

# Hard Rocks

Visitors can pocket a billion years of history at a diamond-strewn park.

In February 2007, at the Crater of Diamonds State Park in Arkansas, Jim Gatliff made a gem of a find. He discovered a 2.67-carat yellow diamond—a rare stone that is a bit bigger than a large pea. And he was allowed to keep it!

Gem hunters uncovered more than 480 diamonds at Crater of Diamonds in 2006. Most were small, about the size of a match head. But some, like Gatliff's discovery, were bigger — and more valuable.

Gems, such as diamonds, rubies, and emeralds, are all types of crystals. They vary in color because they are formed from different materials. Diamonds are made from the element **carbon**. Carbon is also found in **graphite**, the material used in pencil leads. The graphite in your pencil is pretty soft. Diamonds aren't. In fact, diamond is the hardest **mineral** on Earth. Minerals are the solid materials that make up rocks.



*Science Spin*

The hardness scale.

Diamonds are born hundreds of miles below Earth's surface, or **crust**. Beneath the crust is a hot, partially oozing layer called the **mantle**. Inside the mantle, the pressure is enormous and temperatures can reach as high as 4,000 degrees Fahrenheit. That heat and pressure can transform carbon into diamonds.

How did diamonds end up in Arkansas and other places around the world? "It takes a special type of volcanic activity to bring diamonds to the surface," says Rachel Engebrecht, a spokesperson for Crater of Diamonds. Liquid rock called **magma** erupted from the mantle through tubes called **volcanic pipes**. That magma carried diamonds to the surface.

The gems at Crater of Diamonds probably formed billions of years ago. "We think the diamonds got pushed up to the surface around 100 million years ago, during the age of dinosaurs," Engebrecht says.

All diamonds people find in the ground are old, but some diamonds may not come from underground at all. Black diamonds are a rare kind of diamond with mysterious origins. Some scientists think the black gems were created inside **supernovas** (exploding stars) and traveled to Earth from space!

## Measuring Minerals

The hardness of minerals is measured on the Mohs scale. Diamond is the hardest. Talc, a white mineral found in baby powder, is at the softest end of the scale.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. According to the passage, why do gems vary in color?

- A Heat changes the color of the gems.
- B They are formed from different materials.
- C They are dyed different colors.
- D The sun changes the gems' colors.

2. According to the description in the passage, what is the highest temperature the mantle can reach?

- A 4,000 degrees Fahrenheit
- B 4,000 degrees Celsius
- C 480 degrees Fahrenheit
- D 2,006 degrees Fahrenheit

3. Based on the passage, which of the following most likely makes a gem valuable?

- A how much carbon is in the gem
- B how rare the gem is
- C what color the gem is
- D how hard the gem is

4. Read the following sentence and answer the question below: "Black diamonds are a rare kind of diamond with mysterious origins."

As used in the sentence, **rare** describes

- A something that can be found everywhere
- B something that is uncommon
- C something that is light in color
- D something that is created in space

5. The central idea of the passage is

- A how pencils are made
- B how diamonds are formed
- C how to determine the value of a diamond
- D where to find diamonds

6. What transforms carbon into diamonds?

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7. Do you think graphite is more common than diamonds? Please explain your answer.

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8. The question below is an incomplete sentence. Choose the word that best completes the sentence.

\_\_\_\_\_ graphite and diamonds are both made from carbon, graphite is much softer than diamonds.

- A Although
- B Because
- C So
- D Then

9. Answer the following questions based on the sentence below.

Carbon can transform into diamonds in the mantle because the heat and pressure are both extremely high.

What? carbon

(can) What? \_\_\_\_\_

Where? \_\_\_\_\_

Why? \_\_\_\_\_

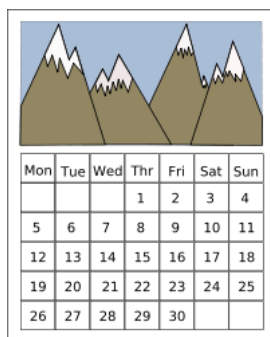
**10.** Read the vocabulary word and definition below, and complete questions 10a, 10b, and 11.

**Vocabulary Word:** valuable (val · u · a · ble): something that is important for different reasons; something that is worth a lot of money.

**10a.** Read the sentences below and underline the word **valuable**.

1. Diamonds are valuable because they are very rare.
2. Bob's piggy bank, filled with all of the money he has saved from his allowance, is very valuable to him.
3. Sally's friendship is valuable to me because we've been friends since first grade.
4. I find my parents' opinion valuable when I have to make an important decision.
5. Please be careful with that plate! It has been in the family for years and is very valuable to us.

