

1. The table below indicates the presence of various minerals in different rock samples.

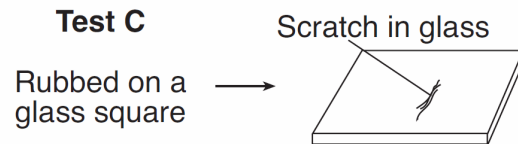
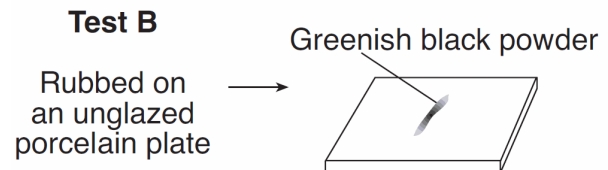
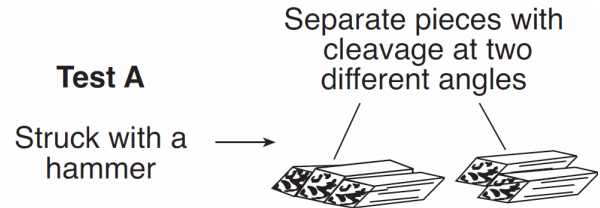
Rock Sample	Mineral Composition								
	Quartz	Potassium feldspar	Plagioclase feldspar	Biotite	Hornblende	Pyroxene	Olivine	Calcite	Others
Granite	✓	✓	✓	✓	✓				
Rhyolite	✓	✓	✓	✓	✓				
Pumice	✓	✓	✓	✓	✓				
Conglomerate	✓	✓	✓	✓	✓	✓	✓	✓	✓
Slate				✓					✓
Marble								✓	
Limestone								✓	
Basalt			✓		✓	✓	✓		
Gabbro			✓	✓	✓	✓			

Key  
✓ = Mineral is present

Which statement is an accurate conclusion based on the information provided in the table?

- A) Most rocks are monomineralic.  
 B) All rocks are polymineralic.  
 C) Many rocks have a number of minerals in common.  
 D) Only igneous rocks contain quartz.
2. What do most igneous, sedimentary, and metamorphic rocks have in common?
- A) They are formed from molten material.  
 B) They are produced by heat and pressure.  
 C) They are composed of minerals.  
 D) They exhibit crystals, banding, and distinct layers.
3. Most rock gypsum is formed by the
- A) heating of previously existing foliated bedrock  
 B) cooling and solidification of lava  
 C) compaction and cementation of shells and skeletal remains  
 D) chemical precipitation of minerals from seawater

4. Base your answer to the following question on the diagram below, which shows the results of three different physical tests, *A*, *B*, and *C*, that were performed on a mineral.

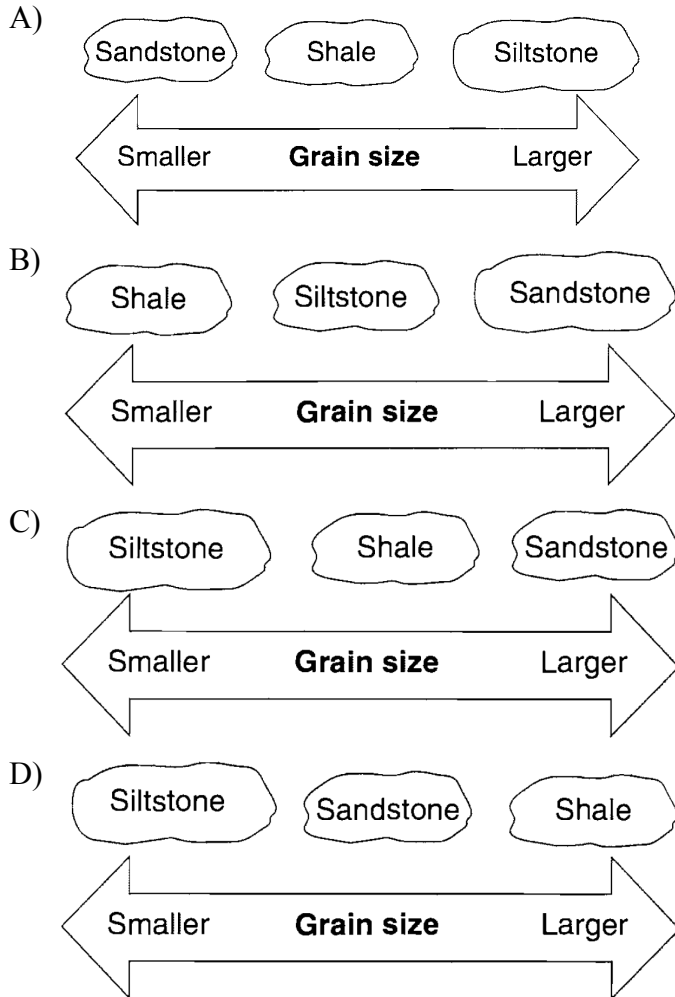


The luster of this mineral could be determined by

- A) using an electronic balance  
 B) using a graduated cylinder  
 C) observing how light reflects from the surface of the mineral  
 D) observing what happens when acid is placed on the mineral

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5. Which diagram best shows the grain size of some common sedimentary rocks?



