

Earth Science Igneous Rocks Pre-Test

Name _____

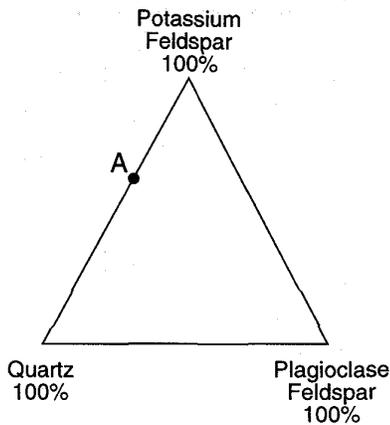
Per _____

Date _____

1. Which relative concentrations of elements are found in a felsic rock?
 - 1) a high concentration of aluminum and a low concentration of iron
 - 2) a high concentration of iron and a low concentration of aluminum
 - 3) a high concentration of magnesium and a low concentration of iron
 - 4) a high concentration of magnesium and a low concentration of aluminum

2. A fine-grained igneous rock contains 11% plagioclase, 72% pyroxene, 15% olivine, and 2% amphibole. This rock would most likely be classified as
 - 1) granite
 - 2) rhyolite
 - 3) gabbro
 - 4) basalt

3. In the diagram below, each angle of the triangle represents a 100 percent composition of the mineral named at that angle. The percentage of the mineral decreases toward 0 percent as either of the other angles of the triangle is approached. Letter A represents the mineral composition of an igneous rock.



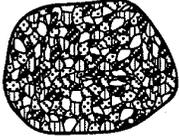
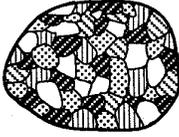
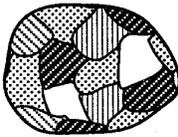
Rock A is a coarse-grained igneous rock that can best be identified as

- 1) rhyolite
- 2) pumice
- 3) granite
- 4) gabbro

4. The bedrock of the flat areas on the Moon is mostly basalt. This fine-grained igneous rock was most likely formed by the
 - 1) cementing and compacting of sediments
 - 2) changes caused by heat and pressure on preexisting rocks
 - 3) slow cooling of magma deep under the surface
 - 4) rapid cooling of molten rock in lava flows

5. Which is the best description of the properties of basalt?
 - 1) fine-grained and mafic
 - 2) fine-grained and felsic
 - 3) coarse-grained and mafic
 - 4) coarse-grained and felsic

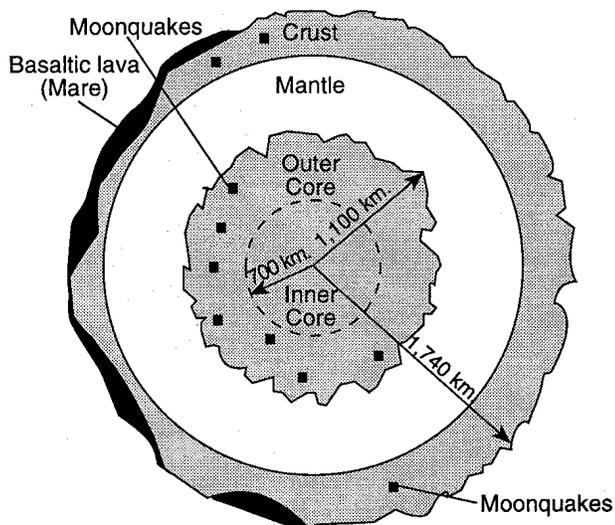
6. Which minerals are present in granite but are never present in gabbro?
 - 1) quartz and plagioclase feldspar
 - 2) potassium feldspar (orthoclase) and quartz
 - 3) plagioclase feldspar and potassium feldspar (orthoclase)
 - 4) biotite mica and hornblende amphibole

7. Which granite sample most likely formed from magma that cooled and solidified at the slowest rate?
 - 1) 
 - 2) 
 - 3) 
 - 4) 

8. A fine-grained igneous rock was probably formed by
 - 1) weathering and erosion
 - 2) great heat and pressure that did not produce melting
 - 3) rapid cooling of molten material
 - 4) burial and cementation of sediment

9. Base your answer to the following question on the information and the cross section below. The cross section represents a possible model of the Moon's interior.

