

Name: \_\_\_\_\_

Start time: \_\_\_\_\_ End time: \_\_\_\_\_

### MHS ROCKS AND MINERALS TRYOUT TEST 2017

A note to the test-graders: feel free to give partial credit on free response/short answer questions, but matching and identification questions are not to be given partial credit at any point (it's all or nothing). There are 120 total points in this test (each section in the key has a spot to tell you how many points it is worth).

#### Section 1: (1 pt each, total 10 pts)

Match each of the following minerals to its proper hardness on the Moh's scale.

1.   H
2.   E
3.   J
4.   B
5.   I
6.   F
7.   A
8.   G
9.   D
10.   C

- |   |
|---|
| <ol style="list-style-type: none"><li>a. Quartz</li><li>b. Fluorite</li><li>c. Diamond</li><li>d. Corundum</li><li>e. Gypsum</li><li>f. Orthoclase</li><li>g. Topaz</li><li>h. Talc</li><li>i. Apatite</li><li>j. Calcite</li></ol> |
|---|

#### Section 2: (1 pt each, total 5 pts)

Match each of the following minerals to the proper mineral class.

1.   C   copper
2.   G   gypsum
3.   D   fluorite
4.   B   azurite
5.   I   quartz

- |   |
|---|
| <ol style="list-style-type: none"><li>a. Borates</li><li>b. Carbonates</li><li>c. Native elements</li><li>d. Halides</li><li>e. Oxides</li><li>f. Phosphates</li><li>g. Sulfates</li><li>h. Sulfides</li><li>i. Silicates</li></ol> |
|---|

#### Section 3: (1pt each, total 5 pts)

Identify each mineral class based on the description of its identifying characteristics (using the same box from section 2).

1.   D   Natural salts
2.   I   Base chemical formula SiO<sub>2</sub>
3.   E   Majority of the most economically important ores
4.   C   Pure chemical formula (only one element)
5.   B   Often in marine settings (with the accumulation of dead plankton)

Section 4: (1 pt each, total 6 pts)

Match each of the following habits to its proper description.

1.   B   “bubbly” or grape-like spheres
2.   G   flat and tablet-shaped
3.   A   thin, tapered, and needle-like
4.   F   eight-sided
5.   C   box-like
6.   D   branching or tree-like

- |               |
|---------------|
| a. Acicular   |
| b. Botryoidal |
| c. Cubic      |
| d. Dendritic  |
| e. Fibrous    |
| f. Octahedral |
| g. Platy      |
| h. Plumose    |

Section 5: (2 pts each, total 16 pts)

Key words for points are bolded and underlined, but most grading can be done holistically and judgement calls made on whether a response merits 1 or 2 points.

Answer the following questions about the different groupings of rocks.

1. What does a foliated rock look like? A foliated rock is a metamorphic rock that will have “stripes” in it
2. Briefly describe the process of foliation. The pressure and heat applied to a rock squeezes the minerals until they align into stripes (which we call foliation!)
3. How does an extrusive rock form? An extrusive rock forms above ground, which means that it has even less time to cool (forming very small grains, called aphanitic).
4. What visible characteristic do most intrusive rocks share? Because these rocks form below ground where it is much hotter, they have more time to grow. Therefore, the crystals in these rocks are much larger than those in extrusive rocks. (This one response merits 2 points)
5. What type of rock are you most likely to find fossils in and why? Sedimentary rocks are the most likely to contain fossils! The heat from igneous rocks would definitely melt the specimens, and although it is possible to find fossils in metamorphic rocks, most of the time the pressure is too intense and the fossils are destroyed.
6. What is the difference between felsic and mafic rocks? Mafic rocks have more magnesium and iron in their composition (which means that they will generally be denser and darker in color). Felsic rocks, on the other hand, are composed of much more silica (which means that they will generally be lighter in weight and color). (Any of responses, ex/more Mg and Fe OR denser and darker, etc will be accepted)
7. Will granite produce a chemical reaction when exposed to HCl? Why or why not? Granite will not react to HCl! The reaction typically seen between certain rocks/minerals and HCl only happens when carbonates are present (ie carbonate minerals or rocks like limestone), as the carbonate and acid form CO<sub>2</sub>.
8. How is a low-grade metamorphic rock different from a high-grade rock? Low grade rocks are metamorphosed by lower heat and pressure environments than high grade rocks. Higher grade rocks tend to show more foliation than low-grade rocks.

Section 6: (2 pts each, total 8 pts)

Answer the following questions about similar rocks and minerals.