6. Which rock type is most likely to be monomineralic?

- A) rock salt                      B) rhyolite  
C) basalt                         D) conglomerate

7. Which mineral is commonly mined as a source of the element lead (Pb)?

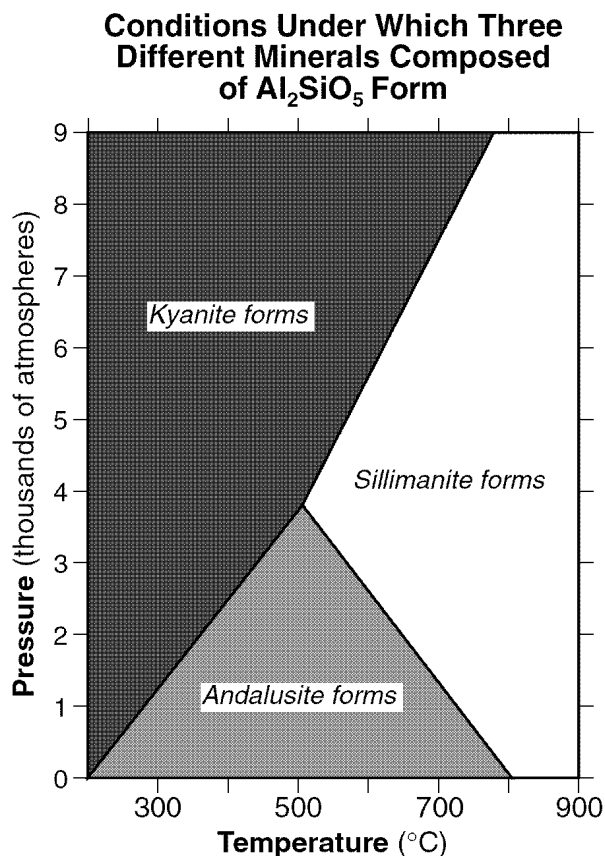
- A) galena                         B) quartz  
C) magnetite                     D) gypsum

8. The minerals talc, muscovite mica, quartz, and olivine are similar because they

- A) have the same hardness  
B) are the same color  
C) contain silicon and oxygen  
D) break along cleavage planes

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9. Base your answer to the following question on the graph below, which shows the crustal temperature and pressure conditions under which three different minerals with the same chemical composition ( $\text{Al}_2\text{SiO}_5$ ) crystallize.

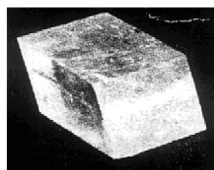


Which mineral has a chemical composition most similar to andalusite, sillimanite, and kyanite?

- A) pyrite  
B) gypsum  
C) dolomite  
D) potassium feldspar
10. Two mineral samples have different physical properties, but each contains silicate tetrahedrons as its basic structural unit. Which statement about the two mineral samples must be true?

- A) They have the same density.  
B) They are similar in appearance.  
C) They contain silicon and oxygen.  
D) They are the same mineral.

11. The photograph below shows a broken piece of the mineral calcite.



The calcite breaks in smooth, flat surfaces because calcite

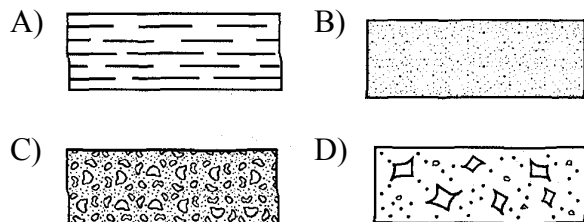
- A) is very dense  
B) is very soft  
C) contains certain impurities  
D) has a regular arrangement of atoms

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12. Soil that contains large quantities of calcium was most likely formed by the weathering of

- A) rock salt                      B) quartzite  
C) coal                              D) limestone

13. Which symbol represents the sedimentary rock with the smallest grain size?



14. Which rock is sedimentary in origin and formed as a result of chemical processes?

- A) granite                          B) shale  
C) breccia                          D) dolostone

15. Which process most likely formed a layer of the sedimentary rock, gypsum?

- A) precipitation from seawater  
B) solidification of magma  
C) folding of clay-sized particles  
D) melting of sand-sized particles

16. Sedimentary rocks of organic origin would most likely be formed from

- A) sediments eroded by running water  
B) materials deposited by glaciers  
C) shells of marine animals  
D) particles removed from the atmosphere by precipitation

17. Which phrase best describes coal?

- A) low density, mafic  
B) chemical precipitate  
C) organic plant remains  
D) glassy texture, volcanic

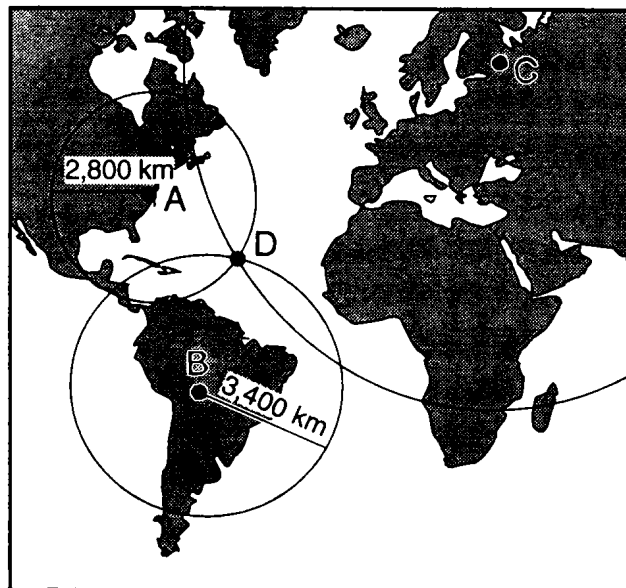
18. Compared to basalt, granite is

- A) lighter in color  
B) greater in density  
C) more mafic in composition  
D) more fine grained in texture