Seismographs left on the Moon by astronauts have provided enough data to develop a model of the Moon's interior. Scientists believe that the Moon has a layered interior and that its crustal thickness varies greatly from one side of the Moon to the other.



According to the cross section, which kind of surface bedrock is found in large amounts on the Moon?

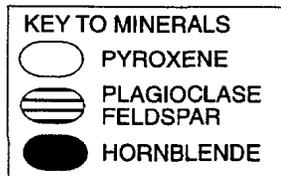
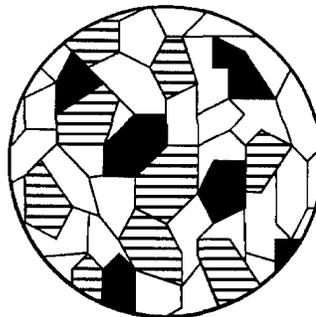
- 1) fossil limestone
 - 2) volcanic rock
 - 3) sedimentary conglomerate
 - 4) nonclastic evaporite
10. The four igneous rocks below are classified into two groups.

Group A	Group B
Granite	Rhyolite
Gabbro	Basalt

What is the basis for this classification?

- 1) density
- 2) color
- 3) crystal grain size
- 4) mineral content

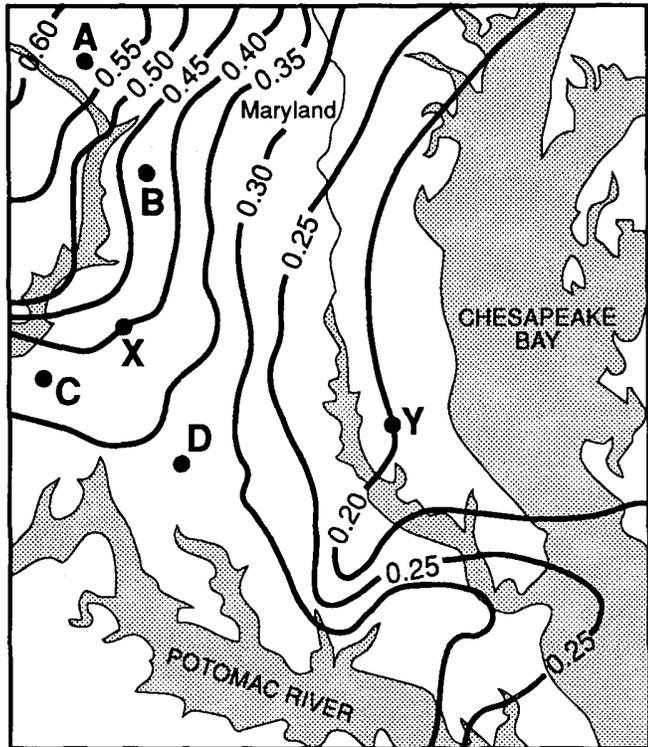
11. The diagram below shows the mineral composition of an igneous rock drawn actual size.



This igneous rock is

- 1) gabbro
 - 2) granite
 - 3) basalt
 - 4) rhyolite
12. Rock X and rock Y are igneous rocks with identical mineral composition. Rock X has no visible crystals and rock Y has large, visible crystals. What can be inferred about rock Y?
- 1) It cooled at the Earth's surface, more slowly than rock X.
 - 2) It cooled beneath the Earth's surface, more slowly than rock X.
 - 3) It cooled at the Earth's surface, more quickly than rock X.
 - 4) It cooled beneath the Earth's surface, more quickly than rock X.
13. Which property is common to most dark-colored igneous rocks?
- 1) high density
 - 2) intrusive formation
 - 3) abundant felsic minerals
 - 4) coarse-grained texture
14. Rhyolite is an example of a
- 1) monomineralic igneous rock
 - 2) polymineralic igneous rock
 - 3) monomineralic sedimentary rock
 - 4) polymineralic sedimentary rock

15. Base your answer to the following question on the field map below, which shows the average size of particles deposited by streams that drained an area of Maryland during the Pleistocene Epoch. The field values represent particle diameters in centimeters.



Particles of sediment collected at location Y contain intergrown crystals of quartz, potassium feldspar, and hornblende. From which rock did these sediments most likely weather?

