

Name: _____

Rocks & Minerals

Log on to YouTube and search for **jocrisci** channel. All videos listed with numbers below and sorted into playlists for easy access. Use these videos if you need extra practice or instruction.

Minerals (Video 3.1, ESRT 16)

1. A student claimed that an object in his hand was a rock. The teacher said it was a mineral. What tests would have to be performed and what would the results be in order to settle this argument?
2. The minerals diamond and graphite are both composed of the element carbon, yet their physical properties are completely different. Why?
3. Does the mineral sample to the right show fracture or cleavage? How can you tell?

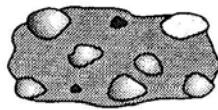


Rocks (Video 3.2, 3.2, 3.4, ESRT 6ab, & 7ab)

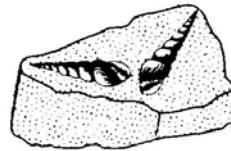
1. State if the rock is igneous, metamorphic or sedimentary and be able to write a sentence describing your decision.



Sample A



Sample B



Sample C



Sample D

- a. Is sample A an igneous, sedimentary, or metamorphic? How can you tell?
 - b. Is sample B an igneous, sedimentary, or metamorphic? How can you tell?
 - c. Is sample C an igneous, sedimentary, or metamorphic? How can you tell?
 - d. Is sample D an igneous, sedimentary, or metamorphic? How can you tell?
2. State and define the textures that are found in each rock type. (Be able to read ESRT pgs. 6+7)
 - a. Which environment is below the Earth's surface?
 - b. What type of texture do intrusive igneous rocks have?
 - c. List all the minerals that can be found in granite.
 - d. Igneous rocks with a felsic composition contain which elements?
 - e. What is the mineral composition of gneiss?
 - f. Shale undergoes metamorphism to become which rock?
 - g. Limestone undergoes metamorphism to become which rock?
 - h. What is the mineral composition of shale?
 - i. Which inorganic sedimentary rocks are made up of all different size sediments?
 - j. Which sedimentary rock can easily be split into thinner layers?
 - k. A particle of 0.2 to 6.4cm in diameter would be called what?
 - l. What is the smallest and largest diameter that a sand particle can be?

Rocks & Minerals Facts

(Search Quizlet for username MsCWood – Rocks & Minerals Facts)

1. Minerals are / solid, naturally occurring, inorganic (not living) substances
2. Minerals are **identified** on the basis of / well defined physical and chemical properties
ex. hardness, cleavage, shape
3. Color is not a good way to ID a mineral because / some minerals come in lots of colors
like quartz
4. Streak is / the color of the powdered form of a mineral, found by using a streak plate
5. Cleavage is / the flat sides on a mineral, mineral breaks along planes of weak bonding
6. The mineral and rock that react to acid are / calcite (rhombus-shaped) and limestone
7. **The physical properties of minerals depends upon / the internal arrangement of atoms**
8. The most abundant elements in Earth's crust are / oxygen and silicon = quartz

-
9. Rocks are **classified** on the basis of / their origin (how they formed)
 10. Rocks are **identified** by their / texture (physical appearance or size of grains)
 11. Sedimentary rocks form from / sediments by compaction & cementation, evaporation, and organic remains
 12. How can you tell a rock is sedimentary / its texture is clastic (pieces of rocks) and fossils

-
13. Igneous rocks form by / the crystallization of molten magma or lava Large crystals / slow cooling (Intrusive) Small crystals / fast cooling (Extrusive)
 14. Vesicular means / gas pockets (cooled fast, extrusive, volcanic)
 15. How can you tell a rock is igneous / its texture is glassy, visible intergrown crystals or vesicular

-
16. Metamorphic rocks form from / other rocks by heat and pressure (recrystallization)
 17. How can you tell a rock is metamorphic / its texture is foliated or banded
 18. Contact metamorphism / molten rock (igneous intrusions) coming in contact with other rocks
 19. Regional metamorphism / over large areas and is associated with mountain building
 20. According to ESRT pg. 7 shale turns into / slate, sandstone into / quartzite, limestone into / marble

Minerals

Facts to Memorize: 1-6

5 Defining Characteristics of Minerals:

<ul style="list-style-type: none"> • _____ • _____ • _____ 	<ul style="list-style-type: none"> • _____ • _____
---------------------------------------------------------------------------------------------	----------------------------------------------------------------------------

Minerals are classified according to their _____ & _____ properties.

Physical Properties of Minerals

ESRT pg. 16

Physical Property	Definition, Tests & Examples
Color	_____ _____ _____ <i>Example:</i> Quartz - _____ _____ Calcite & Halite - _____ _____
Streak	_____ _____ <i>Test:</i> _____ _____
Luster	_____ _____ Metallic - _____ <i>Example:</i> _____ Non - Metallic - _____ _____ <i>Example:</i> _____

Hardness	<hr/> <hr/> <i>Test:</i> _____ <hr/> <div style="display: flex; align-items: center;"> <div style="flex: 1;"> Moh's Hardness Scale - _____ </div> <table border="1" style="margin-left: 20px; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Mineral</th> <th>Hardness</th> <th>Common object</th> </tr> </thead> <tbody> <tr><td>Diamond</td><td>10</td><td></td></tr> <tr><td>Corundum</td><td>9</td><td></td></tr> <tr><td>Topaz</td><td>8</td><td></td></tr> <tr><td>Quartz</td><td>7</td><td></td></tr> <tr><td>Feldspar</td><td>6</td><td>Steel file (6.5)</td></tr> <tr><td>Apatite</td><td>5</td><td>Glass (5.5)</td></tr> <tr><td>Fluorite</td><td>4</td><td>Iron nail (4.5)</td></tr> <tr><td>Calcite</td><td>3</td><td>Copper penny (3)</td></tr> <tr><td>Gypsum</td><td>2</td><td>Fingernail (2.5)</td></tr> <tr><td>Talc</td><td>1</td><td></td></tr> </tbody> </table> </div> <hr/> <hr/>	Mineral	Hardness	Common object	Diamond	10		Corundum	9		Topaz	8		Quartz	7		Feldspar	6	Steel file (6.5)	Apatite	5	Glass (5.5)	Fluorite	4	Iron nail (4.5)	Calcite	3	Copper penny (3)	Gypsum	2	Fingernail (2.5)	Talc	1	
Mineral	Hardness	Common object																																
Diamond	10																																	
Corundum	9																																	
Topaz	8																																	
Quartz	7																																	
Feldspar	6	Steel file (6.5)																																
Apatite	5	Glass (5.5)																																
Fluorite	4	Iron nail (4.5)																																
Calcite	3	Copper penny (3)																																
Gypsum	2	Fingernail (2.5)																																
Talc	1																																	
Cleavage	<hr/> <hr/> <i>Test:</i> _____ <hr/> <hr/>																																	
Fracture	<hr/> <hr/> <hr/> <hr/>																																	
Composition	<hr/> <hr/> <hr/> <hr/>																																	
Special Properties	<i>Examples:</i> _____ <hr/> <hr/>																																	

Hardness tests

mineral on mineral



fingernail



penny



knife



file



glass



Streak test for color



Labeling



Minerals are grouped according to their _____ composition.