19. A fine-grained igneous rock composed mostly of plagioclase feldspar and hornblende and containing no quartz or pyroxene would be classified as

- A) granite                          B) andesite  
C) peridotite                        D) scoria

20. Base your answer to the following question on the map below, which shows seismograph recording stations at locations *A*, *B*, and *C*. Location *D* is an earthquake epicenter. The distances from locations *A* and *B* to this epicenter are given in kilometers.



Which statement best describes the igneous crustal bedrock below locations *A*, *B*, *C*, and *D*?

- A) The bedrock below *D* is mostly basalt; below *A*, *B*, and *C*, the bedrock is mostly granite.  
B) The bedrock below *D* is mostly granite; below *A*, *B*, and *C*, the bedrock is mostly basalt.  
C) The bedrock below *A*, *B*, *C*, and *D* is mostly basalt.  
D) The bedrock below *A*, *B*, *C*, and *D* is mostly granite.

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Base your answers to questions 21 and 22 on the two tables below and on your knowledge of Earth science. Table 1 shows the composition, hardness, and average density of four minerals often used as gemstones. Table 2 lists the minerals in Moh's Scale of Hardness from 1 (softest) to 10 (hardest).

Table 1

Gemstone Mineral	Composition	Hardness	Average Density (g/cm <sup>3</sup> )
emerald	Be <sub>3</sub> Al <sub>2</sub> (Si <sub>6</sub> O <sub>18</sub> )	7.5–8	2.7
sapphire	Al <sub>2</sub> O <sub>3</sub>	9	4.0
spinel	MgAl <sub>2</sub> O <sub>4</sub>	8	3.8
zircon	ZrSiO <sub>4</sub>	7.5	4.7

Table 2

Moh's Scale of Hardness
1 talc
2 gypsum
3 calcite
4 fluorite
5 apatite
6 feldspar
7 quartz
8 topaz
9 corundum
10 diamond

**KEY**

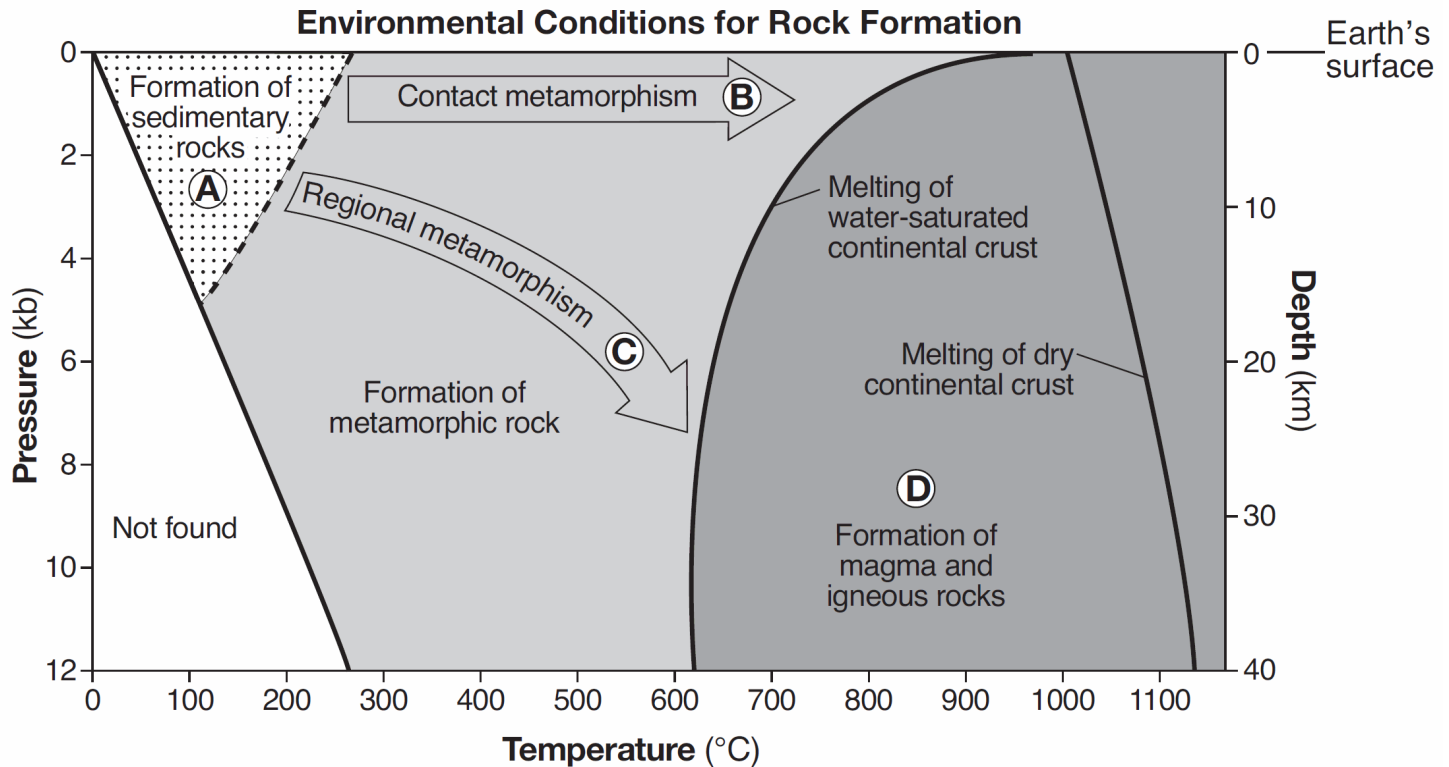
Al = aluminum	O = oxygen
Be = beryllium	Si = silicon
Mg = magnesium	Zr = zirconium

