineral resources.



04 Mineral deposits cluster in specific regions instead of spreading evenly across Earth.

1. A mineral is a naturally occurring solid with a specific chemical makeup and an orderly, repeating crystal structure.

☐ True ☐ False

2. A rock is always made of exactly one type of mineral and nothing else.

☐ True ☐ False

3. The three main rock families are igneous, sedimentary, and metamorphic.

☐ True ☐ False

4. On the Mohs hardness scale, a mineral with a hardness of 1 is harder than a mineral with a hardness of 10.

☐ True ☐ False

5. Minerals with a Mohs hardness above about 5.5 can typically scratch window glass.

☐ True ☐ False

6. Metals like copper and iron are generally shiny and conduct electricity well.

☐ True ☐ False

7. Metalloids, such as silicon, have properties that are entirely identical to metals.

☐ True ☐ False

8. Valuable mineral deposits are called ores when they contain enough useful material to be worth mining.

☐ True ☐ False

9. Mineral deposits are spread perfectly evenly across every region of Earth, so location does not affect where mining occurs.

☐ True ☐ False

10. Earth's internal heat and energy from the Sun both play roles in cycling Earth's materials and concentrating mineral deposits.

☐ True ☐ False

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05 Short Answer



01 Minerals come in many colors and crystal shapes, each with its own chemical fingerprint.

Answer each question in 1-2 complete sentences using what you learned in the article.

1. What is the difference between a mineral and a rock? Use granite as part of your explanation.

2. How does the Mohs hardness scale help geologists identify an unknown mineral, and what role does window glass play in this test?

3. Explain why valuable mineral ores are found in some places on Earth but not others, using plate tectonics as part of your answer.

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06 Case Study

Read the scenario carefully, then answer the three questions in complete sentences using evidence from the article.



03 Testing whether a mineral scratches glass helps geologists estimate its hardness quickly.

Scenario: A mining company is exploring two regions to find new mineral resources. Region A sits near an active plate tectonic boundary, where mountains have formed and volcanic rock is common. Region B is a flat plain far from any plate boundary, made mostly of undisturbed sedimentary layers. Geologists collect unknown mineral samples from both regions and run simple field tests to identify them, including scratching each sample against a piece of window glass. One sample from Region A scratches the glass easily, while a sample from Region B does not scratch the glass at all. The company also finds that Region A has visible mineral veins running through cracks in the rock, while Region B shows no such veins. Based on their findings, the geologists predict that Region A is far more likely to contain valuable ore deposits like copper or gold. They explain to a group of visiting students that Earth's internal heat and surface processes work together to concentrate minerals unevenly across the planet. The students are surprised to learn that useful minerals are not scattered randomly everywhere on Earth.

1. Using the glass-scratch test results, explain what the geologists can conclude about the hardness of the mineral samples from Region A and Region B. Refer to the Mohs hardness scale in your answer.

2. Explain why Region A, located near a plate tectonic boundary with mineral veins, is more likely to contain valuable ore deposits than Region B.

3. Describe how both Earth's internal heat and energy from the Sun contribute to the uneven distribution of mineral resources described in this scenario.

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07 Discussion Questions

Discuss each question with your group, using evidence from the article to support your reasoning.



01 Minerals come in many colors and crystal shapes, each with its own chemical fingerprint.

1. Why are mineral resources like gold, copper, and rare Earth elements found in some places on Earth but not others?

2. How does the Mohs hardness scale help geologists identify unknown minerals, and why is the glass-scratch test so useful in the field?

3. What is the difference between a mineral and a rock, and why does that distinction matter when scientists study Earth's materials?

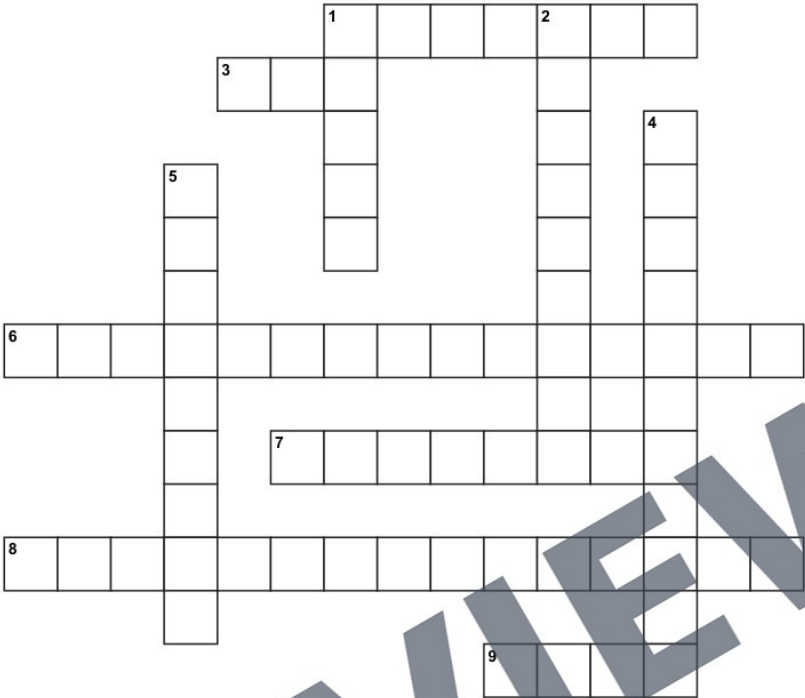
4. How do Earth's internal heat and energy from the Sun work together to cycle Earth's materials and concentrate mineral deposits?

5. Why might the uneven distribution of rare Earth elements and other mineral resources affect relationships between different countries?

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Crossword



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Crossword

ACROSS

1. A _____ is a naturally occurring solid with a specific chemical makeup and an orderly, repeating crystal...
2. An _____ is a mineral deposit that contains enough useful material to be worth mining.
3. _____ is rock that has been changed by intense heat and pressure without fully melting.
4. _____ is a mineral property measured on the Mohs scale from 1 to 10 that tells how well a mineral resists...
5. _____ is rock formed from compacted layers of sediment over time.
6. A _____ is usually a mixture of one or more minerals bonded together, like granite made of quartz...

DOWN

1. A _____ is an element, such as copper or iron, that is typically shiny and conducts electricity well.
2. The _____ is the long-term process by which rocks are broken down, buried, heated, melted, or cooled and...
3. _____ is rock that forms when molten rock cools and hardens.
4. A _____ is an element, such as silicon, that has properties between those of metals and nonmetals and is...

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Word Search

K G I R O O S L T H T E E N I S
 S B Y A I A L L E C C G R C A C
 R E S C R A N S L R R R C L M O
 T C D L H A M A K O E T E K E D
 R M H I E M R S E M O S E R M U
 A A C C M E T T N K C S I R K C
 H A R D N E S S C O E N A A T N
 L C L I I G N E O U S R O C K T
 E T M S R T E T O W R C I I A I
 O A I O D M E T A L L O I D O R
 I I O C H A M C O R N E R A L R
 K K A A L R O C K C Y C L E N R
 L H N E Y F K N E H D R T Y R L
 L N A L E O M O I K C I O R O X
 M E T A M O R P H I C R O C K C
 N R E N O R R I P A K R D E K R

FIND THESE WORDS

Metamorphic rock

Sedimentary rock

Igneous rock

Metalloid

Rock cycle

Hardness

Mineral

Metal

Rock

Ore