- | | |
|--------------|--------------|
| 1) granite | 2) gabbro |
| 3) sandstone | 4) limestone |
16. Olivine and pyroxene are commonly found in igneous rocks that are
- 1) felsic, with low density
 - 2) felsic, with high density
 - 3) mafic, with low density
 - 4) mafic, with high density

17. A mafic igneous rock is most likely to be relatively

- 1) high in density and dark in color
- 2) high in density and light in color
- 3) low in density and dark in color
- 4) low in density and light in color

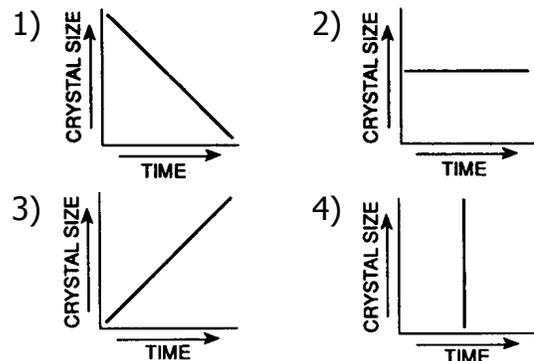
18. Which minerals are found in the igneous rocks gabbro and basalt?

- 1) olivine and quartz
- 2) olivine and pyroxene
- 3) pyroxene and orthoclase
- 4) orthoclase and quartz

19. The best evidence for determining the cooling rate of an igneous rock during its solidification is provided by

- 1) index fossils
- 2) faults in the rock
- 3) the crystal size of its minerals
- 4) the disintegration of radioactive substances

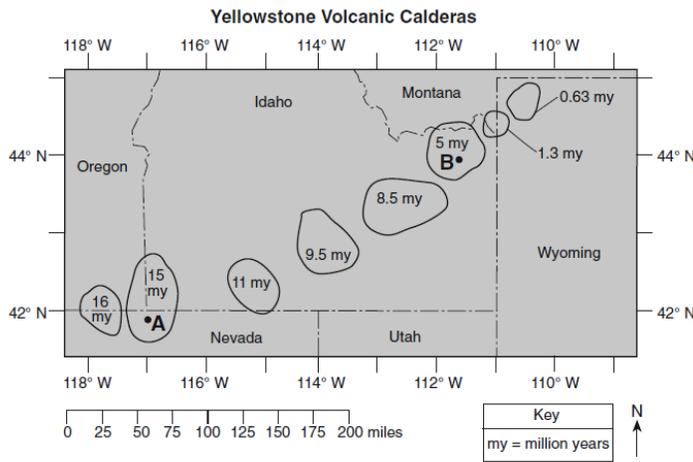
20. Which graph best represents the relationship between the length of time molten magma takes to cool and the size of the crystals in the rock formed by the magma?



21. A coarse-grained rock contains 50% plagioclase, 45% pyroxene, and 5% hornblende. This rock should be identified as

- | | |
|-------------|------------|
| 1) basalt | 2) granite |
| 3) rhyolite | 4) gabbro |

22. Base your answer to the following question on the map and passage below. The map shows the outlines and ages of several calderas created as a result of volcanic activity over the last 16 million years as the North American Plate moved over the Yellowstone Hot Spot. A and B represent locations within the calderas.



The Yellowstone Hot Spot

The Yellowstone Hot Spot has interacted with the North American Plate, causing widespread outpourings of basalt that buried about 200,000 square miles under layers of lava flows that are a half mile or more thick. Some of the basaltic magma produced by the hot spot accumulates near the base of the plate, where it melts the crust above. The melted crust, in turn, rises closer to the surface to form large reservoirs of potentially explosive rhyolite magma. Catastrophic eruptions have partly emptied some of these reservoirs, causing their roofs to collapse. The resulting craters, some of which are more than 30 miles across, are known as volcanic calderas.

Identify two minerals found in the igneous rock that is produced from the explosive rhyolite magma.

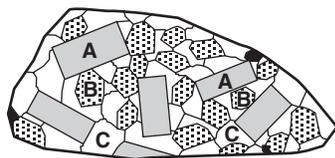
23. Base your answer to the following question on the passage below and on your knowledge of Earth science.