- The elements _____ and _____ are the most _____ elements found in Earth's crust.
- Together , _____ and _____ combine to make a group of minerals called _____ .
- The _____ are the most _____ group of minerals in the Earth's crust.

ESRT pg. 16

THE PHYSICAL PROPERTIES OF MINERALS DEPENDS UPON THE _____

Two minerals can have the same chemical composition but exhibit completely different physical properties. For example, **Diamond & Graphite are both made up of solely Carbon. However, their internal arrangement of atoms is different.**

Mineral Practice Questions

1. Fill in the missing information in the chart below by using the "Properties of Common Minerals" chart on page 16 of your ESRT.

Luster	Hardness	Composition	Color	Mineral Name
Non-metallic	6		White to pink	
	2	S		
	4		Colorless/variable	
Metallic	2.5		Metallic silver	
		Mg ₃ Si ₄ O ₁₀ (OH) ₂		Talc
	1-6.5	Fe ₂ O ₃		
Non-metallic	2	CaSO ₄ – 2H ₂ O	White to pink	
Non-metallic		CaF ₂		
			Brassy yellow	
		Fe ₃ Al ₂ Si ₃ O ₁₂	Dark red	
		C		
Non-metallic	3		Colorless/variable	
Metallic	5.5-6.5		Black to silver	
	6.5	(Fe, Mg) ₂ SiO ₄		

2. Which of the minerals found on ESRT pg. 16 has the following mineral characteristics?

Mineral Characteristics	Mineral Name
Bubbles with acid when powdered	
Cleaves at 56° and 124°	
Food additive and melts ice	
Easily scratched by a fingernail	
Red-brown streak	
Feels greasy	
Used in jewelry, glass and electronics	
NYS Gemstone	

Use the tables below to answer questions #3-6.

Gemstone Mineral	Composition	Hardness	Average Density
Emerald	$\text{Be}_3\text{Al}_2(\text{Si}_6\text{O}_{16})$	7.5-8	2.7
Sapphire	Al_2O_3	9	4.0
Spinel	MgAl_2O_4	8	3.8
Zircon	ZrSiO_4	7.5	4.7

1	Talc
2	Gypsum
3	Calcite
4	Fluorite
5	Apatite
6	Feldspar
7	Quartz
8	Topaz
9	Corundum
10	Diamond

3. What element is found in all four of the above samples?

4. How many minerals will sapphire scratch on page 16 of your ESRT?

5. Using Table 2 and your ESRT, between which two minerals will Dolomite fall in between?

6. What happens when acid is applied to Calcite?

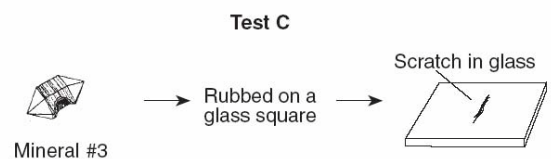
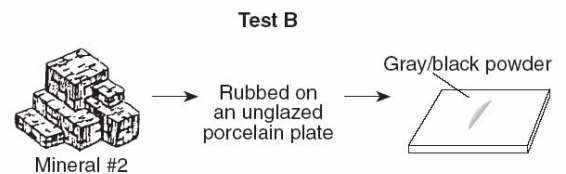
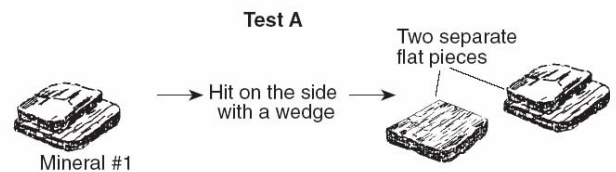
Use the diagrams to the right to answer questions #7-10.