21. The hardness and density of each gemstone is based primarily on the gemstone's
- A) internal arrangement of atoms                      B) geologic time of formation  
C) oxygen content    D) natural abundance
22. Part of a gemstone's value is based on the way the gemstone shines in reflected light. The way a mineral reflects light is described as the mineral's
- A) fracture              B) hardness              C) luster              D) streak

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23. Base your answer to the following question on the graph below and on your knowledge of Earth science.

The graph shows the temperature, pressure, and depth environments for the formation of the three major rock types. Pressure is shown in kilobars (kb). Letters *A* through *D* identify different environmental conditions for rock formation.



At what pressure and temperature is sand most likely to be compacted into sandstone?

- A) 2 kb and 150°C  
B) 6 kb and 200°C  
C) 10 kb and 400°C  
D) 12 kb and 900°C

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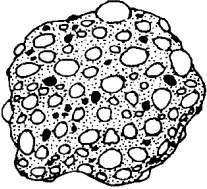
24. Base your answer to the following question on the diagrams below of five rock samples.



BASALT



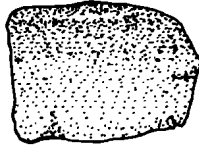
GNEISS  
(METAMORPHIC)



CONGLOMERATE



GRANITE



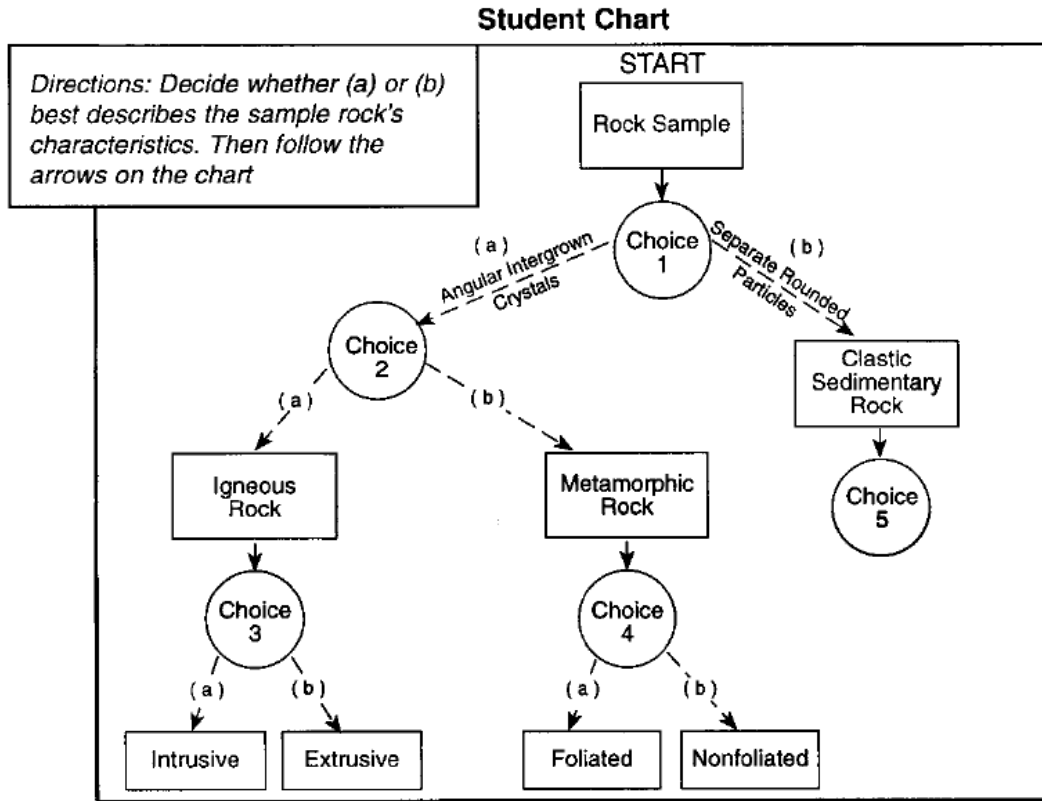
SANDSTONE

If granite were subjected to intense heat and pressure, it would most likely change to

- A) conglomerate      B) sandstone  
C) gneiss              D) basalt
25. How do the metamorphic rocks schist and quartzite differ?
- A) Quartzite contains the mineral quartz and schist does not.  
B) Quartzite forms from regional metamorphism and schist does not.  
C) Schist is organically formed and quartzite is not.  
D) Schist is foliated and quartzite is not.
26. Which characteristic of an igneous rock would provide the most information about the environment in which the rock solidified?
- A) color                  B) texture  
C) hardness              D) streak
-

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27. Base your answer to the following question on the diagram below which shows the structure of a student-developed chart for identifying some rock samples. The circles labeled choice 1 through choice 4 represent decision-making steps leading either to path (a) or path (b). Choice 5 has not been completed.