1. What is the difference between pumice and scoria? **Scoria is a mafic rock (composed of more iron and magnesium, with a higher density and darker color), while pumice is a felsic rock (composed of light weight silica, with a lighter color).** Also, pumice can float on water because it has a density of .25 while scoria sinks. (If only unbolded section of response present, merits 1 point)
2. How are azurite and malachite related? **Azurite and malachite are often found together in a form known as “azure-malachite” (do not take points away if they can’t name the mix).** This is because malachite is a pseudomorph of azurite. (2 points for just one of responses)
3. How can you tell the difference between halite and calcite? Halite tastes like salt. Calcite fizzes when exposed to HCl, and it may exhibit double refraction. Halite has 90 degree cleavage angles while calcite is slanted at 120/60 degree angles.  
(Any two of possible listed responses merits 2 points)
4. Why is it that quartz varieties differ so much in coloration? Pure quartz is clear and colorless. Many of the variations of quartz are colored differently due to **color impurities**, though some of them are also in part related to **slight differences in electron configuration**.

Section 7: (1 pt each, total 10 pts)

Define each of the following geological terms (each definition is only worth one point).

1. Specific gravity: density of a mineral as represented by a ratio to the density of water (at 4 degrees celcius)
2. Conchoidal: a type of fracture that resembles broken glass; often exhibits strange curving patterns
3. Plutonic: synonym for intrusive; refers to any rock that forms below the earth’s surface
4. Clastic: describes a sedimentary rock that is composed of pieces of other rock (sediment) that have been cemented together into one solid form
5. Adularescence: optical property (sometimes seen in feldspars and opal) in which the mineral reflects a billowy “ghost like” bluish-white color
6. Effervescence: fizzing reaction that may occur between carbonates and acids
7. Aphanitic: rock with very fine crystals (often used to describe extrusive igneous rocks)
8. Pseudomorph: one mineral chemically replaces another but keeps the same shape as the old mineral
9. Secondary mineral: form through processes such as weathering and hydrothermal alteration/chemical changes
10. Vitreous: type of luster; can also be called glassy (it’s very shiny; you’ll see it in a lot of gems!)

Section 8: (1 pt per blank, total 12 pts)

Complete the following chart (each blank is worth one point):

Mineral	Color	Cleavage/ Fracture	Hardness	Streak	Luster
Graphite	Grey/black	Basal	1-2	Black/grey	Greasy
Biotite	Black	Basal	2.5-3	White/ gray	Vitreous
Pyrite	Brassy/yellow/ Gold	Irregular	6-6.5	Black	Metallic
Olivine	Yellow-green	Irregular fracture	6.5-7	White	Vitreous
Albite	White (also bluish/greenish)	2 faces @ 90 degrees	6-6.5	White	Vitreous, sometimes pearly
Fluorite	Very wide range	Perfect octahedral	4	White	vitreous

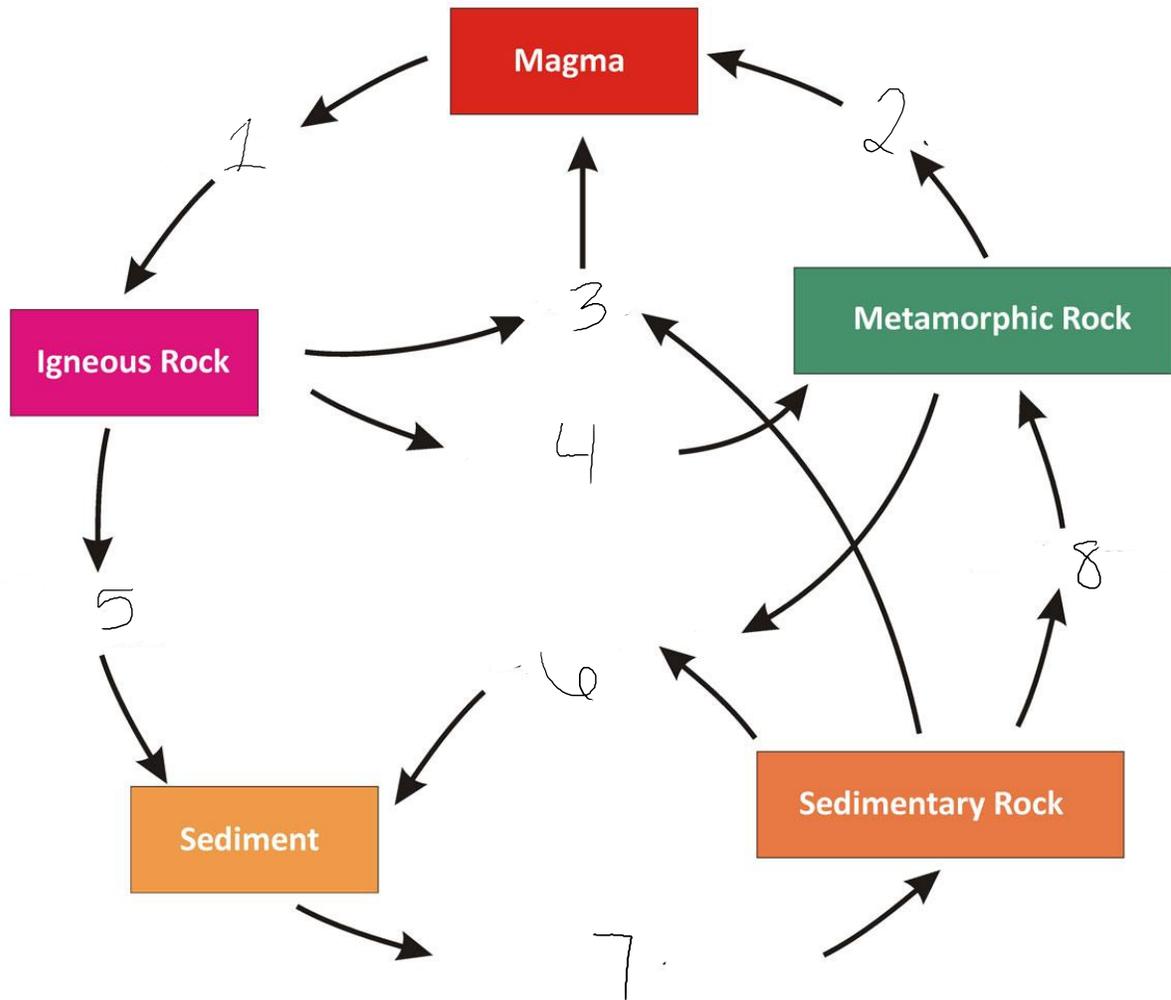
Section 9: (2 pts each, total 10 pts)