7. Mineral test A is testing for _____

8. Mineral test B is testing for _____

9. Mineral test C is testing for _____

10. Out of ALL mineral tests, which is the least reliable?

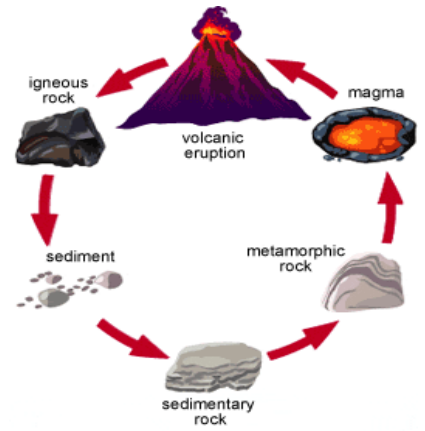


The Rock Cycle

Facts to Memorize: 9-10

There are 3 different classifications of rock

- _____
- _____
- _____



Rocks are classified based on _____

Rocks are identified by their _____

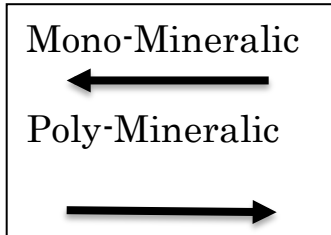
Igneous Rocks form from - _____

Sedimentary Rocks form from - _____

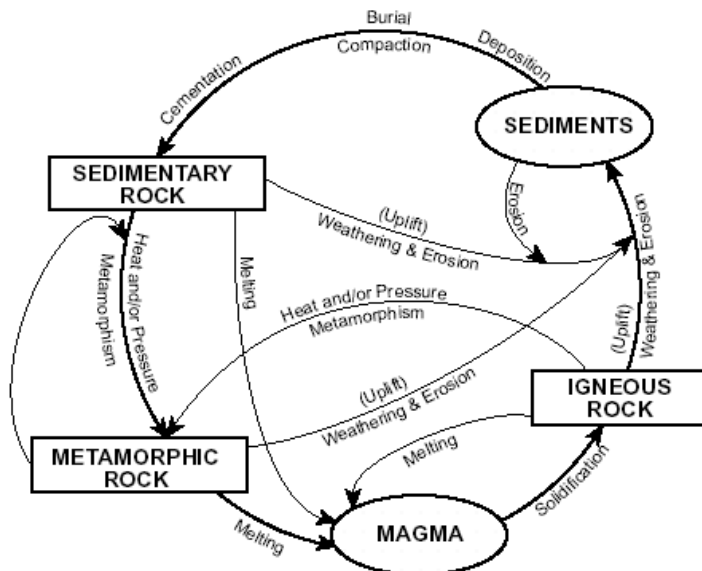
Metamorphic Rocks form from - _____

Rocks can be both _____ and _____

- Mono-mineralic - _____
- Poly-mineralic - _____
 - Most rocks are _____



Rock Cycle in Earth's Crust



ESRT pg. 6

Sedimentary Rocks

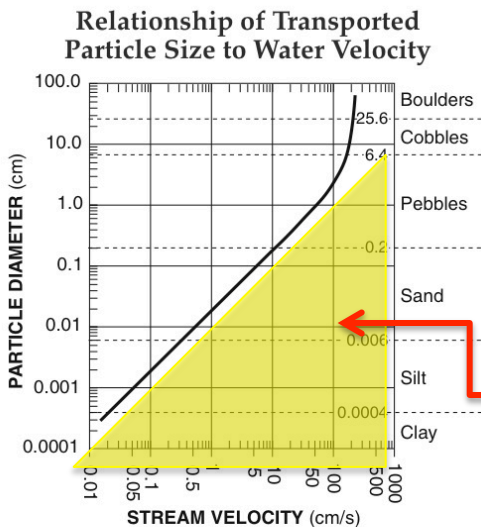
- Most sedimentary rocks are made up of _____ of other rocks.
- Most sedimentary rocks are formed in _____ environments.
- Two *processes* that form a sedimentary rock:
 - **Compaction** - _____
 - **Cementation** - _____

Key Features of Sedimentary Rocks

- **Strata** - _____
- **Clasts** - _____
- **Fossils** - _____



Sedimentary Rock ESRT Practice Questions



ESRT pg. 6

As the stream velocity increases, the particle diameter that can be carried by the stream _____.

The larger the sediment → the _____ the water must be moving to carry it.

If where the points given for stream velocity & particle diameter meet BELOW the line drawn in the graph, the sediment CAN be carried by the stream.

This generalized graph shows the water velocity needed to maintain, but not start, movement. Variations occur due to differences in particle density and shape.

Relationship of Transported Particle Size to Water Velocity

1. What is the range of particle size for PEBBLE? _____ to _____
2. What is the range of particle size for SAND? _____ to _____
3. What is the range of particle size for SILT? _____ to _____
4. What is the range of particle size for CLAY? _____ to _____
5. What is the minimum stream velocity needed to carry a BOULDER? _____
6. What is the minimum stream velocity needed to carry a COBBLE? _____
7. What is the minimum stream velocity needed to carry a particle of SILT? _____
8. What is the minimum stream velocity needed to carry a particle of CLAY? _____

ESRT pg. 6

Scheme for Sedimentary Rock Identification

9. What is another name for clastic rocks? _____
10. How are clastic sedimentary rocks classified? _____
11. By what 2 processes did these clastic sedimentary rocks form? _____
12. Fill in the chart below:

Rock Name	Grain Size Name	Grain Size (cm)	Comments
Conglomerate			
Breccia			
Sandstone			
Siltstone			
Shale			

13. How are crystalline and bioclastic sedimentary rocks classified? _____
14. By what 2 processes do crystalline rocks form? _____
15. Where does coal come from? _____
16. What does limestone sometimes contain? _____
17. Fill in the chart below:

Rock Name	Composition	Crystalline or Bioclastic?	Grain Size
Rock Salt			
Rock Gypsum			
Dolostone			
Limestone			
Coal			

18. Using both of the charts, *Relationship of Transported Particle Size to Water Velocity & Scheme for Sedimentary Rock Identification*, complete the table to the right.

Grain Size	Particle Size Name	Rock Name
0.00001		
0.1		
0.002		
0.007		
0.9 (round)		
0.5 (angular)		
0.00004		
0.005		

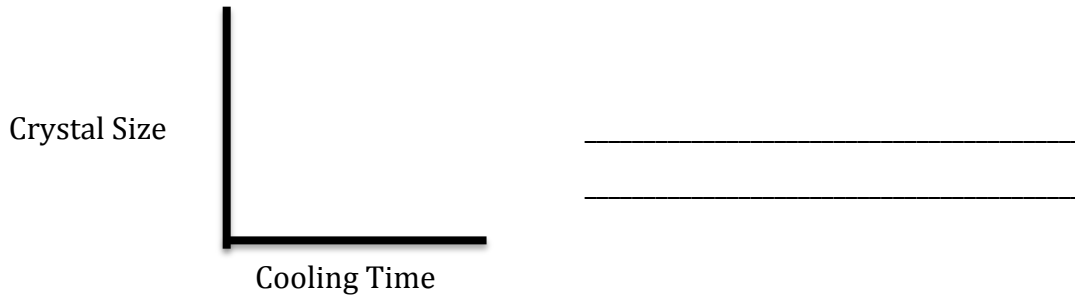
19. Which rock is formed when rock fragments are deposited and cemented together?
- Dolostone
 - Sandstone
 - Gabbro
 - Rhyolite
20. Which rock type most likely contains fossils?
- Intrusive igneous rocks
 - Extrusive igneous rocks
 - Sedimentary rocks
 - Metamorphic rocks
21. Some sedimentary rocks are composed of rock fragments that had different origins. Which statement best explains why this could occur?
- Fossils are often found in sedimentary rocks
 - Sedimentary rocks form from the weathered products of any type of rock
 - When molten lava solidifies to form sedimentary rock it often contains foreign particles
 - Under high heat and pressure, recrystallization results in the formation of many minerals
22. Which rocks form relatively thin layers, compared to the thickness of the continent, over large areas of the continents?
- Granite & Gabbro
 - Sandstone & Shale
 - Metamorphic Rocks
 - Intrusive Igneous Rocks

23. One similarity between a sand pile and sandstone is that they:
- Contain a cementing agent
 - Always contain fossils
 - Have a crystalline structure
 - Are composed of sediments
24. Which kind of bedrock would most likely contain fossils?
- A mass of granite in the core of a mountain
 - A series of alternating layers of shale and sandstone
 - A basalt lava flow from an ancient volcano
 - A high-grade metamorphic rock layer made from mixed igneous and sedimentary layers
25. Which statement correctly describes the distribution of sedimentary rocks on the Earth?
- Sedimentary rock layers are the thickest in the middle of the oceans
 - Sedimentary rocks extend down into the Earth's crust as far as the inner core
 - Sedimentary rocks are usually located in volcanic regions
 - Sedimentary rocks usually form a thin layer over large areas of the continents

