

Gemstones



Gemstones

**Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.**

Gemstones can be brilliant some can be dull. Some hard and some soft. Some colored and some colorless. Take the following brief quiz to see how much you already know about gemstones. See the bottom of page 4 to check your answers.

1. What is the *most* valuable natural gemstone in the world?
 - a. red diamond
 - b. brown diamond
 - c. blue diamond
 - d. green diamond
2. What is the most common gemstone found on Earth?
 - a. ruby
 - b. diamond
 - c. emerald
 - d. quartz
3. According to historical records, what was Cleopatra's favorite gemstone?
 - a. diamond
 - b. ruby
 - c. peridot
 - d. sapphire
4. Which gemstone has such a low density that it could float on a saltwater swimming pool?
 - a. jade
 - b. amber
 - c. garnet
 - d. pearl
5. How many carats is the Star of Asia sapphire that resides in the Smithsonian National Museum of Natural History in Washington, DC?
 - a. 33
 - b. 330
 - c. 3,300
 - d. 33,000



Crystal Systems

Crystal systems are defined by the way that atoms are arranged in a gemstone. Although several crystal systems occur in nature, there are some systems that are most common. These include the amorphous, hexagonal, trigonal, isometric, monoclinic, triclinic, orthorhombic, and tetragonal systems. In this activity, you'll create and identify a paper representation of a specific crystal system.

Materials

crystal template 1- sheer of white copy paper
scissors transparent tape pencil

Procedure

1. Lay the copy paper over the crystal template below (figure 1) and trace the crystal shape on the copy paper.
2. Use scissors to carefully cut out the traced shape on the copy paper along the dark lines. Do not cut the dashed lines.
3. Once the shape is cut out, fold the paper along each of the dashed lines, making sure to match up letters.
4. Secure the paper with transparent tape to form your crystal system.

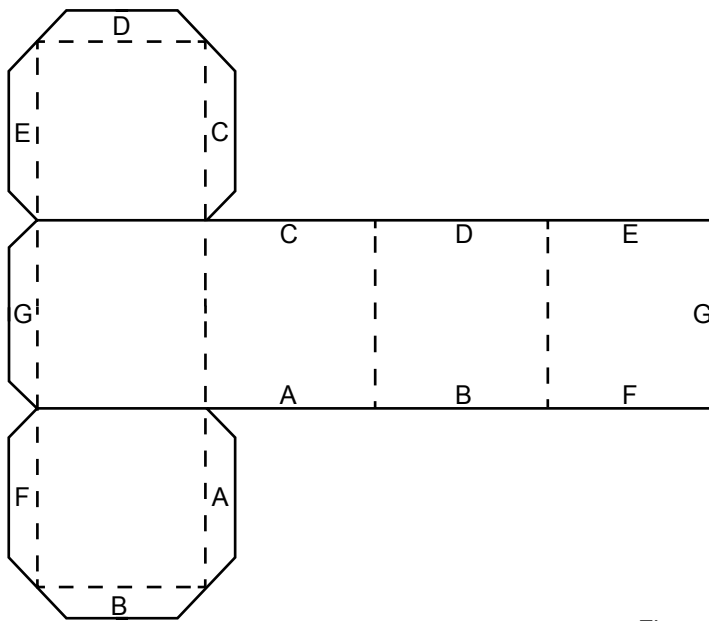


Figure 1

Questions

1. Which crystal system did you make in this activity?
2. What are some gemstones that would have this type of crystal system?

Gemstones

The Ruby Laser

The first laser ever made was the ruby laser. This laser used a synthetic ruby crystal to produce pulses of light with a wavelength of 694 nanometers. This wavelength of light is associated with a deep red color. The ruby was pumped with extremely high energy that resulted in light made by the ruby's fluorescence, which caused stimulated emission.

Stimulated emission is the process in which a specific photon can interact with an atom's electron and cause the electron to drop to a lower energy level. The energy released from this process creates a new photon that is identical to the incoming light wave. As a result, the incident light wave is "amplified" or reinforced by a newly emitted light wave that has the same wavelength and energy.

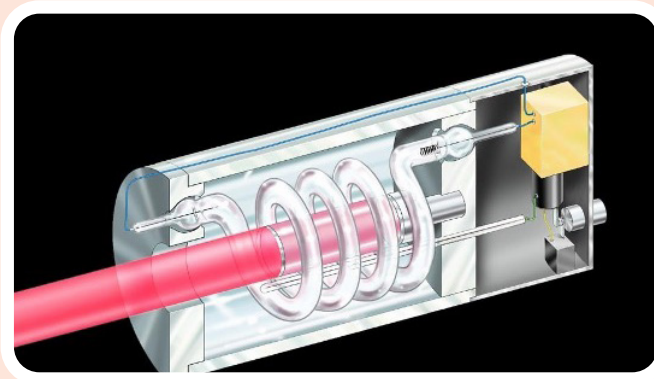


Figure 1.

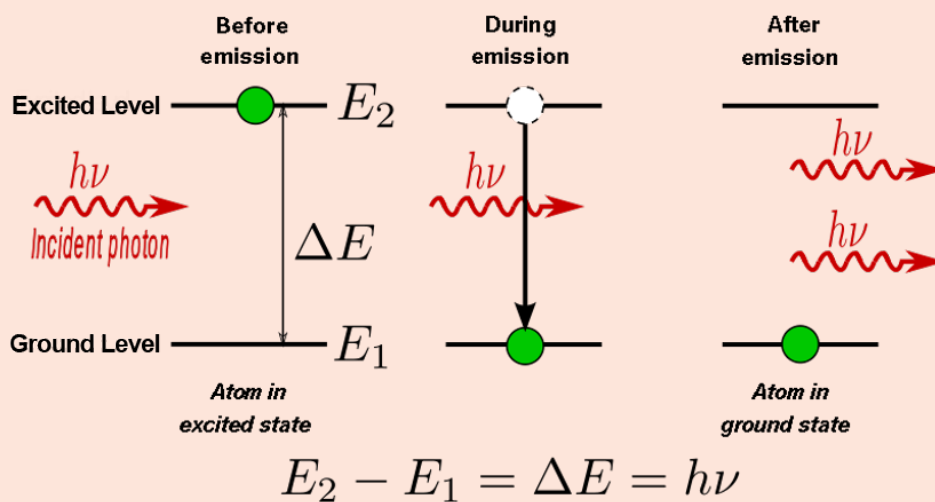


Figure 1 shows an electron (green dot) in a higher energy level where the electron is in an excited state. The electron then receives a photon of some energy ($h\nu$). The electron then moves to a lower energy state and in the process releases another photon ($h\nu$) of equal wavelength and energy as the incident photon.

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mond, garnet, fluorite, and spinel.

Answers: Page 2 Answers: (1) c, (2) d, (3) c, (4) b, (5) b. Page 3 Answers: Crystal System (1) isometric system. (2) Answers will vary. Might include dia-
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