Answer the following questions on miscellaneous topics.

1. What is Bowen's reaction series? **Bowen's reaction series illustrates what minerals form at what temperatures in igneous rocks**. It can be used to get a rough estimate as to how rocks formed and to better understand the difference between composition and cooling temperature. (If mention underlined portion, gets full two points)
2. What are the names of the two branches in Bowen's reaction series? **Continuous and discontinuous (one point for each answer)**
3. What is the difference between cleavage and fracture? **Cleavage refers to a mineral that breaks evenly so that it has a flat face**, whereas **fracture refers to a mineral that does not break on a flat face** (1pt for each definition)
4. Name three of the defining characteristics of a mineral. (give one point for naming one or two of the characteristics, and give two points for three of the following): solid, inorganic, naturally occurring, definable chemical composition, formed by geological processes, and has a crystalline structure.
5. Why is it important to look at multiple physical properties when identifying a mineral? **Multiple minerals may be similar in regards to one specific property (ie calcite and halite are often both colorless and transparent). Additionally, one mineral may exhibit multiple variations of one physical property (ie quartz has its many different color varieties). (Give one point if either idea is expressed without an example; two points if either idea is expressed with a proper example).**

Section 10: (1pt each, total 8 pts)

Fill in the blanks on the rock cycle diagram (each blank is worth one point).



1. Cooling/crystalization
2. Melting
3. Melting
4. Heat and pressure
5. Weathering/erosion
6. Weathering/erosion
7. Compaction/cementation
8. Heat and pressure

Section 11 (the moment you've all been waiting for): (1 pt per blank, total 30 pts)

Identify each of the rock and mineral samples (one point each) and answer the question to follow (also one point each).



1.

Sample: Malachite

2. What is this sample an ore of?

Copper



3.

Sample: Quartzite

4. What is the parent rock of this sample?

Sandstone



5.

Sample: Sodalite

6. What class does this mineral belong to?

Silicate



7.

Sample: Fluorite

8. How is this sample formed?

It's an evaporate! (left behind in process of evaporation of water)



9.

Sample: Andesite

10. Is this sample intrusive or extrusive?

Extrusive



11.

Sample: Epidote

12. What types of rock is this sample most often found in? **igneous**



13. Sample: **diatomite**

14. Where does this rock get its name from? **It is made up of tiny organisms called diatoms!**



15. Sample: **barite**

16. What is this particular sample nicknamed? **Barite rose**



17. Sample: **calcite**

18. What type of sedimentary rock is this sample commonly associated with? **limestone**



19. Sample: **aragonite**

20. What mineral has the same chemical formula as this sample? **calcite**



21. Sample: **pegmatite**

22. Why are the crystals in this sample so large? **This is an intrusive rock that had a long time to cool and form larger grains.**



23. Sample: **shale**

24. What is this particular variety called? **Oil shale**



25.

Sample: **talc**

26. What is this sample often used for?

**It's crushed into talcum powder for cosmetics and baby powder.**



27.

Sample: **corundum**

28. What is the red version of this sample more commonly known as? **ruby**



29.

Sample: **staurolite**

30. What is the nickname for this sample?

**Fairy's cross**