Igneous Rocks

Igneous Rocks are formed by _____

What determines crystal size? _____

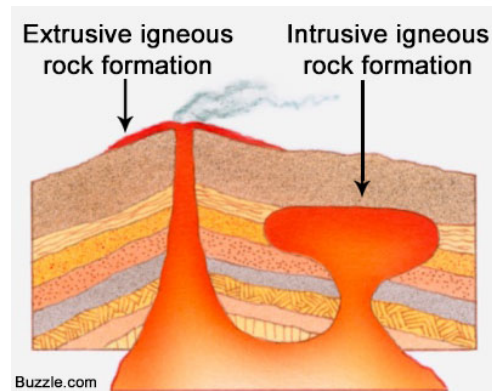


Large crystals indicate - _____

Small crystals indicate - _____



Extrusive	Intrusive



Use Earth Science Reference Table, page 6, to complete the following chart

Intrusive	Environment of Formation	Extrusive
	Also Known As	
	Rate of Cooling	
	Size of Crystals	
	Texture	

Igneous Rock ESRT Practice Questions

1. The two extrusive glassy textured rocks that are non-vesicular are

2. The two extrusive glassy textured rocks that are vesicular are

3. What is the grain size of an extrusive rock with a glassy texture? _____
4. What is the cooling rate for extrusive rocks with a glassy texture? _____
5. Where are extrusive rocks formed? _____
6. The three extrusive fine textured rocks that are vesicular are

7. The four extrusive fine textured rocks that are non-vesicular are

8. What is the grain size of an extrusive rock with a fine texture? _____
9. What is the cooling rate for extrusive rocks with a fine texture? _____
10. What is another word for extrusive? _____
11. What does vesicular mean? _____
12. List the 6 intrusive, coarse textured rocks listed in the ESRT

13. Name the intrusive, very coarse textured rock listed in the ESRT _____
14. What is another word for intrusive? _____
15. What is the grain size of coarse textured rocks? _____
16. What is the grain size of the very coarse textured rocks? _____
17. Are these rocks (coarse and very coarse) vesicular or non-vesicular? _____
18. What is the cooling rate for intrusive rocks? _____
19. Where are these rocks formed? _____
20. What is the cooling rate for extrusive rocks? _____

21. Complete the chart below using your ESRT

Rock Name	Color Light / Dark	Density High / Low	Composition Felsic / Mafic
Pegmatite			
Granite			
Gabbro			
Pumice			
Basaltic Glass			
Scoria/Vesicular Basalt			
Rhyolite			
Basalt			
Vesicular Rhyolite			

22. Complete the following sentences.

- a. Mafic rocks are _____ in color, have a _____ density and contain _____ and _____
- b. Felsic rocks are _____ in color, have a _____ density and contain _____ and _____

23. List the appropriate minerals and their % amount found in the following Igneous Rocks

- a. Granite _____

- a. Basalt _____

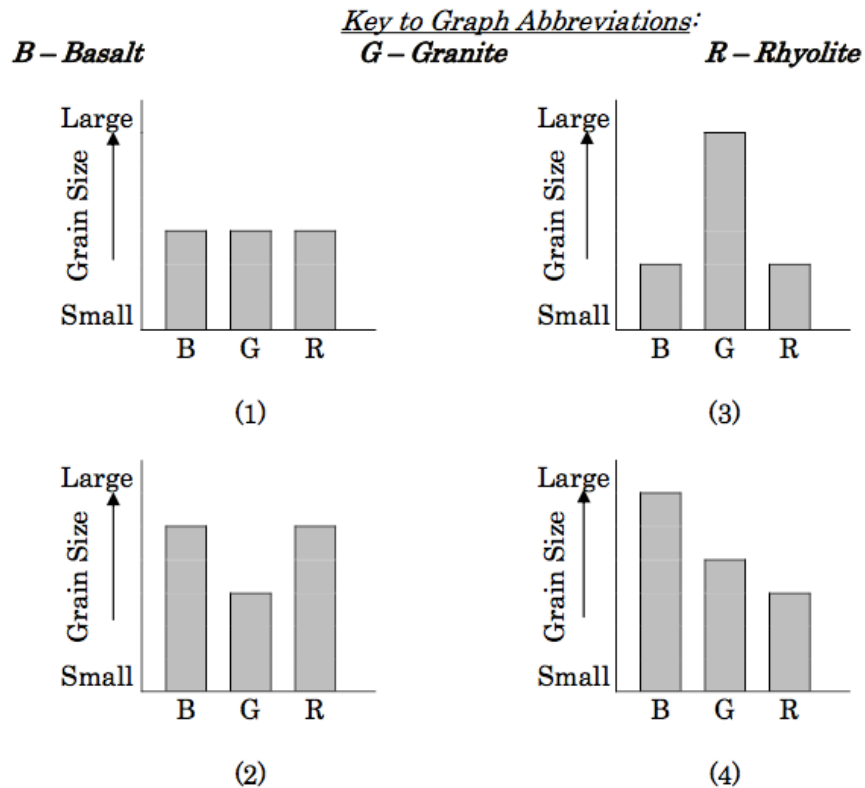
22. Which is usually a characteristic of igneous rocks with a high density?

- a. They are light in color c. They have high aluminum content.
b. They are felsic. d. They contain iron.

23. As the percentage of mafic minerals in an igneous rock increases, the rocks color becomes

- a. Lighter and its grain size decreases
b. Darker and its density decreases
c. Lighter and its grain size increases
d. Darker and its density increases

24. Which rock is of felsic composition, low in density, light in color, and coarse grained?
 a. Rhyolite b. Basalt c. Granite d. Gabbro
25. Which statement is true of granite and gabbro?
 a. They are both intrusive c. They have different grain sizes
 b. They both contain potassium feldspar d. They are both extrusive
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
27. Which graph best represents the comparison of the average grain sizes in basalt, granite and rhyolite?



Metamorphic Rocks

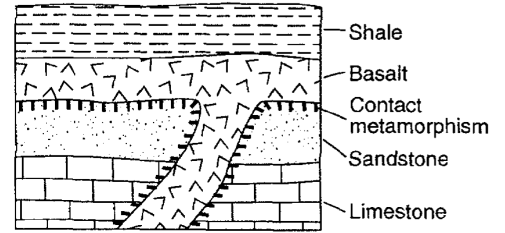
Facts to Memorize: 16-20

Two processes that form metamorphic rocks:

*If _____ occurs, the rock is no longer classified as a metamorphic rock. It becomes an _____ rock.