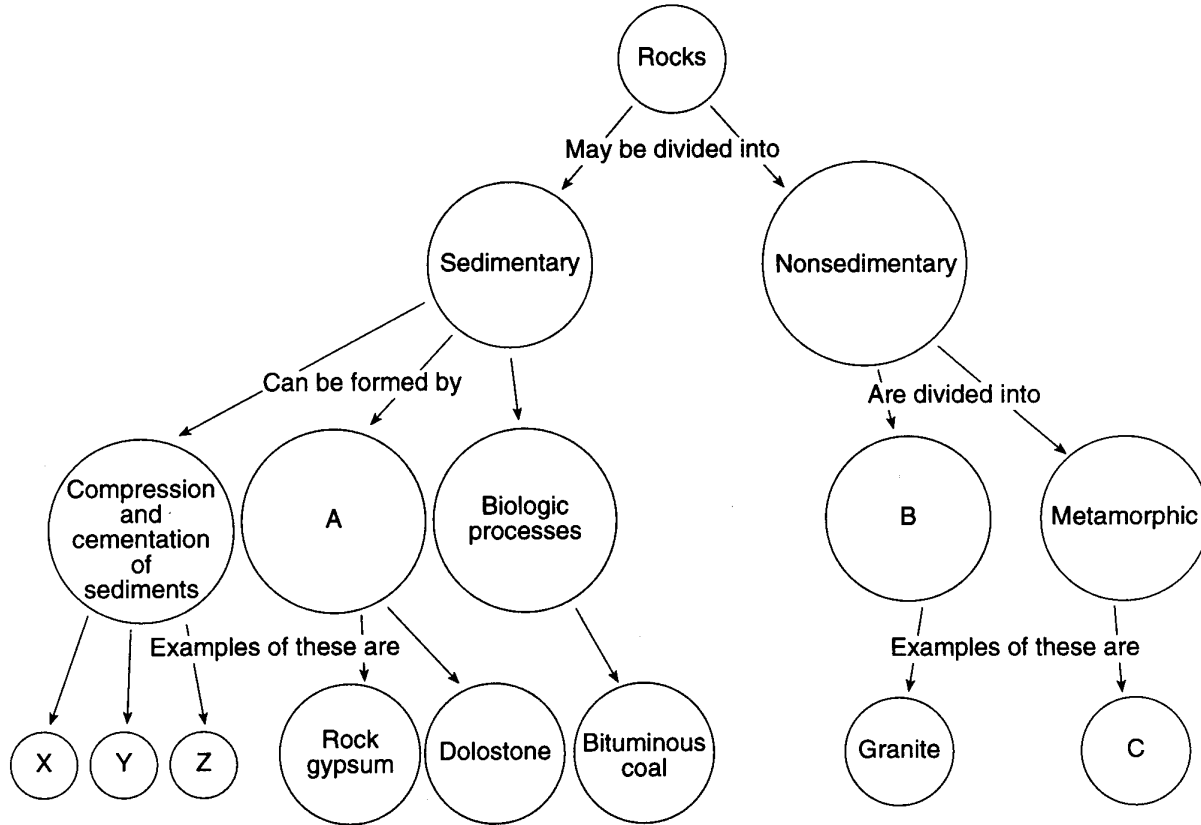
At choice 2, the student should generally select path (a) if the student observes

- A) a random arrangement of mineral crystals
- B) distorted structure and crystal alignment
- C) bands of mineral crystals
- D) layers of same-sized crystals



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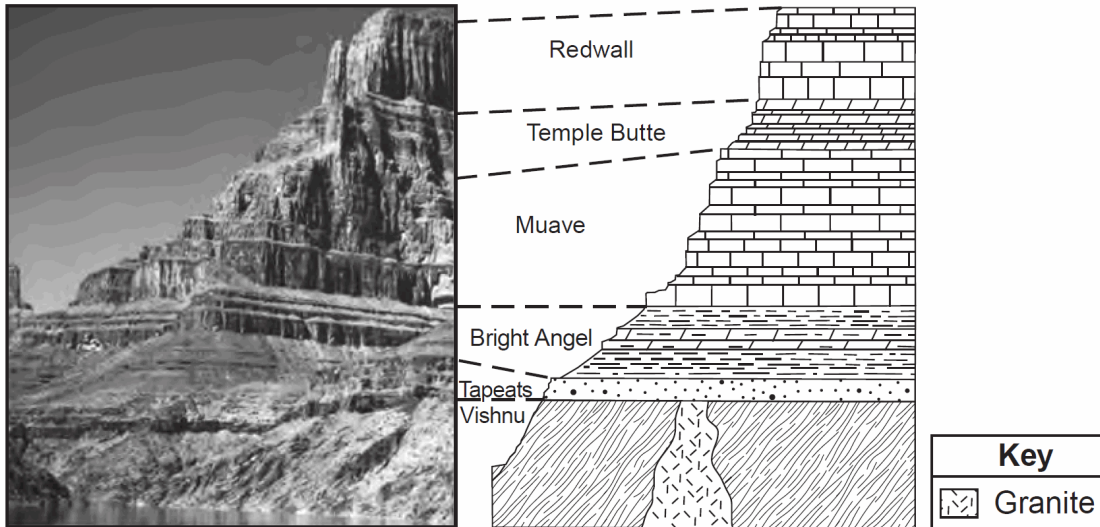
Base your answers to questions 28 and 29 on the diagram below, which represents a scheme for classifying rocks. The letters *A*, *B*, *C* and *X*, *Y*, *Z* represent missing labels.



