

- Order the following in order of increasing carbon content: Lignite, Anthracite, Peat, Bituminous Coal

\_\_\_\_\_ Peat, Lignite, Bituminous, Anthracite \_\_\_\_\_

- Identify and order the following minerals from lowest to highest on the Bowen’s reaction series.

1.



\_\_\_\_\_ Muscovite \_\_\_\_\_

2.



\_\_\_\_\_ Biotite \_\_\_\_\_

3.



\_\_\_\_\_ Quartz \_\_\_\_\_

4.



\_\_\_\_\_ Olivine \_\_\_\_\_

Order: \_\_\_\_\_ 4 – 2 – 1 - 3 \_\_\_\_\_

- Suppose you come across a black, average-looking mineral on your worldwide travels. Of the following minerals, which is it least likely to be?

Sphalerite, Hornblende, Augite, Limonite

\_\_\_\_\_ Sphalerite \_\_\_\_\_

- Name the difference between calcite and aragonite.

\_\_\_\_\_ Calcite and Aragonite are pseudomorphs, they have the same chemical composition, but they crystallize in different systems. Aragonite is not thermodynamically stable and will turn into calcite after many years. \_\_\_\_\_

- Which two elements make up mafic and felsic rocks, respectively?

\_\_\_\_\_ Mafic: rich in magnesium and iron. Felsic: rich in Silicon and Oxygen \_\_\_\_\_

- Which clastic rocks are composed of rounded and angular rock fragments, respectively?

\_\_\_\_\_ Rounded: Conglomerate, Angled : Breccia \_\_\_\_\_

- Hornfels is created by which metamorphic process?

\_\_\_\_\_ Contact metamorphism \_\_\_\_\_

8. Which is the first mineral to crystallize from the very high temperatures as magma first starts to cool? **Olivine**
9. Which is the last mineral to form from the last remaining melt of high silica content? **Quartz**
10. (T-F) Bowen's reaction series indicates that minerals with the highest melting temperatures crystallize from a cooling magma before those with lower melting points.
11. (T-F) Bowen's reaction series indicates that ferromagnesian minerals in magma crystallize in the sequence shown in the discontinuous branch.
12. (T-F) Bowen's reaction series offers an explanation for the differentiation of felsic and mafic minerals in magma.
13. Which bonding occurs at the highest temperatures within the Discontinuous Branch?  
**a. ionic** b. covalent

The following questions refer to the two branches of the Bowen's Reaction Series.

14. Which reaction series follows a repetitive sequence of stable to unstable pattern, not permitting simultaneous formation of similar minerals?  
**a. continuous** b. discontinuous
15. Which reaction series follows a gradual transitional pattern of mineral formation thus permitting combinations of minerals to form and exist as the magma cools?  
a. continuous **b. discontinuous**
16. Which list the sequence of ferromagnesian silicate minerals crystallizing from a cooling magma?  
a. amphibole, olivine, biotite, pyroxene **c. olivine, pyroxene, amphibole, biotite**  
b. biotite, amphibole, pyroxene, olivine d. pyroxene, olivine, amphibole, biotite
17. Of the following, which rock type is most likely to contain calcium-rich feldspar?  
**a. basalt** b. granite c. pumice d. rhyolite
18. Of the following paired minerals, which are characteristic of lower crystallization temperatures and absent in basalt and gabbro?  
a. pyroxene and olivine c. biotite and olivine  
b. quartz and pyroxene **d. quartz and muscovite**
19. Which rock is composed of finely to coarsely crystalline calcite or dolomite and was formed during metamorphism of limestone or dolomite rock? **Marble**
20. Which rock is composed of fine to coarse crystalline quartz and is derived from metamorphism of quartz sandstone and chert? **Quartzite**

21. Which rock was derived from regional metamorphism of high-silica igneous rocks and muddy sandstones? **Gneiss**

22. Describe the cleavage angles of a monoclinic, orthorhombic, and triclinic crystal system.

\_\_\_\_\_ Monoclinic: two cleavage angles are 90, one isn't. Orthorhombic: all are 90. Triclinic: none of them are 90\_\_\_\_\_

23. Classify the following rocks as sedimentary, metamorphic, or igneous.  
Gneiss, Gabbro, Phyllite, Breccia, Andesite

Sedimentary: \_\_\_\_\_ Breccia\_\_\_\_\_

Metamorphic: \_\_\_\_\_ Gneiss, Phyllite\_\_\_\_\_

Igneous: \_\_\_\_\_ Andesite, Gabbro\_\_\_\_\_

24. You are asked to identify a mineral. It has a metallic red-to-black color, is not magnetic, and when scratched across a streak plate, it leaves a dark red mark. What is it?

