



Assignment Discovery Lesson Plan Strong Chemistry

Subject

Earth Science

Grade level

6-8

Duration

Two class periods

Objectives

Students will

- review basic facts about diamonds, such as what they are, where they come from, and their basic properties;
- review the definitions of minerals and gemstones and learn about their properties;
- select a gemstone to research, such as sapphire, ruby, topaz, or jade; and
- create a poster that shows the gemstone's appearance, properties, and chemical makeup.

Materials

- Computer with Internet access
- Print resources about mineral gemstones
- Poster board and markers
- Color printer for printing Web research images (optional)

Procedures

1. As a class, review what you learned about diamonds in the video. What is a diamond made of? (*The element carbon.*) How are diamonds formed? (*They form under very high pressures deep within the earth.*) How do they come to the surface? (*In rocks released during volcanic eruptions.*) What are some properties of diamonds? (*They are very hard, durable, reflect light well, and refract light into many colors.*) If students want to learn more about diamonds, visit The Nature of Diamonds feature on the American Museum of Natural History's Web site: <http://www.amnh.org/exhibitions/diamonds>

2. Next, explain that diamonds are a mineral—a solid substance that occurs naturally in rocks or in the ground. Every mineral has a unique chemical makeup and distinct characteristics. Some minerals are treasured for their beauty, durability, and rarity. These minerals, called gemstones, are often cut, polished, and used for jewelry or decoration. Gemstones include emeralds, rubies, and sapphires, as well as diamonds.
3. Explain that all minerals, including gemstones, are described by their properties, which include the following.
 - **Color:** A mineral can vary in color, depending on its chemical makeup.
 - **Streak:** When a mineral is crushed or rubbed against another surface, the resulting color is its streak. A mineral's streak is often different from the mineral's color.
 - **Specific Gravity (or SG):** A mineral's density or weight is calculated by how heavy it is relative to water. If a mineral has an SG of 3.5, it is 3.5 times heavier than the same amount of water. Most minerals have an SG between 2 and 4.5.
 - **Luster:** This property describes how the mineral's surface reflects light—for example, “dull,” “metallic,” or “brilliant.”
 - **Hardness:** How well a mineral resists scratching by another mineral is determined by its hardness. Diamonds, the hardest mineral, can scratch talc, the softest. Talc cannot scratch diamonds. Two minerals that scratch each other are the same hardness.
4. Explain that a mineral’s hardness is one of the most important properties in identification. The standard scale for measuring and describing hardness is called the Mohs Scale. This scale was invented by an Austrian mineralogist, Frederick Mohs, in 1822. The scale ranges from 1 to 10, with 1 being the softest and 10 being the hardest. Each number represents a different mineral: 1 is talc, which crumbles easily; 10 is diamond, the hardest known substance.
5. Divide the class into pairs of students and assign or have them choose a gemstone, such as the following:
 - Amethyst
 - Aquamarine
 - Diamond
 - Emerald
 - Jade
 - Opal
 - Ruby
 - Sapphire
 - Topaz
 - Turquoise
6. Next, tell students that they will be creating a gemstone poster, which they will use to give their class report. The poster should have at least two images and include answers to the following questions:
 - Is this mineral part of a larger mineral group or mineral class? If so, which

- one? What, if any, other popular gemstones belong in this group?
 - What chemical elements make up this gemstone?
 - What is this gemstone's relative hardness?
 - What is its specific gravity?
 - What color (or colors) is this gemstone?
 - Describe the luster of this gemstone.
7. Share these web sites to guide students' research: Tell students that they are going to work in pairs to use books and the Internet to research and present one gemstone to the class. First, assign or have pairs choose one of the following sites:
- Gemstones
http://www.minerals.net/gemstone/gem_abc/gem_abcd.htm
 - USGS: Mineral Gemstones
<http://pubs.usgs.gov/gip/gemstones/mineral.html>
 - Chemical Formulas of Gemstones
<http://pubs.usgs.gov/gip/gemstones/formulas.html>
 - Identification of Rocks and Minerals
<http://rocksforkids.com/RFK/identification.html>
 - Mineral Properties
<http://www.minerals.net/resource/property/property.html>
8. When students have completed their posters, have students give brief, five-minute presentations to the class. Have students hang their posters in an area of the room dubbed the "gemstone gallery."

Extensions

- After reviewing basic facts about the periodic table, divide the class into four teams: alkali, metal, non-metal or noble gas. Have each team research the properties of elements within their assigned group. Then have each student choose an element from the group and research individual properties and uses of that element.
- Felix Hoffmann's 1897 discovery of aspirin was a revolution in medicine. Working in pairs, have students research another important medical discovery from the past few centuries. How did their discovery change the way patients were treated? The following sites provide a good launching point:
 - PBS: A Science Odyssey: Doctor Over Time
<http://www.pbs.org/wgbh/aso/tryit/doctor/>
 - BBC Education: Medicine Through Time
<http://www.bbc.co.uk/education/medicine/nonint/home.shtml>
- Learn about one of the three NASA satellites discussed in the video: SOHO, ACE, and IMAGE. Divide the class into three groups, one for each satellite. Students should describe what the satellite looks like, when it was launched, where it travels, what kind of data each one collects, and why its data is important.

Evaluation

Use the following three-point rubric to evaluate students' work during this lesson.

3 points: Students were highly engaged in class discussions; demonstrated a thorough understanding of the properties of minerals; developed a clear, coherent presentation with two images and answers to all of the assigned questions.

2 points: Students showed satisfactory participation in class discussions; demonstrated a satisfactory understanding of the properties of minerals; developed an adequate presentation with one or two images and answers to most of the assigned questions.

1 point: Students participated minimally in class discussions; demonstrated a weak understanding of the properties of minerals; developed a simplistic presentation with no images and answers to few of the assigned questions.

Vocabulary color

Definition: One of the most visible properties of minerals

Context: The same mineral can vary in color, depending on the presence of different elements.

gemstone

Definition: A mineral treasured for its beauty, durability, and rarity

Context: Gemstones are often cut, polished, and used for decoration.

hardness

Definition: How well a mineral resists scratching by another mineral

Context: The Mohs scale is the standard scale used to describe the hardness of a gemstone.

luster

Definition: A property of minerals that describes how the surface reflects light; minerals can be metallic, dull, glassy, waxy, pearly, oily, brilliant, and silky.

Context: Diamonds have a brilliant luster.

mineral

Definition: A pure, solid substance that occurs naturally in rocks or in the ground; every mineral has distinct characteristics and a unique chemical makeup.

Context: All rocks are made of two or more minerals.

specific gravity (or SG)

Definition: The density or weight of a mineral; specifically, how heavy it is relative to water

Context: If a mineral has an SG of 3.5, it is three and a half times heavier than the same amount of water.

streak

Definition: The resulting color of a mineral's powder when it is crushed or rubbed against another surface

Context: Two minerals may have the same color, but different streaks.

Academic Standards

This lesson plan addresses the following science education standards created by the National Academy of Sciences:

- Unifying Concepts and Processes: Systems, order, and organization; Change, constancy, and measurement
- Physical Science: Properties and changes of properties in matter

Credit

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