28. If the rock in circle *C* formed from limestone, it would be called
- A) schist      B) anthracite coal      C) marble      D) slate
29. The classification of rocks into sedimentary or nonsedimentary groups is based primarily on the rocks'
- A) origin      B) density      C) color      D) age
- 
30. Volcanic ash deposits found in the geologic record are most useful in correlating the age of rock layers if the volcanic ash was distributed over a
- A) large area during a short period of time  
B) large area during a long period of time  
C) small area during a short period of time  
D) small area during a long period of time

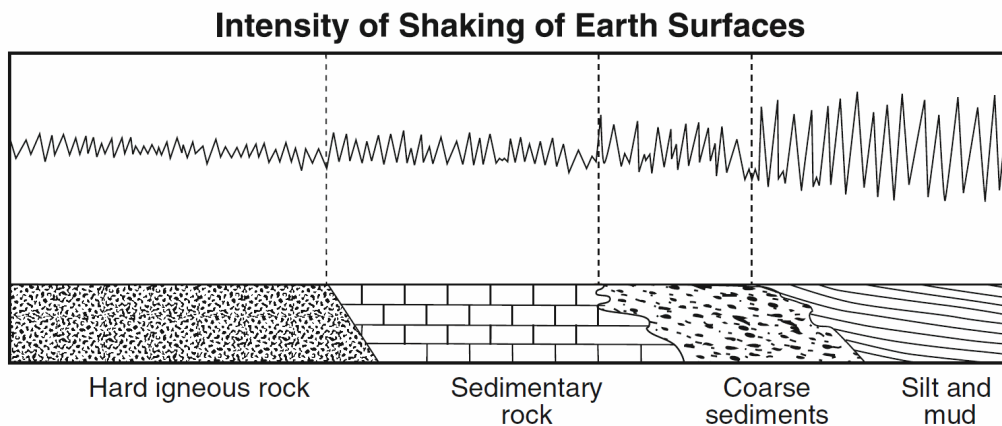
## Topic 11: Rx & Min Practice Test

31. Base your answer to the following question on the photograph and cross section below and on your knowledge of Earth science. The sequence of rock types found in the walls of the Grand Canyon are shown. The names of rock formations are shown and the upper and lower boundaries of each formation are indicated by dashed lines. The rock layers have *not* been overturned.



If the Vishnu schist had been exposed to greater heat and pressure during metamorphism, it could have formed

- A) gneiss      B) marble      C) quartzite      D) phyllite
32. The diagram below represents the intensity of the shaking that occurs on different Earth surfaces during the same earthquake.

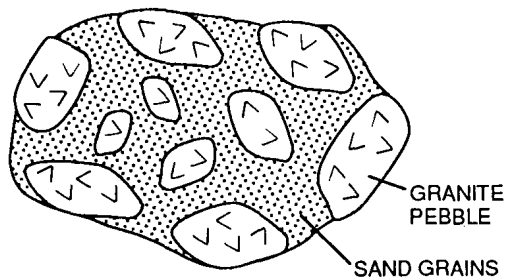


The greatest earthquake hazard to homes exists when they are built on

- A) hard igneous rock      B) sedimentary rock  
C) coarse sediments      D) silt and mud

