

How to Ace High-Stakes Tests Earth Science

Opal appears to be a solidified mass of milky glass, but when light strikes the stone at certain angles, flashing colors are revealed... Very little precious opal has been found in the United States, but common opal has been obtained from New York, New Jersey, North Carolina, Georgia, Florida, and Oregon.

**Gem Stones of the United States [A Contribution to Economic Geology]
By Dorothy M. Schlegel US Government Geological Survey Bulletin 10420G [1957]**

STANDARD KNOWLEDGE - EARTH SCIENCE, EARTH’S SURFACE

Water, rocks, and soil make up the earth’s natural surface.
 This surface is changed by the way these things interact.
 Change of the earth’s surface can occur at any pace, from rapid to glacial.
 Natural resources are unevenly distributed across the globe.
 Some natural resources have value.
 Gems are rocks that have the most ‘beauty, durability, and rarity.’ (Schlegel)
 Gems have the greatest value of all rocks.
 Gems are divided into semi-precious and precious categories.

Study the **chart, below and** answer the questions that follow.

Comparing Two Minerals		
	mineral X	mineral Y
formula	C	SiO ₂ ·nH ₂ O
color	Usually: yellow, brown or gray to colorless. Rarely: blue, green, black, translucent white, pink, violet, orange, purple and red wiki-switch to official .	ranges from clear through white, gray, red, orange, yellow, green, blue, magenta, rose, pink, slate, olive, brown, and black; must be a play of color
crystal habit	isometric, (cubic, octahedral	Irregular veins, in masses, in nodules
cleavage	111(perfect in 4 directions)	none
fracture	Conchoidal (shell-like)	Conchoidal to uneven[1]
hardness (Mohs)	10	5.5–6[1]
luster	adamantine	Subvitreous to Vitreous to resinous pearly - common opal is waxy
streak	colorless	white
diaphaneity (wiki)	Transparent to subtransparent to translucent	opaque, translucent, transparent

Comparing Two Minerals		
	mineral X	mineral Y
ultraviolet fluorescence	none	black or white body color: inert to white to moderate light blue, green, or yellow in long and short wave. May also phosphoresce; common opal: inert to strong green or yellowish green in long and short wave, may phosphoresce; fire opal: inert to moderate greenish brown in long and short wave, may phosphoresce.[1]

(this is the only time I've used adapted mostly from wiki - get official sources)

On the Two Mineral Comparison chart
KNOWLEDGE: GEMS HAVE TWO GRADES, PRECIOUS AND SEMI-PRECIOUS
<p>The chart shows the properties of gem X and gem Y. Which is the harder gem?</p> <p>A. Gem X B. Gem y C. they have the same hardness D. it is impossible to tell</p>
<p>Assuming harder gems are more durable, which gem would be classified as the most durable?</p> <p>A. Gem X B. Gem y C. they have the same hardness D. it is impossible to tell</p>
<p>Given this, which stone would be more likely to be classified as semi-precious?</p> <p>A. Gem X B. Gem y C. they have the same hardness D. it is impossible to tell</p>

On the Two Mineral Comparison chart
KNOWLEDGE: GEMS HAVE TWO GRADES, PRECIOUS AND SEMI-PRECIOUS
<p>[use if do NOT use the above question] Gem Two is Opal: Using only the chart, above, what would need to be different about an opal to make it qualify as precious?</p> <p>A. It would have to be even more beautiful</p> <p>B. the chart does not indicate what would have to happen</p> <p>C. it would have to be harder</p> <p>D. it would have to have no fluorescence</p>
<p><i>Please answer the question, below, in no more than three succinct, full sentences.</i> From its examples and/or word roots, can you guess what “diaphaneity” is?</p>

Now, read the selection, below:

Gem Stones of the United States [A Contribution to Economic Geology]

By Dorothy M. Schlegel US Government Geological Survey Bulletin 10420G [1957]

<http://pubs.usgs.gov/bul/1042g/report.pdf>

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Permission to print forthcoming - this is in case the material is lost.

ABSTRACT

Many semiprecious, but few precious, gem stones have been found in the United States. Beauty, durability, and rarity are the most important qualities of a precious gem. Gem stones are distinguished by their, physical properties: color, crystal form, cleavage, parting, hardness, specific gravity, luster, index of refraction, transparency, and dispersion. Gems are named for their color, type locality, outstanding physical property, or persons. The most popular gem cuts are the cabochon, rose, brilliant, step, and mixed. The carat, one-fifth of a gram or 200

milligrams, is the unit of weight measurement. The color of four popular gems may be changed by heat treatment or dyeing. Only the ruby, sapphire, spinel, emerald, rutile, and quartz of gem quality have been synthesized. The best quality of assembled stones are the doublet and triplet. Most gem stones are found in alluvial gravels and igneous rocks, especially granite and pegmatite deposits.