**10b.** Which image shows something that is probably valuable?



**11.** Which of the following would likely be more valuable: a piece of art in a museum or a doodle in a notebook? Why?

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## Teacher Guide &amp; Answers

**Passage Reading Level:** Lexile 860

**Featured Text Structure:** Descriptive – the writer explains, defines, or illustrates a concept or topic

**Passage Summary:** This passage describes how gems such as diamonds are formed and how the hardness of a mineral is measured.

1. According to the passage, why do gems vary in color?
  - A Heat changes the color of the gems.
  - B They are formed from different materials.**
  - C They are dyed different colors.
  - D The sun changes the gems' colors.
2. According to the description in the passage, what is the highest temperature the mantle can reach?
  - A 4,000 degrees Fahrenheit**
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  - A how much carbon is in the gem
  - B how rare the gem is**
  - C what color the gem is
  - D how hard the gem is
4. Read the following sentence and answer the question below: "Black diamonds are a rare kind of diamond with mysterious origins."

As used in the sentence, **rare** describes

- A something that can be found everywhere
    - B something that is uncommon**
    - C something that is light in color
    - D something that is created in space
  5. The central idea of the passage is
    - A how pencils are made
    - B how diamonds are formed**
    - C how to determine the value of a diamond
    - D where to find diamonds
  6. What transforms carbon into diamonds?
- Suggested answer:** Heat and pressure inside the mantle transform carbon into diamonds. [paragraph #4]
7. Do you think graphite is more common than diamonds? Please explain your answer.

**Suggested answer:** Graphite is likely more common than diamonds because it is used in things like pencils. Diamonds are very valuable—probably because they are rare. [paragraphs #1 & #3]

8. The question below is an incomplete sentence. Choose the word that best completes the sentence.

\_\_\_\_\_ graphite and diamonds are both made from carbon, graphite is much softer than diamonds.

- A Although
- B Because
- C So
- D Then

9. Answer the following questions based on the sentence below.

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What? carbon

(can) What? **transform into diamonds**

Where? **in the mantle**

Why? **because the heat and pressure are both extremely high**

10. ReadWorks recommends that you teach this vocabulary word to the whole class out loud using the four steps listed below.

**Vocabulary Word:** valuable

**Step 1:** Introduce the word

- a. Teacher writes the word on the board and divides it into syllables: (val · u · a · ble)
- b. Teacher says: "This word is valuable. What is the word?" [All students reply together out loud: "Valuable."]

**Step 2:** Provide a child-friendly definition

- a. Teacher says: "Valuable can mean something that is important for different reasons, and it usually means something that is worth a lot of money."
- b. Teacher says: "In the passage, valuable describes many of the diamonds that are worth a lot of money."
- c. Teacher says: "What is the word?" [All students reply together out loud: "Valuable."]

**Step 3:** Practice the word

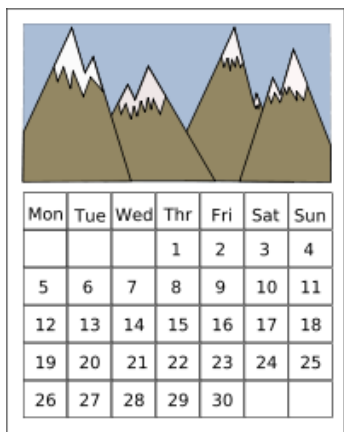
Teacher provides examples and additional opportunities to repeat the word. Read the first sentence out loud to your students. Begin reading it again and when you come to the vocabulary word, prompt students to say the vocabulary word out loud. Then, finish reading the sentence out loud to your students.

- 10a.**
1. Diamonds are valuable because they are very rare.
  2. Bob's piggy bank, filled with all of the money he has saved from his allowance, is very valuable to him.
  3. Sally's friendship is valuable to me because we've been friends since first grade.
  4. I find my parents' opinion valuable when I have to make an important decision.
  5. Please be careful with that plate! It has been in the family for years and is very valuable to us.

**Step 4:** Check for student understanding

This step can be completed as a whole class activity or as an independent practice.

- 10b.** Which image shows something that is probably valuable?



- 11.** Which of the following would likely be more valuable: a piece of art in a museum or a doodle in a notebook? Why?

**Suggested answer:** If a piece of art is in a museum, it usually means that people consider it valuable. On the other hand, notebook doodles are often thrown away, so they are not likely to be valuable.

*Suggested Additional Vocabulary:* carbon, graphite, mineral, erupted