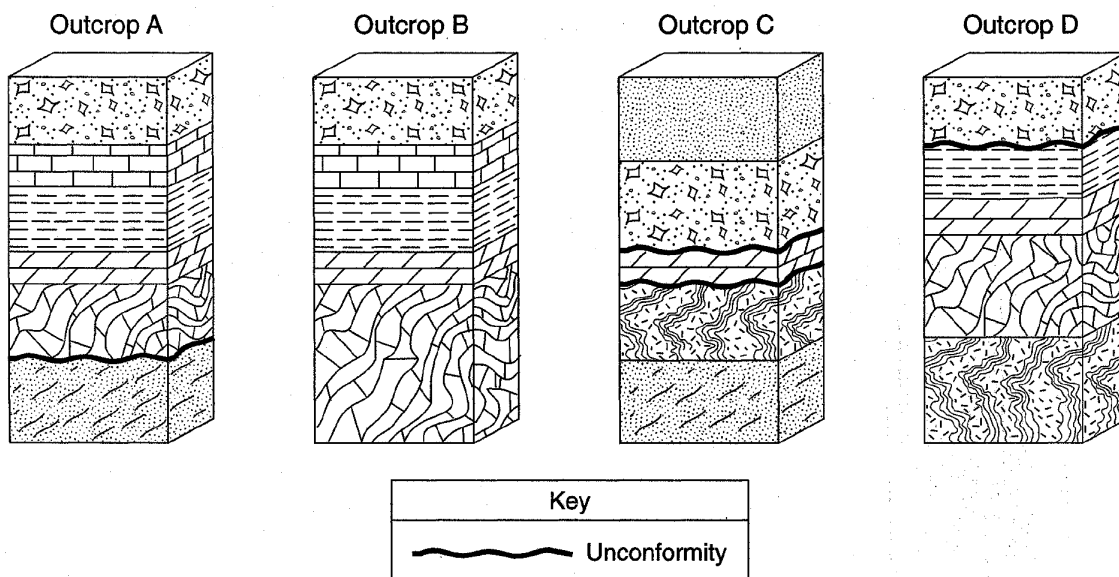
## Topic 11: Rx & Min Practice Test

33. The diagram below represents a rock consisting of granite pebbles and sand grains cemented together.



How does the age of the granite pebbles compare to the age of the rock itself?

- A) The pebbles are younger than the rock.
  - B) The pebbles are older than the rock.
  - C) The pebbles are the same age as the rock.
  - D) The relative age of the pebbles cannot be determined.
34. Base your answer to the following question on the block diagrams of four rock outcrops, *A*, *B*, *C*, and *D*, located within 15 kilometers of each other. The rock layers have not been overturned.



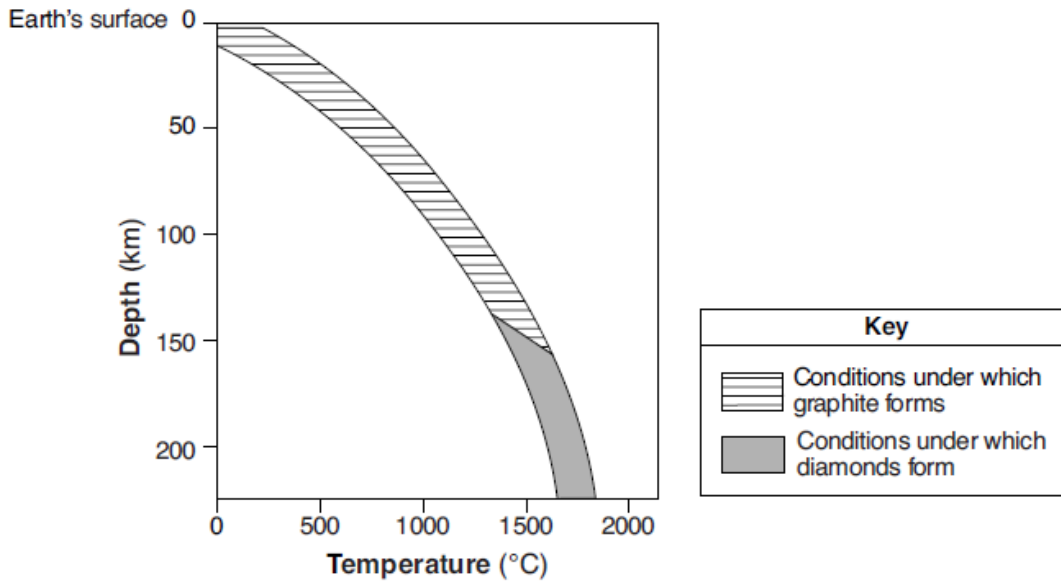
By which process was the quartzite formed?

- A) deposition of clastic sediment
- B) precipitation from seawater
- C) metamorphism of sandstone
- D) cementation of shells

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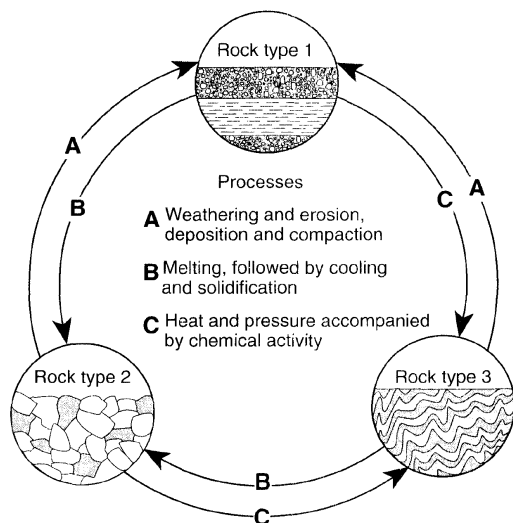
35. The graph below shows the depth and temperature conditions in Earth's interior under which carbon becomes either the mineral graphite or the mineral diamond.



Compared to the depth and temperature conditions under which graphite forms, describe the difference in the relative depth and relative temperature conditions under which most diamonds form.

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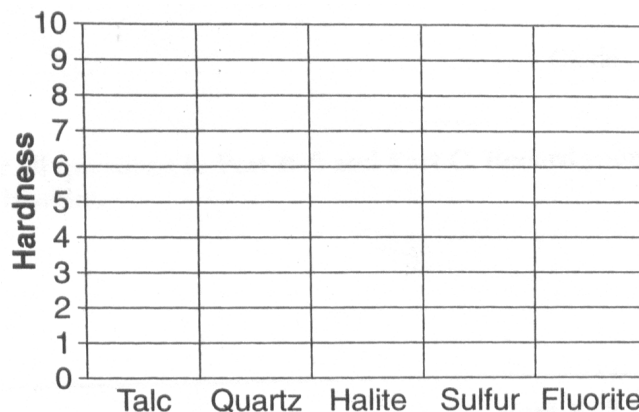
36. The diagram below represents geological processes that act continuously on Earth to form different rock types.