INTRODUCTION

Gem stones generally are divided into two categories: precious and semiprecious. A precious gem stone has beauty, durability, and rarity, whereas a semiprecious gem stone has only one or two of these qualities.

The beauty of a gem stone is determined by personal taste. In ancient times man preferred brightly colored, translucent or opaque stones. Today he prefers evenly tinted, transparent stones. The desired hues are blue, rose, green, and true canary yellow in the diamond; pigeon-blood red in the ruby; cornflower blue in the sapphire; and grass green in the emerald. Most diamonds, however, are colorless.

The durability of a gem stone depends upon its hardness and lack of ready cleavage. A gem must be sufficiently hard to resist abrasion by objects normally found in everyday life and by dust. It should also resist the chemicals with which it comes in contact. Cleavability is the tendency of certain gems to split in one direction more readily than in another.

Rarity is one of the most important factors in establishing the price of a gem stone. Such gems as the diamond and ruby are rare, in addition to being beautiful and durable, and therefore are very expensive. Although the deep red pyrope garnet closely resembles the ruby in color, there is no comparison in expense and popularity. . .

see below for report's specifics on opal:

OPAL SiO₂ · nH₂O

Physical properties:

Varieties: White opal, black opal, fire opal (reddish or orange), water opal (colorless), hydrophane.

Crystal form: None (amorphous).

Cleavage: None (conchoidal fracture).

Hardness: 5.5-6.5.

Specific gravity: 1.9-2.3.

Luster: Vitreous to resinous pearly (common opal is waxy).

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Opal may be precious but most varieties are semiprecious. It is a semitransparent stone having a vivid display of colors. When pure, opal is colorless; when impure, it may be red, yellow, green, blue, or black. It is an amorphous form of hydrated silica containing varying amounts of water. It is composed of a series of very thin films or layers which differ in refractivity. Opal appears to be a solidified mass of milky glass, but when light strikes the stone at certain angles, flashing colors are revealed. This phenomenon is known as opalescence. The colors are believed to be caused by the different refractivities of light in the thin layers; the thinner and more uniform the layers, the more beautiful the colors. Opal is a soft gem stone and therefore must be worn with care. Hydrophane, the opaque variety of common opal, is very porous and will absorb any liquid. Other varieties are less porous but will absorb some liquid. Wearers of opal should keep the stone away from dirty water, ink, or colored fluids. Heat evaporates the water in opal and therefore causes the stone to shatter or to lose its color. The value of opal is determined by its principal color, uniformity of structure, and beauty of opalescence. True black opals with good opalescence are the most valuable.

Opal occurs as a secondary mineral associated with volcanic rocks. It is also found in seams and fissures of sedimentary, igneous, and metamorphic rocks. The forms of opal range from massive, botryoidal, stalactitic to earthy, depending upon how the silica was deposited. Very little precious opal has been found in the United States, but common opal has been obtained from New York, New Jersey, North Carolina, Georgia, Florida, and Oregon.

The best-known deposit of precious opal in the United States is in Virgin Valley, Humboldt County, Nev. The opals are obtained from thin seams of volcanic ash in the bottom of a Tertiary lake. The gem material occurs as opalized wood which appears to be driftwood that was covered by volcanic ash and completely petrified by opaline solutions. The greatest variety of opals in the world is found here (Dake, Fleener, and Wilson, 1938, p. 249). Other localities for precious opal in the United States are in lava flows of the Columbia Plateaus in Washington, Idaho, and Oregon.

Using the Two Mineral Comparison chart, and the Geological Survey Bulletin by Dorothy M. Schlegel, and answer the questions, *below*:

STANDARD: SOME KNOWLEDGE RETAINS ITS ACCURACY OVER LONG PERIODS OF TIME
Please list several facts that are the essentially the same in both texts.

STANDARD: SOME KNOWLEDGE RETAINS ITS ACCURACY OVER LONG PERIODS OF TIME

is there anything in these texts that contradicts one another?

Now look at this new text from the American Museum of Natural History [used in another question set - technol and engineering field sketches]:

“Opal most commonly forms by the action of warm water on volcanic glass. b) It can also form at low temperatures, when water rich with dissolved silica mixes with sediment or enters rocks.”

Considering all three sources, answer the following questions:

STANDARD: SOME KNOWLEDGE RETAINS ITS ACCURACY OVER LONG PERIODS OF TIME

Where in the texts is it discussed where opals are found? Provide three quotes that interest you the most and explain why in no more than three succinct sentences:

STANDARD: SOME KNOWLEDGE RETAINS ITS ACCURACY OVER LONG PERIODS OF TIME

Is there anything among **these** texts that is contradictory?