Dimension Stone: Granite

Dimension stone is any rock mined and cut for specific purposes, such as kitchen countertops, monuments, and the curbing along city streets. Examples of rock mined for use as dimension stone include limestone, marble, sandstone, and slate. The most important dimension stone is granite; however, not all dimension stone sold as granite is actually granite. Two examples of such rock sold as "granite" are syenite and anorthosite. Syenite is a crystalline, light-colored rock composed primarily of potassium feldspar, plagioclase feldspar, biotite, and amphibole, while anorthosite is composed almost entirely of plagioclase feldspar. Like actual granite, both syenite and anorthosite have large, interlocking crystals.

Explain why syenite is classified as a plutonic igneous rock.

Base your answers to questions **24** through **26** on the diagram and table below. The diagram represents a felsic igneous rock. Letters A, B, and C represent three different minerals in the rock sample. The table describes the physical properties of minerals A, B, and C found in the igneous rock sample.



(Actual size)

Mineral	Key	Physical Properties
A		pink, cleaves in two directions at 90°
B		white, cleaves in two directions, striations visible
C		colorless or clear with a glassy luster

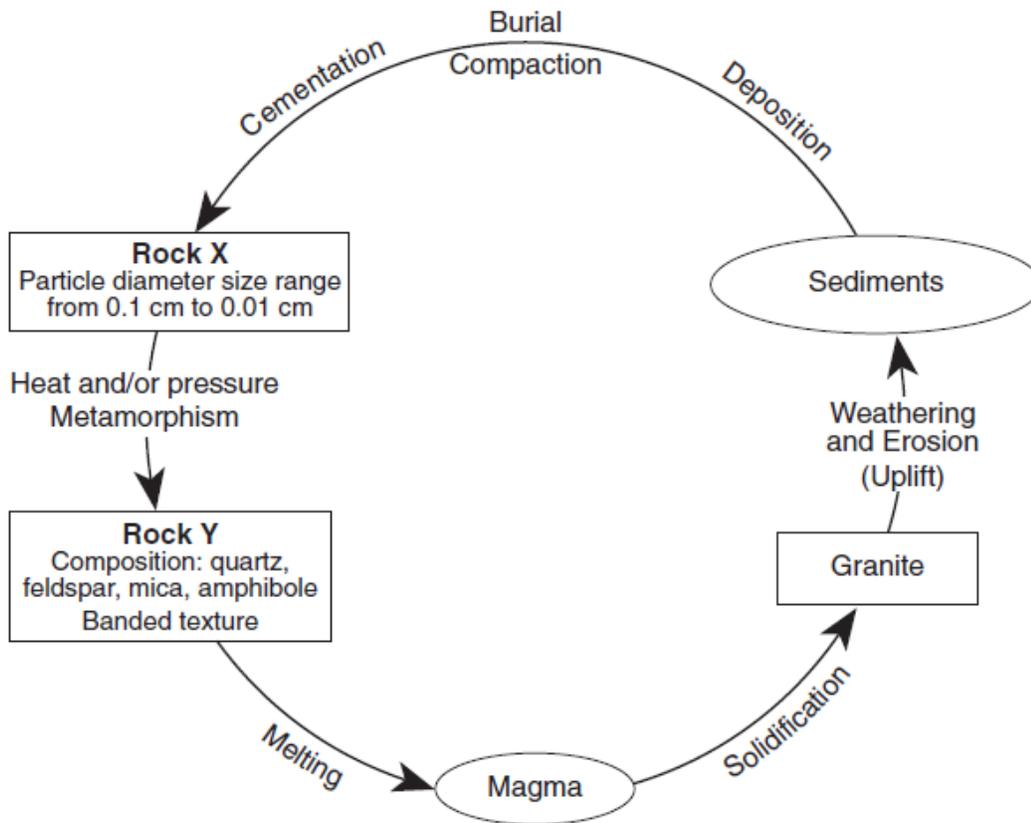
24. State two processes responsible for the formation of an igneous rock.

25. State the texture of this igneous rock.

26. On the table provided below, state the names of minerals A, B, and C.

Mineral	Name of Mineral
A	
B	
C	

27. Base your answer to the following question on the diagram below, which represents a part of the cycle. The igneous rock, granite, and the characteristics of sedimentary rock X and metamorphic rock Y are shown.



Complete the table below, with descriptions of the observable characteristics used to identify granite.

