

Student Name: _____

College: _____

Grade: _____

Physical Geology 101 Laboratory MINERALS II – Identification of Igneous Minerals

INTRODUCTION: The purpose of this lab is you will improve your mineral identification skills and experience. The focus of today's mineral lab is identifying igneous rock-forming minerals, which is fundamental in the classification and identification igneous rocks.

I. Review of Igneous Rock-Forming Minerals: A handful of common silicate minerals make up the igneous rocks that make up the vast bulk of Earth's crust and mantle. Silicates are among our most important rock forming minerals. You need to become familiar with each of these mineral's **color**, **hardness**, and **cleavage** to be good at identifying these minerals in hand samples of igneous rocks. Mineral color is the first step in igneous mineral identification. Quartz, the feldspars (the two potassium feldspars and sodic plagioclase), and muscovite are the light-colored minerals rich in silica, sodium and potassium. The rest of the common igneous minerals are dark-colored, and are rich in iron, magnesium, and calcium (including calcic plagioclase). Note that all the common igneous minerals are hard except for the micas. Most have cleavage except for a few minerals, like quartz. Below is a color image of the 12 most common igneous rock-forming minerals.



Olivine



Ca-Plagioclase Feldspar



Garnet



Pyroxene



Na-Plagioclase feldspar



Magnetite



Amphibole



Orthoclase feldspar



Microcline feldspar



Biotite



Muscavite



Quartz



Tourmaline

Directions: The following are the most common silicate minerals: Look up these minerals in the mineral glossary and write down their color, hardness and cleavage characteristics.

	<u>Color</u>	<u>Hardness</u>	<u>Cleavage</u>	<u>Associated Igneous Rocks</u>
1. Olivine	_____	_____	_____	_____
2. Augite (pyroxene)	_____	_____	_____	_____
3. Hornblende (amphibole)	_____	_____	_____	_____
4. Biotite (mica)	_____	_____	_____	_____
5. Garnet	_____	_____	_____	_____
6. Tourmaline	_____	_____	_____	_____
7. Quartz	_____	_____	_____	_____
8. Orthoclase Feldspar	_____	_____	_____	_____
9. Microcline Feldspar	_____	_____	_____	_____
10. Plagioclase Feldspar	_____	_____	_____	_____
11. Muscovite (mica)	_____	_____	_____	_____
12. Magnetite	_____	_____	_____	_____

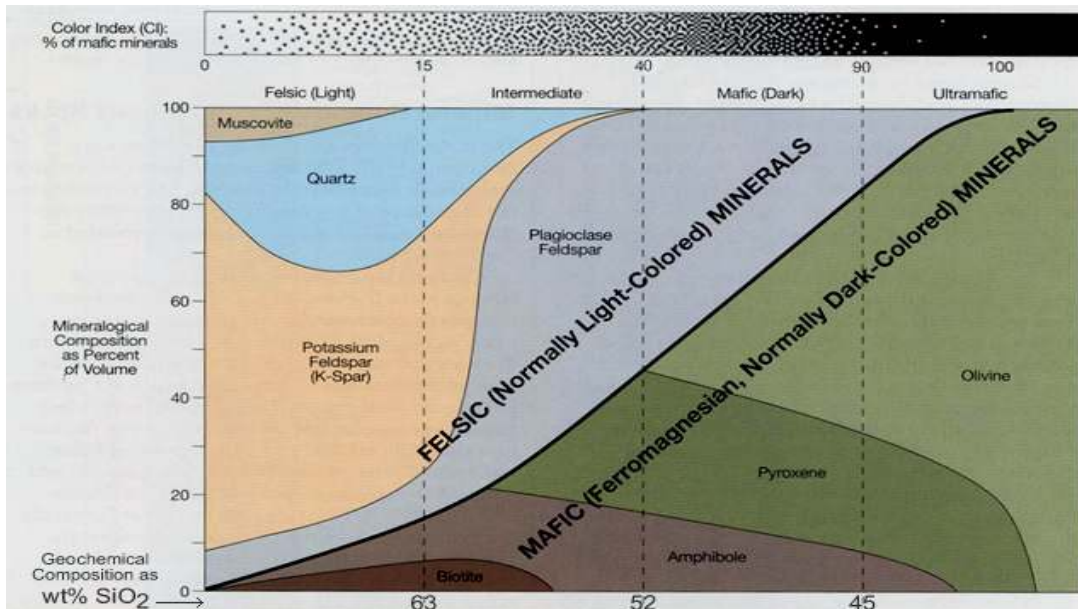
II. UNKNOWN IGNEOUS MINERAL SAMPLE IDENTIFICATION:

Directions: Determine the color, hardness, and cleavage of the following unknown mineral samples. Carefully read the steps listed below:

- 1) Note color as either "Light", "Dark" or if characteristic AND actual hue, like "green" for olivine.
- 2) Note mineral hardness (should be between 3 and 7);
- 3) Note number of sets of cleavage (0, 1, 2 @ 90 or 2 not @ 90).
- 4) Using your mineral ID chart, name the mineral that best fits your listed properties.
- 5) Using your igneous rock mineral ID chart below, name the igneous rocks that this mineral is common to.

<u>Sample</u>	<u>Color</u>	<u>Hardness</u>	<u>Cleavage</u>	<u>Mineral Name</u>	<u>Found In Which Igneous Rocks?</u>
A.	_____	_____	_____	_____	_____
B.	_____	_____	_____	_____	_____
C.	_____	_____	_____	_____	_____
D.	_____	_____	_____	_____	_____
E.	_____	_____	_____	_____	_____
F.	_____	_____	_____	_____	_____
G.	_____	_____	_____	_____	_____
H.	_____	_____	_____	_____	_____
I.	_____	_____	_____	_____	_____
J.	_____	_____	_____	_____	_____
K.	_____	_____	_____	_____	_____

III. IGNEOUS ROCK-FORMING MINERALS ABUNDANCES IN IGNEOUS ROCKS: Each of the common igneous rock-forming minerals varies in occurrence and abundance in the various types of igneous rocks, based on the chemistry of the magma or lava that they crystallized from. You need to become familiar with the igneous mineral abundance chart below, in terms of which specific minerals characterize each igneous rock type and the general proportion that each mineral contributes to the total mineral make-up of the rock. The COLOR INDEX (shown at top of figure below) helps to classify the mineral composition of the unknown igneous rock, but is only useful for coarse-grained rocks.



FELSIC IGNEOUS ROCK (Granite): Rich in potassium feldspars, sodic plagioclase and quartz, with possible accessory minerals including, but not necessarily all present in same rock: biotite, muscovite, garnet, tourmaline and hornblende. Color index is low: between 0 and 20. **Question: What is the color index for this granite?** _____



INTERMEDIATE IGNEOUS ROCK (Diorite): Rich in intermediate plagioclase and hornblende, with possible accessory minerals including, but not necessarily all present in same rock: quartz, pyroxene, biotite, and magnetite. Color index is mid range: between 20 and 30. **Question: What is the color index for this diorite?** _____



MAFIC IGNEOUS ROCK (Gabbro): Rich in calcic plagioclase, pyroxenes, olivine, and hornblende, with possible accessory minerals including magnetite. Color index is high: between 40 and 90. **Question: What's the color index for this gabbro?** _____

Directions: Do the following for each of the eight unknown coarse-grained igneous rock samples: 1) Determine the color index; 2) Make your best determination as to what the light and dark minerals are in the hand sample; And 3) List the igneous rock type, based on the color index. Note to use your igneous rock chart to help you answer both 1), 2) and 3). Use the microscope to help in the determination of the minerals.

<u>Sample</u>	<u>Color Index</u>	<u>Observable minerals present in Rocks</u>	<u>Igneous Rock Type</u>
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____

IV. - Written Laboratory Reflection

Directions: Write a reflection of the lab activity, explaining its purpose, the methods used, the results obtained, and a brief personal reflection of what you enjoyed and learned about doing this lab (3 points possible). Answer the following 3-point question reflection set (fill in all the lines for full credit.)

1) *What was the purpose of this lab? What did you actually discover and learn during this lab?*

2) *What did you enjoy most about this lab? Also, what was challenging or thought-provoking?*

3) *What are your constructive comments about the design and execution of this lab? What's good? What's bad? Offer suggestions for making the lab better.*