\_\_\_\_\_ Hematite\_\_\_\_\_

25. You are asked to identify a mineral. It is shiny, metallic, and dense. You notice cubic crystals. What is it?

\_\_\_\_\_ Galena\_\_\_\_\_

26. You are asked to identify a mineral. It is pale in color and takes the shape of the petals of a rose. Which two minerals could it be?

\_\_\_\_\_ barite rose or selenite rose\_\_\_\_\_

#### ROCKS AND MINERALS IDENTIFICATION BONANZA

Identify the following minerals by picture.

Name



\_\_\_\_\_ epidote \_\_\_\_\_



\_\_\_\_\_ chalcopyrite \_\_\_\_\_



\_\_\_\_\_ Ulexite \_\_\_\_\_



\_\_\_\_\_ fluorite \_\_\_\_\_



\_\_\_\_\_ sphalerite \_\_\_\_\_



\_\_\_\_\_ Galena \_\_\_\_\_



\_\_\_\_\_ Bornite \_\_\_\_\_

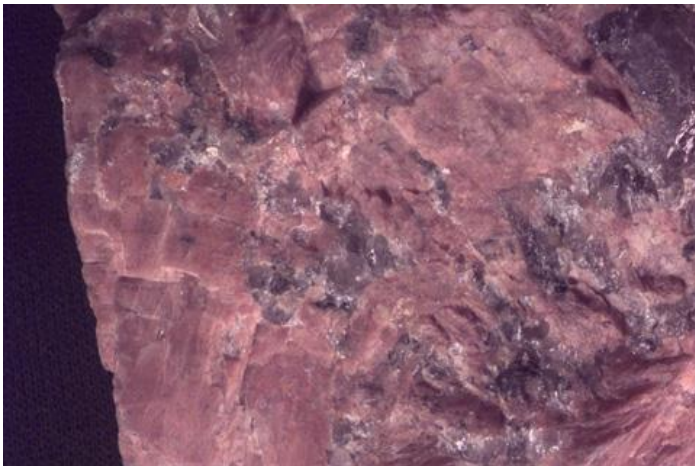


\_\_\_\_\_ lepidolite \_\_\_\_\_



**Identify: Coquina**

**Usage? Building material for forts, also fertilizer**



**Identify: granite**

**Average melting temperature range is: 1215-1260 degrees Celsius**



Identify: limestone

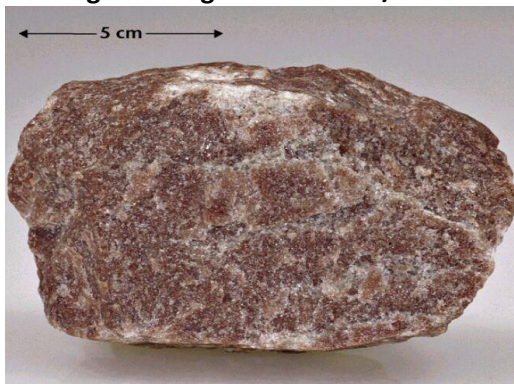
This mineral is 10 percent of all sedimentary rocks in the world.



Identify: Hematite



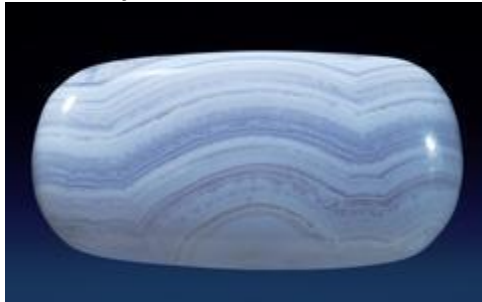
**Identify: Shale** What minerals is this rock mostly made of? Small small quartz pieces  
How big are the grain sizes?  $< 1/256$  mm



**Identify: Quartzite**  
Parent rock? Sandstone



Identify: Topaz                      Crystal form? Orthorhombic  
Commonly found in what kind of rocks? Igneous



Identify: (multiple answers will be accepted, try your best): Chalcedony, agate





**Identify: Limonite**  
**Usage? Pigment, iron ore**



**Identify: Goethite**  
**Usage? Pigment, iron ore**



**Identify: Olivine**



**Identify two minerals: Hematite, Magnetite (ask for a hint, if you need it)**  
**What is the colloquial name? Where is this famously found (but still found in many other places)?**  
**Black sand, found in hawaii (it's the famous magnetic sand)**



Identify: Silver

State mineral of what state? Nevada



Identify: Citrine