Characteristic of Granite	Description
Texture	
Color	
Density	

Base your answers to questions **28** through **30** on the photograph below and on your knowledge of Earth Science. The table shows the approximate mineral percent composition of an igneous rock.

Mineral Name	Percentage of Mineral Present
plagioclase feldspar	55%
biotite	15%
amphibole	30%

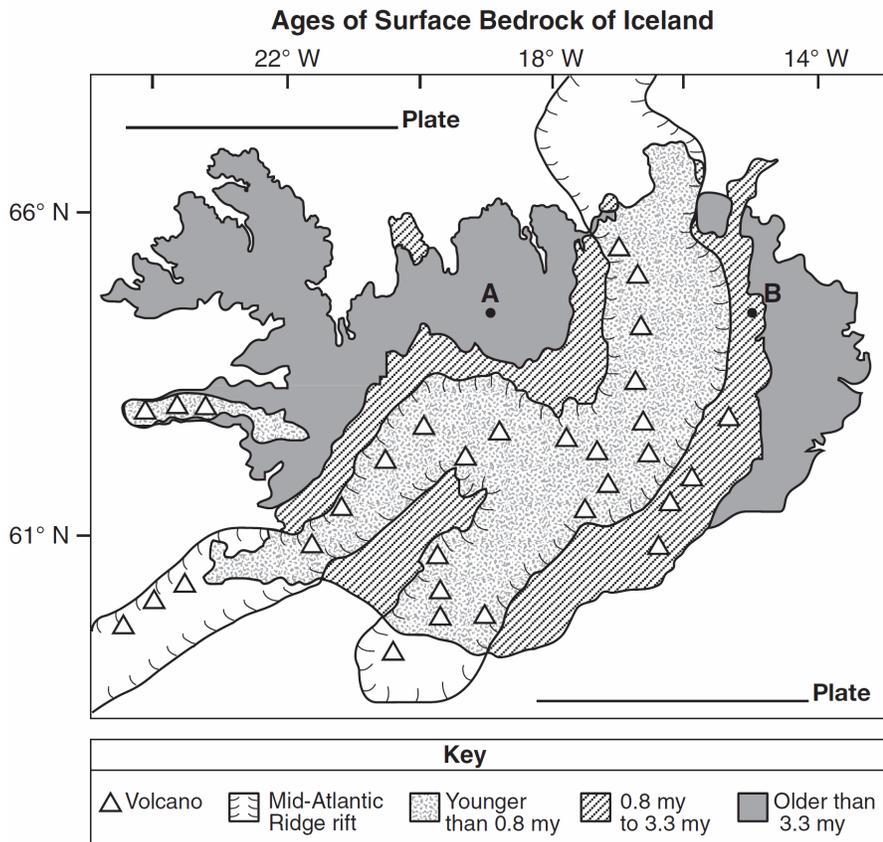


28. Identify this igneous rock.

29. Identify two elements that are commonly found in all three minerals in the data table.

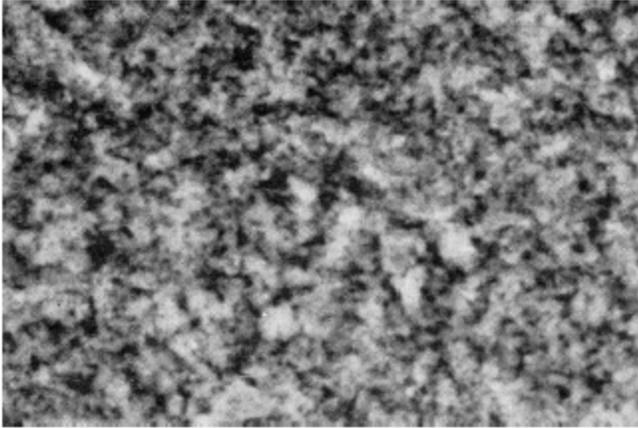
30. Identify two processes that formed this rock.

31. Base your answer to the following question on the map below and on your knowledge of Earth science. The map shows the generalized ages of surface bedrock of Iceland, an island located on the Mid-Atlantic Ridge rift. The location of the Mid-Atlantic Ridge rift is indicated. Points A and B represent locations on the surface bedrock, which is igneous in origin. The ages of the surface bedrock, in million years (my), are indicated in the key.



