

## Lab 11: Hand Specimens of Metamorphic Rocks

The purpose of this lab is to begin to familiarize you with metamorphic rock types and what they look like in hand sample. It is also to get you to practice naming metamorphic rocks and thinking about the effect of composition and metamorphic grade on mineralogy. It is not an exciting lab in concept, but the rocks are pretty, and contain minerals which are very important in metamorphic petrology, so engrain them into your psyche. The ultimate goal, of course, is for you to learn how to identify these rocks in the field. If you are uncertain whether an unknown mineral is one thing or another, write down what it is that makes the identification uncertain.

Here is a list of the minerals you might see along with a brief, incomplete, and ambiguous description. Use your other resources to get more information:

quartz- if you can't identify this, you fail  
apatite- distinct basal parting and hexagonal mineral habit  
plagioclase- white, a little glassy  
biotite- black, thin sheets  
muscovite- silvery white, thin sheets  
tremolite- long clear prisms  
staurolite- short black crystals, look for twinning  
andalusite- square cross section, chiasolite crosses, elongate crystals  
kyanite- pearly luster, bluish--kyanite's hardness varies dramatically with direction:  
H=5  
    parallel to the length of the crystal, H=7 across the length. Conveniently, steel  
    is around H=6...  
sillimanite- pearly luster, square cross section  
stilpnomelane - like biotite, only the habit is distinctively different  
chlorite- green, thin sheets  
tourmaline- long black prismatic crystals, distinct luster, striations and habit in cross-section  
chloritoid- black, dark grey, euhedral crystals--usually present as porphyroblasts  
graphite- gray, greasy appearance  
pyroxene- typically black, omphacite is green  
glaucophane/riebeckite- blueish amphiboles  
calcite- variable color, use hcl, 3 perfect cleavage directions, soft (H=3)  
pyrite- looks like gold, little cubes  
serpentine- green, dark green, platy/fibrous  
garnet- red (Fe, Mg varieties) or orange (Ca), soccer ball shape  
hornblende- long black crystals, look for cleavage angle (not crystal habit)  
epidote- pistachio green color, association  
zoisite/clinozoisite- difficult to tell from plagioclase. Association may be the only way

**S/M**

Rock Type?

Protolith?

Observe the relict bedding ( $S_0$ ) and the metamorphic foliation ( $S_1$ ). For those in the structure class, sketch the specimen as if it were in a fold, assuming that the metamorphic foliation is an axial planar cleavage.

**22**

What are the minerals in this rock?

Name the rock

What is the protolith?

What metamorphic facies would you put it in?

**126 Frederick County, Maryland.**

Name the rock

Protolith?

What metamorphic mineral is present? (hint: it gives this rock its color)

**145 Greenville**

Rock Type?

What metamorphic mineral is present?

What was the original rock type?

If this rock was collected above water, what tectonic environment was it likely metamorphosed in?

**38-30 Bethel, Vermont.**

Identify and describe 3 metamorphic minerals.

Rock name?

Protolith?

**N-1**

What is the porphyroblast?

What are the other minerals?

What is the bulk composition?

What is the rock name?

What is its metamorphic grade?

**2027**

Rock type?

Protolith?

Can you tell what P/T conditions this rock made it up to?

**1944**

What are the 3 dominant minerals in this rock (hint: one of them is graphite, and one of them is really not obvious at all)

Which of the minerals occur as porphyroblasts?

Rock name:

**MS-31 Mendocino, CA**

The black platy mineral looks very much like biotite, but is not, what is it?  
Describe its crystallization in regard to the main fabric development.

Name 2 other phases in this rock.

Name the rock.

**GS-1 Zermatt, Switzerland**

Name and describe 3 prominent phases.

Name the rock.

Protolith

What tectonic environment was this sampled in?

**M**

Name the rock.

What is the protolith?

What grade of metamorphism is this rock?

**757**

Rock type?

Is this classification based primarily on composition or texture?

**1348**

Identify the prominent porphyroblast phase

What other minerals are in this rock?

Protolith

**1261**

Identify and describe 3 prominent phases.

Describe the texture.

Speculate on the genesis of this rock.

**93**

Name principle phases

Name the rock.

What is the protolith?

What metamorphic grade is this stuff?

**80**

What are the principal phases?

Name the rock.

What is a likely protolith?

**307**

What's the mineralogy?

Name the rock.

**6261**

What phases are present?

Name the rock.

(e.c.: does this rock show shear banding or S-C fabric? What is the sense of shear?)

**5224625**

What are the minerals?

What is the protolith?

What would you name the rock?

**BF02**

This is the highest grade sample in the lab, and records pressures of up to 1-1.2 GPa and temperatures in excess of 800 °C. How kilometers depth is that? What metamorphic grade is that?

What do you think the prograde mineralogy is?

This rock is retrogressed a bit. What is the retrograde assembly?

Name that rock.

**F03**

This rock is like BF02, but instead, it is more thoroughly retrogressed. Can you tell in hand sample?

Name this rock too.