Two types of metamorphism:

- **Regional** - _____
- **Contact** - _____



Key Identifying Features of Metamorphic Rocks

- **Foliation** - _____

** _____ **



- **Distorted Structures** - _____

- **Key Identifier Minerals**

- _____
(Dark Red Color)
- _____
(Shiny, flaky mineral)



Metamorphic Rock ESRT Practice Questions

ESRT pg. 7

1. Fill in the following table to identify the metamorphic rock

Characteristic	Metamorphic Rock Name
Foliated, fine grained, low-grade metamorphism of shale	
Non-foliated, fine grained	
Foliated, high grade metamorphism, contains pyroxene & quartz	
Non-foliated, contains quartz, contact metamorphism	
Coarse grained, parent rock is conglomerate, pebbles may be distorted	
Parent rock is Dolostone	
Contains only mica	
Fine to medium grain size, contains clay minerals, but never contains pyroxene	
Has banding	
Contact metamorphism due to extreme heat from nearby lava	
Metamorphism of sandstone	
Mineral alignment, visible platy mica crystals	

2. Name the Parent Rock of each of the following rocks.

Metamorphic Rock	Parent Rock
Slate	
Phyllite	
Schist	
Gneiss	

Metamorphic Rock	Parent Rock
Quartzite	
Marble	
Anthracite Coal	
Metaconglomerate	

3. Name the 5 minerals found in Phyllite:

4. What mineral may or may not be found in a sample of schist? _____

5. What type of rock is produced when various rocks are changed by nearby lava or magma? (Circle one)

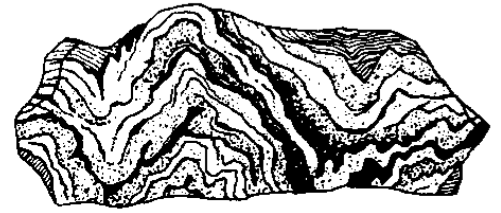
Igneous

Sedimentary

Metamorphic

Rocks Practice Questions

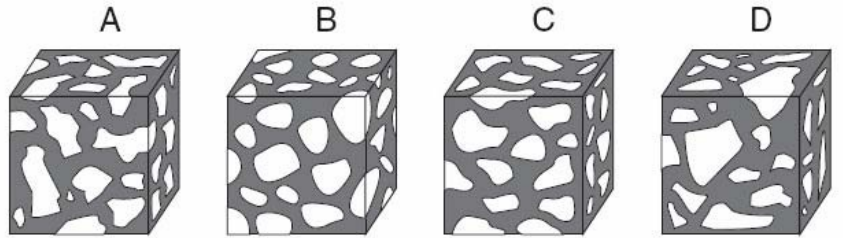
Use the picture to the right to answer #1-2.



1. What process caused the banding in this rock sample?
2. What is the name of this rock sample?

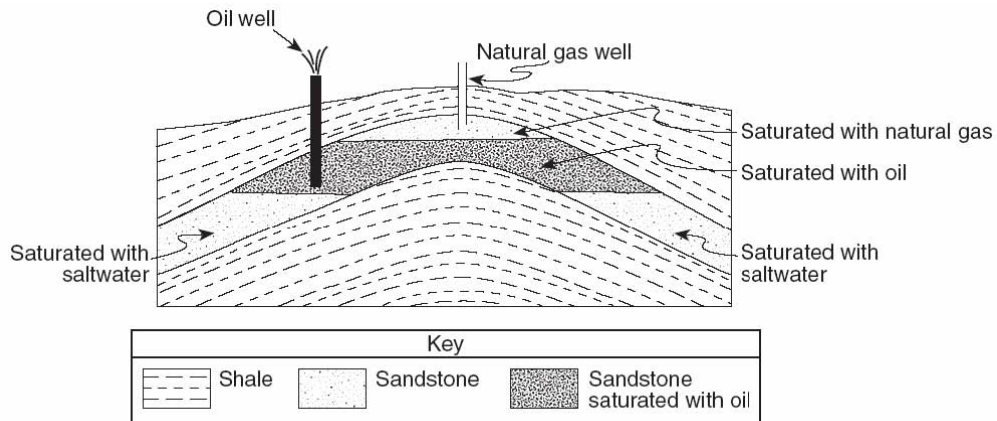
Use the picture to the right to answer #3-5.

3. Which two samples could be Breccia?
4. Which two samples could be Conglomerate?



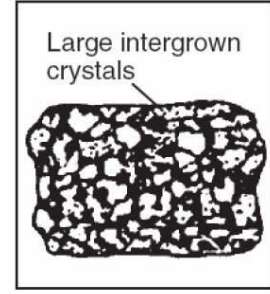
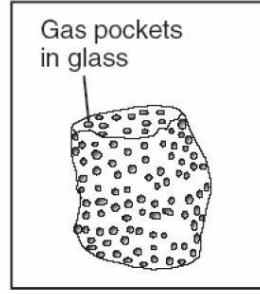
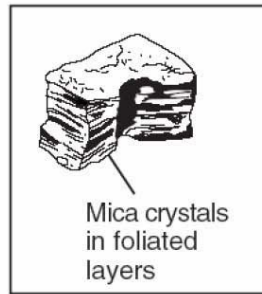
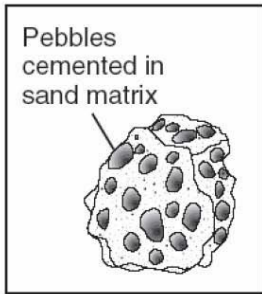
5. What **observational** information did you use to make your decisions in question 3 & 4?

Use the diagram below to answer #6-8.



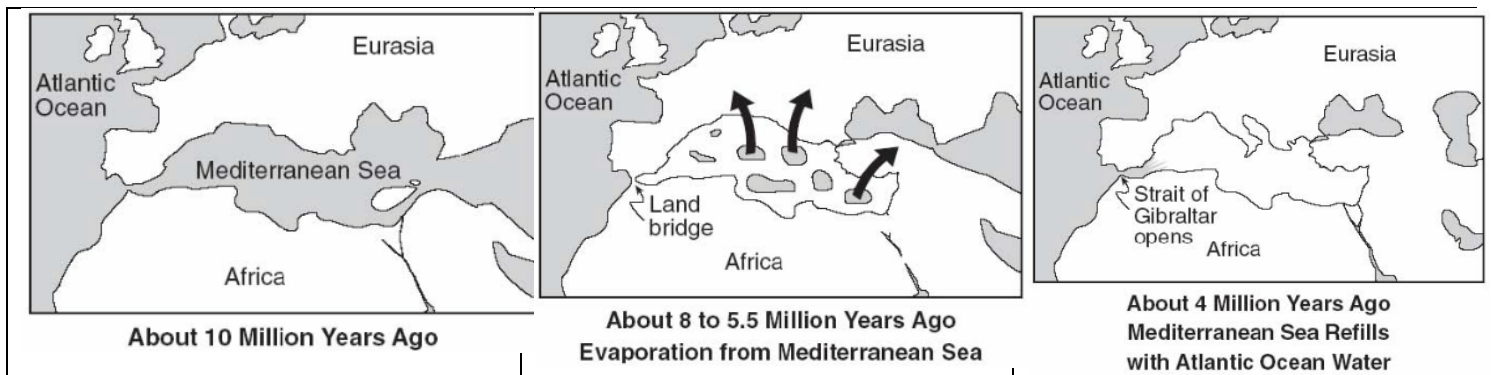
6. How is it possible that Sandstone could be saturated with liquid oil or water?
7. Why is the natural gas above the oil and saltwater?
8. What is the grain size (numerically) of the sandstone layer?