Identify one dark-colored, mafic igneous rock with a vesicular texture that is likely to be found on the surface of Iceland.

32. The photograph below shows actual crystal sizes in a light-colored igneous rock that contains several minerals, including potassium feldspar, quartz, and biotite mica.

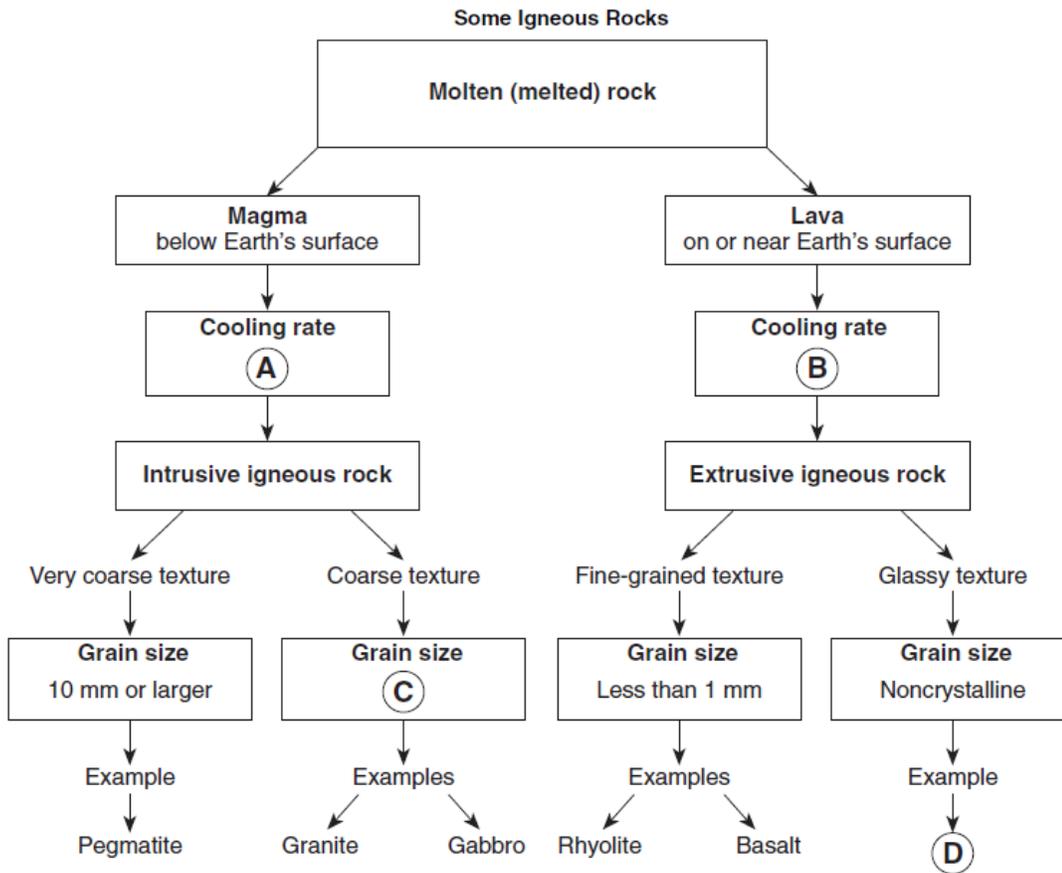


(Shown to actual size)

The rock should be identified as

- | | |
|------------|-------------|
| 1) granite | 2) gabbro |
| 3) basalt | 4) rhyolite |

Base your answers to questions **33** through **35** on the flowchart below and on your knowledge of Earth science. The flowchart shows the formation of some igneous rocks. The bold letters **A**, **B**, **C**, and **D** indicate parts of the flowchart that have not been labeled.



33. Give the numerical grain-size range that should be placed in the flowchart at **C** . Units must be included in your answer.

34. State one igneous rock that could be placed in the flowchart at **D** .

35. Contrast the rate of cooling at **A** that forms intrusive igneous rock with a rate of cooling at **B** that forms extrusive igneous rock.

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36. Base your answer to the following question on the newspaper article shown below, taken and adapted from the Los Angeles Times.

Volcanic Blast Shaped Earth

Study finds eruption split an ancient continent, creating Atlantic Ocean

The largest volcanic eruption in Earth's history — so powerful it split an ancient supercontinent and created the Atlantic Ocean — spewed millions of square miles of searing lava that extinguished much of life on ancient Earth.