Which table correctly classifies each rock type?

- A)
- | Rock Type | Classification |
|-----------|----------------|
| 1         | sedimentary    |
| 2         | metamorphic    |
| 3         | igneous        |
- B)
- | Rock Type | Classification |
|-----------|----------------|
| 1         | sedimentary    |
| 2         | igneous        |
| 3         | metamorphic    |
- C)
- | Rock Type | Classification |
|-----------|----------------|
| 1         | metamorphic    |
| 2         | igneous        |
| 3         | sedimentary    |
- D)
- | Rock Type | Classification |
|-----------|----------------|
| 1         | igneous        |
| 2         | metamorphic    |
| 3         | sedimentary    |

37. Base your answer to the following question on the hardness of the minerals talc, quartz, halite, sulfur, and fluorite.



Which mineral shown on the grid would be the best abrasive? State *one* reason for your choice.

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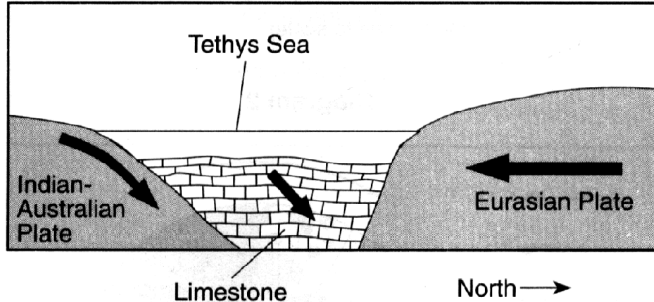
38. Base your answer to the following question on the passage and cross section below, which explain how some precious gemstones form. The cross section shows a portion of the ancient Tethys Sea, once located between the Indian-Australian Plate and the Eurasian Plate.

### Precious Gemstones

Some precious gemstones are a form of the mineral corundum, which has a hardness of 9. Corundum is a rare mineral made up of closely packed aluminum and oxygen atoms, and its formula is  $Al_2O_3$ . If small amounts of chromium replace some of the aluminum atoms in corundum, a bright-red gemstone called a ruby is produced. If traces of titanium and iron replace some aluminum atoms, deep-blue sapphires can be produced.

Most of the world's ruby deposits are found in metamorphic rock that is located along the southern slope of the Himalayas, where plate tectonics played a part in ruby formation. Around 50 million years ago, the Tethys Sea was located between what is now India and Eurasia. Much of the Tethys Sea bottom was composed of limestone that contained the elements needed to make these precious gemstones. The Tethys Sea closed up as the Indian-Australian Plate pushed under the Eurasian Plate, creating the Himalayan Mountains. The limestone rock lining the seafloor underwent metamorphism as it was pushed deep into Earth by the Indian-Australian Plate. For the next 40 to 45 million years, as the Himalayas rose, rubies, sapphires, and other gemstones continued to form.

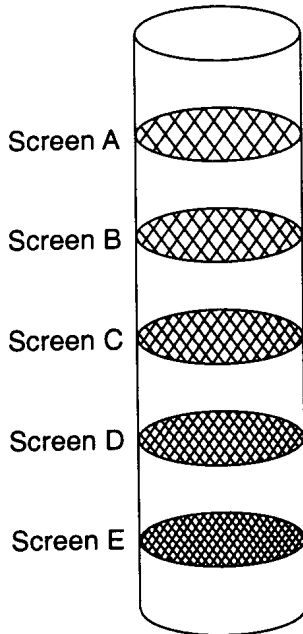
**A Portion of the Tethys Sea 50 Million Years Ago**



Which element replaces some of the aluminum atoms, causing the bright-red color of a ruby?

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39. Base your answer to the following question on the information, diagram, and data table below. To sort a quartz sediment sample by particle size, a student shook the sample through a column containing screens *A* through *E*. The mesh of the screens (the open spaces between the wires) had different-sized openings, as represented by the diagram. The results of the sorting are given in the student's data table.



(Screen mesh not drawn to scale)

Student Data Table

Screen	Screen Mesh Opening Size (cm)	Percentage of Particles Trapped by the Screen (%)
<i>A</i>	0.1	0
<i>B</i>	0.05	30
<i>C</i>	0.025	45
<i>D</i>	0.0125	15
<i>E</i>	0.00625	10

Which clastic sedimentary rock may be formed from particles of the same size as this quartz sediment sample?

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40. Base your answer to the following question on the data table below, which shows some characteristics of four rock samples, numbered 1 through 4. Some information has been left blank.

**Data Table**

<b>Rock Sample Number</b>	<b>Composition</b>	<b>Grain Size</b>	<b>Texture</b>	<b>Rock Name</b>
1	mostly clay minerals		clastic	shale
2	all mica	microscopic, fine	foliated with mineral alignment	
3	mica, quartz, feldspar, amphibole, garnet, pyroxene	medium to coarse	foliated with banding	gneiss
4	potassium feldspar, quartz, biotite, plagioclase feldspar, amphibole	5 mm		granite

Write the rock name of sample 2.