Use the diagram below to answer #9-13.



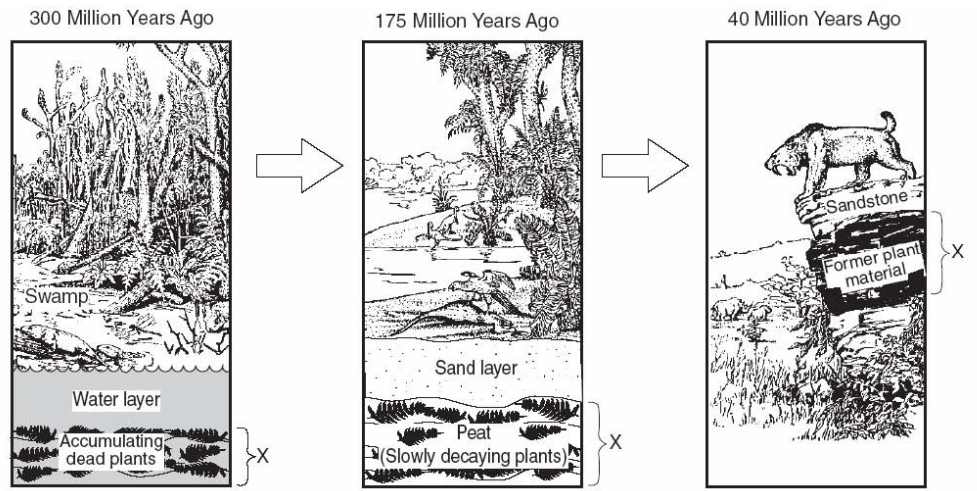
9. Put an S under the sedimentary rock.
10. What is the name of that sedimentary rock?
11. Put an E under the extrusive igneous rock.
12. Put an M under the metamorphic rock.
13. Put a G under the rock that could be granite.

Use the diagram below to answer #14-15.



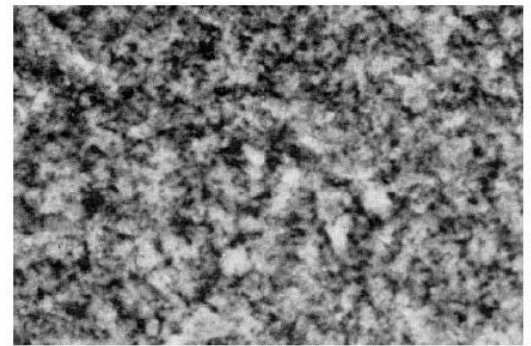
14. What happened to the Mediterranean Sea about 6 million years ago?
15. Name 3 sedimentary rocks that could have formed when the water evaporated.

16. Using the pictures to the right, name the rock that is forming in layer X.



17. What rock could this be shown in the picture to the right?

18. What **observational** clues did you use to determine your answer to question 17?



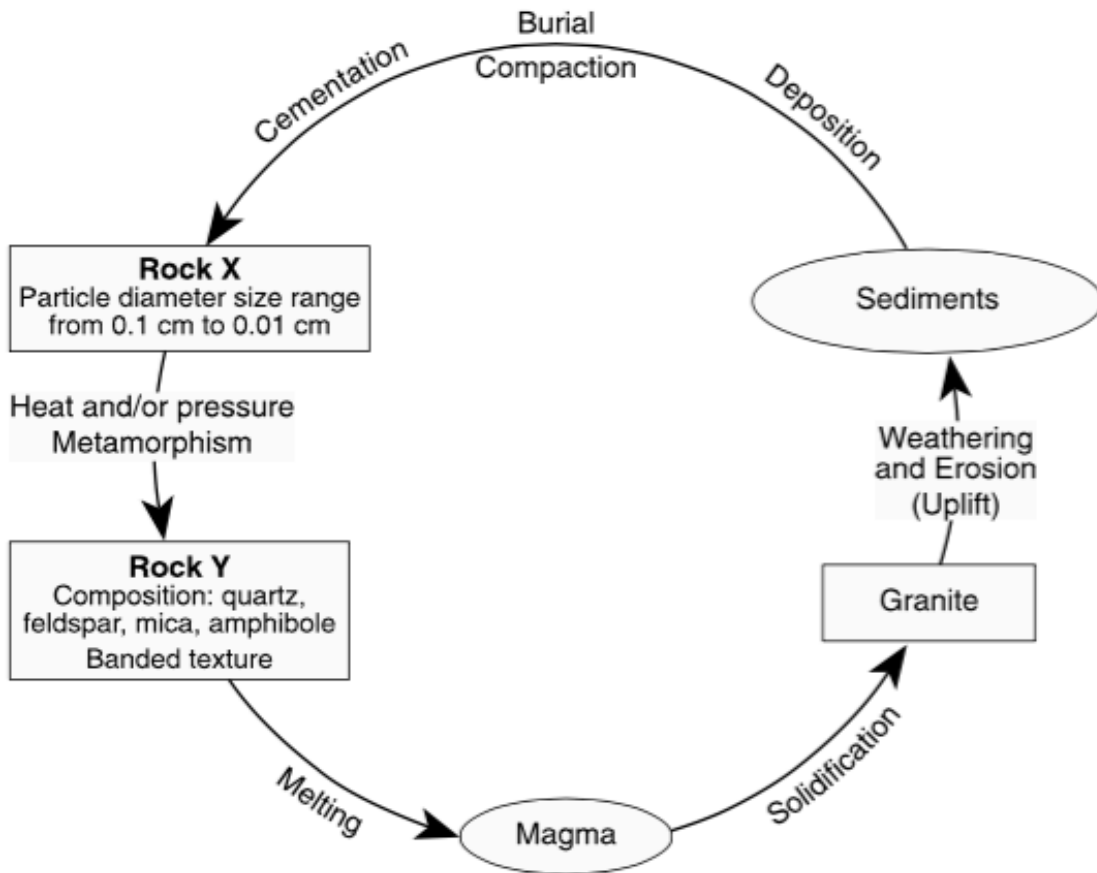
(Shown to actual size)

19. What TWO processes formed the layers of Sandstone and Shale as seen in the picture to the right?



Rocks & Minerals Review Questions

Base your answers to questions 1 through 3 on the diagram below, which represents a part of the rock cycle. The igneous rock granite, and the characteristics of sedimentary rock X and metamorphic rock Y are shown.