From hundreds of basalt outcrops that rim the Atlantic coasts, scientists have pieced together evidence of the titanic eruption 200 million years ago. Researchers said that the eruption set the fractured landmasses adrift and, by wedging them apart, gradually opened the gulf that created the Atlantic — giving the map of the world the form it has today.

"This is one of the biggest things that has ever happened in Earth's history. This is a gigantic, igneous event and it all seems to have occurred in an amazingly brief amount of time."

To reconstruct the ancient catastrophe, a team of scientists analyzed basalt dikes, sills, and lavas from the New Jersey Palisades, the Brazilian Amazon, Spain, and West Africa.

By studying the chemical composition and dating the residual radioisotopes in the basaltic rocks, the researchers determined that the rocks all originated from the same eruption. Once they realized the outcrops were linked, they were able to determine that, in the distant past, the rocks all had been located together at the center of an immense continent called Pangea that once stretched, unbroken, from pole to pole.

Scientists stated that rocks from the volcanic eruption that separated the continents are basalt. List two observable characteristics that are normally used to identify basaltic rock.

Answer Key

Igneous_rx_pre_test

- | | | |
|---|--|--|
| <p>1. <u>1</u></p> <p>2. <u>4</u></p> <p>3. <u>3</u></p> <p>4. <u>4</u></p> <p>5. <u>1</u></p> <p>6. <u>2</u></p> <p>7. <u>4</u></p> <p>8. <u>3</u></p> <p>9. <u>2</u></p> <p>10. <u>3</u></p> <p>11. <u>1</u></p> <p>12. <u>2</u></p> <p>13. <u>1</u></p> <p>14. <u>2</u></p> <p>15. <u>1</u></p> <p>16. <u>4</u></p> <p>17. <u>1</u></p> <p>18. <u>2</u></p> <p>19. <u>3</u></p> <p>20. <u>3</u></p> <p>21. <u>4</u></p> <p>22. <i>Examples: – plagioclase feldspar – potassium feldspar (orthoclase)</i></p> | <p>23. — Large crystals form from slow cooling deep underground. — The crystals in syenite formed in an intrusion or an intrusive environment. — The texture is coarse. — Syenite formed by solidification of magma. — Large interlocking crystals — Syenite formed inside of Earth.</p> <p>24. Examples: melting and solidification; melting and crystallization; cooling and crystallization</p> <p>25. Acceptable responses include, but are not limited to, these examples: coarse; nonvesicular; large grains; big crystals</p> <p>26. Mineral <i>A</i> — potassium feldspar <i>or</i> orthoclase; Mineral <i>B</i> — plagioclase feldspar <i>or</i> Na–Ca feldspar; Mineral <i>C</i> — quartz</p> <p>27.</p> | <p>30. –melting –cooling –solidification/cr-</p> <p>31. vesicular basalt <i>or</i> scoria</p> <p>32. <u>1</u></p> <p>33. 1mm to 10 mm</p> <p>34. Responses include, but are not limited to: obsidian; basaltic glass; pumice; vesicular basalt glass.</p> <p>35. Responses include, but are not limited to: <i>A</i> is slower cooling than <i>B</i>; <i>B</i> is faster cooling than <i>A</i>; Intrusive rock forms from molten rock that cools slowly; Extrusive rock forms from molten rock than cools rapidly.</p> <p>36. fine grained (crystals less than 1 mm) glassy texture vesicular texture dark colored mafic (high Fe and Mg content) high density (3.0 g/cm³) mineral composition: plagioclase feldspar pyroxene olivine amphibole</p> |
|---|--|--|

Characteristic of Granite	Description
Texture	coarse nonvesicular 1 mm to 10 mm
Color	light colored white pink gray
Density	low 2.7 g/cm ³

28. diorite
29. –silicon *or* Si
–oxygen *or* O
–aluminum *or* Al

IMPORTANT NOTE (!):

The answer key shown on this page does not include full sentences, nor does it describe the importance of including nouns in ALL of your responses to constructed response questions. Therefore, you should "grade yourself" on the understanding that ALL constructed response questions should include: full sentences, a restating of the question, and subject nouns (NOT pronouns) throughout your answer.