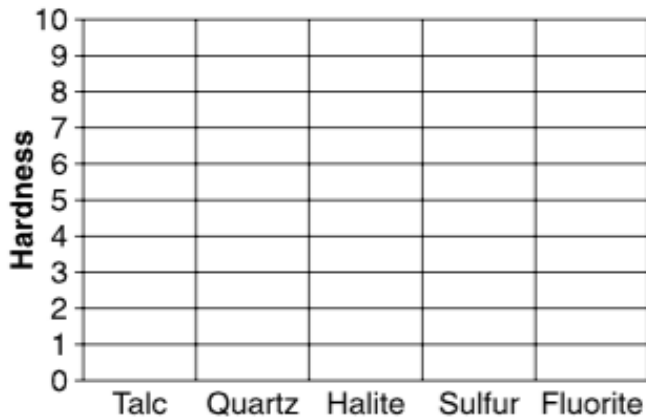


1. Identify sedimentary rock X.
2. Identify metamorphic rock Y.
3. Complete the table with the descriptions of the **observable** characteristics used to identify granite.

Characteristic of Granite	Description
Texture	
Color	
Density	

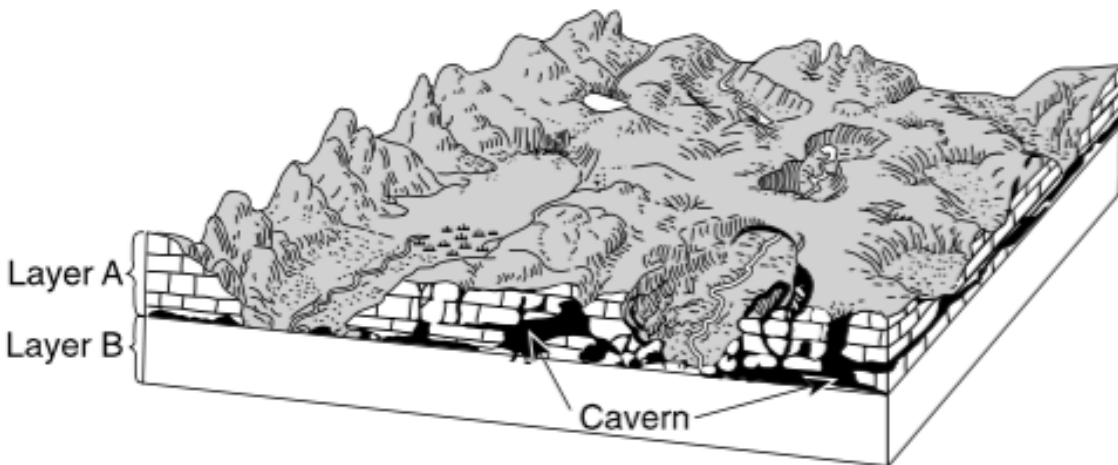
Base your answers to questions #4-5 on the hardness of the minerals talc, quartz, halite sulfur and fluorite.

4. On the grid below, construct a **bar graph** to represent the hardness of these minerals.



5. Which mineral shown on the grid would be the best abrasive? How do you know?

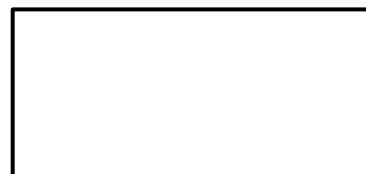
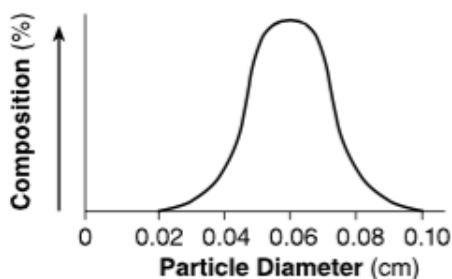
Base your answers to questions # 6-8 on the block diagram below, which show the landscape features of an area on Earth's crust. Two sedimentary rock layers, A and B, are labeled in the diagram. The rock symbol for layer B has been omitted.



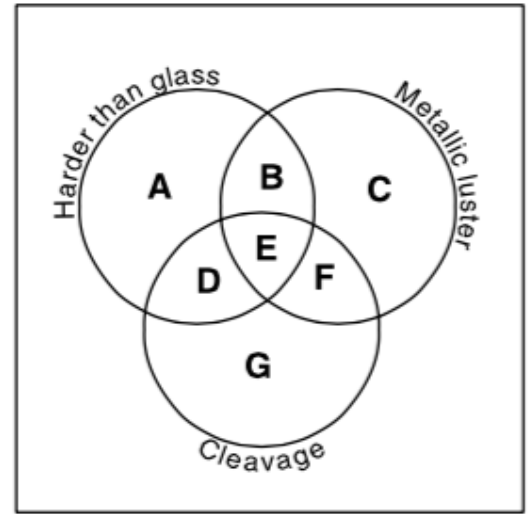
6. Identify the most abundant mineral in rock layer A.

7. Describe how the caverns formed in rock layer A.

8. The graph below shows the particle sizes that compose the **clastic sedimentary rock** in layer B. In the box below, sketch the map symbol from the *Earth Science Reference Tables* that represent rock layer B.



Base your answers to questions 9 and 10 on the diagram to the right of a mineral classification scheme that shows the properties of certain minerals. Letters A through G represent mineral property zones. Zone E represents the presence of all three properties. For example, a mineral that is harder than glass, has a metallic luster, but does not have cleave, would be placed in zone B. Assume that glass has a hardness of 5.5.



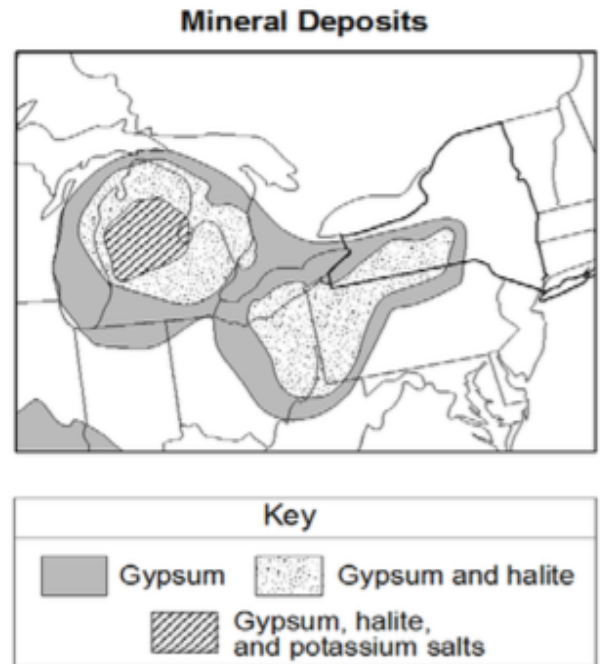
9. In which lettered zone would the mineral Potassium Feldspar be placed?

10. State the name of one mineral listed on ESRT pg. 16 that could not be placed in **any** of the zones.

Base your answers to questions 11 and 12 on the map to the right. The map shows the approximate area in a portion of North America where some sedimentary rock layers composed of gypsum, halite, and potassium salt minerals found in Earth's crust.

11. Identify one New York State landscape region in which deposits of gypsum and halite are commonly found.

12. Identify the sedimentary rock composed of halite and explain how this rock is usually formed



Base your answers to questions 13-14 on the passage and photograph below. The passage describes the properties of porphyritic rocks. The photograph shows a sample of andesite rock that has a porphyritic texture.

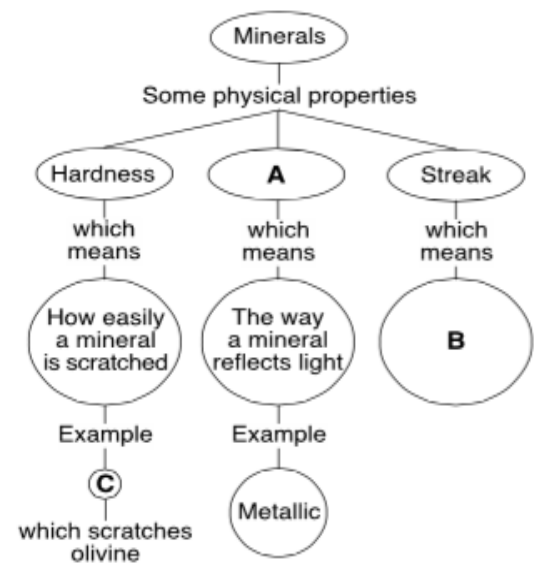
Porphyritic Rocks

Igneous rocks that have two distinctly different crystal sizes have a porphyritic texture. They contain large, coarse-grained crystals called phenocrysts, which are visible to the naked eye. Fine-grained crystals called groundmass surround these crystals.



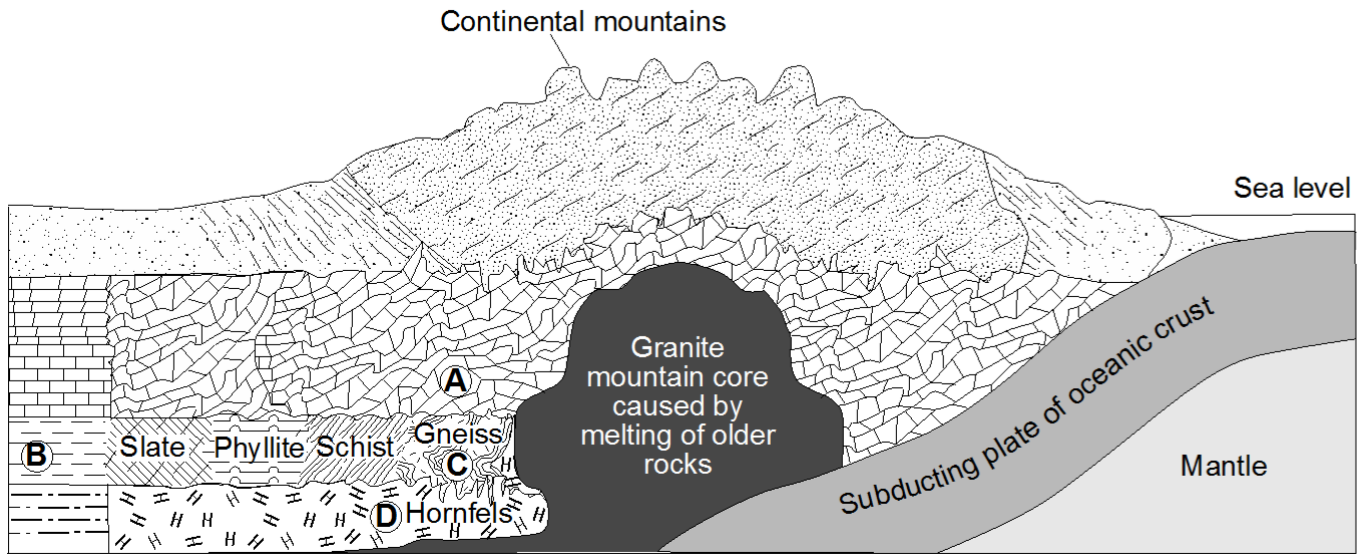
13. Identify the evidence shown by the photograph that indicates that two different cooling events occurred during the formation of this rock.
14. The andesite sample in the photograph has a small percentage of quartz. List three other minerals that are found in this sample.

Base your answers to questions 15-17 on the chart to the right, which show some physical properties of minerals and the definitions of these properties. The letters A, B, and C indicate parts of the chart that have been left blank. Letter C represents the name of a mineral.



15. Which physical property of a mineral does letter A represent?
16. State the definition represented by letter B.
17. Identify one mineral that could be represented by letter C.

Base your answers to questions 18 through 21 on the cross section below, which shows the bedrock structure of a portion of the lithosphere. Letters A through D represent locations in the lithosphere.



18. Identify one of the most abundant minerals in the metamorphic rock at location A.

19. Explain why the type of rock changes between locations B and C.

20. Identify the grain size of the metamorphic rock at location D.

21. Explain why the oceanic crust (basalt) sinks beneath the continental crust (granite) when the two plates collide.

Base your answers to questions 22 through 24 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				
Sample #	Composition	Grain Size	Texture	Rock Name
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

22. State a possible grain size, in centimeters, for most of the particles found in sample 1.

23. What is the rock name of sample 2?

24. What is a term or phrase that correctly describes the texture of sample 4?

Base your answers to questions 25-27 on the photograph of a sample of gneiss below.

25. What observable characteristic could be used to identify this rock sample as gneiss?

26. Identify two minerals found in gneiss that contain iron and magnesium.

27. A dark red mineral with a glassy luster was also observed in this gneiss sample.

a. Identify this mineral.

b. State one possible use for this mineral.

