GLY 301 - Fall 2010
Lab Midterm Review

Minerals:

Be able to identify minerals by determining cleavage and hardness and with aid of the important minerals handout (see last page).

Igneous Rocks:

Be able to identify igneous rocks using texture and color and the classification of igneous rocks chart (below).

	felsic	intermediate	mafic
volcanic	rhyolite	andesite	basalt
plutonic	granite	diorite	gabbro

Sedimentary Rocks:

Be able to identify conglomerate, sandstone, shale, and limestone (know the definition/characteristics of these rock types).

Metamorphic Rocks:

Be able to identify slate, schist, gneiss, quartzite, and marble (know the definition/ characteristics of these rock types).

Minerals in Rocks:

Be able to list one of the most/more abundant minerals in each rock specimen.

Geologic Structures: Be able to...

- interpret strike and dip, fold axis, and plunging fold axis symbols on a map
- interpret the kind of fold (anticline or syncline) from the pattern of formation ages
- draw simple sketch of anticlines and synclines
- construct a geologic cross section from a geologic map
- identify the kind of fault shown in a cross section and stress that produced it

Earthquakes: Be able to...

- use S-P interval and Travel Time vs. Distance graph to determine distance and triangulate to determine epicenter
- determine magnitude of an Earthquake using S-P interval and amplitude
- determines the sense of fault motion using first motion studies (geographic pattern of first compression or dilation)
- predict areas more susceptible to earthquake damage based on the underlying soil and rock types

<u>**Things to remember about sedimentary & metamorphic rocks**</u>

Sedimentary Rocks

Clastic

conglomerate: contains clasts larger than sand-size (>2mm) (some sand also)
composition: quartz & rock fragments

sandstone: composed of sand-size particles (1/16 mm, barely visible, to 2 mm)
composition: commonly quartz, sometimes feldspars or other minerals

shale: composed of microscopic silt-size and clay-size particles
composition: clay minerals + silt-size quartz & feldspar

Biogenic

limestone: skeletal remains of marine organisms (coral, mollusks, etc.)
composition: calcite ($CaCO_3$)

Metamorphic Rocks

Foliated

slate: foliation: slaty cleavage
composition: microscopic micas
protolith: shale (mudstones, etc.)

schist: foliation: schistosity
compostion: visible micas
protolith: shale (mudstones, etc., just got buried deeper than slate)

gneiss: foliation: gneissic banding
composition: felsic (quartz feldspar) bands & mafic (biotite & hornblende) bands
protoliths: shale (mudstones, etc.), igneous rocks, etc.

Non-Foliated

quartztie: composition: quartz (hardness=7, doesn't fizz)
protolith: sandstone

marble: composition: calcite (hardness=3, fizzes)
protolith: limestone

Important Silicate Minerals

Quartz, a framework silicate, is identified by its hardness (7), lack of cleavage, conchoidal fracture, and six-sided crystals. Color may be clear, pink, purple, milky white, gray, black, etc.

Feldspars, also framework silicates, are separated into **potassium feldspars** (alkali feldspar) and **plagioclase feldspars**. All feldspars are nearly as hard as quartz (6) but have two cleavages at nearly right angles. One cleavage direction is better than the other.
Potassium feldspars range from pink to white to gray (the variety called amazonite is green). They often display a subtle pattern of wavy stripes known as *perthite*
Plagioclase feldspars are white to gray to black (the labradorite variety is iridescent blue) and usually show closely spaced *striations* on the perfect cleavage plane due to alternating *twinned* crystals.

Micas, sheet silicates, are easily identified by their one perfect cleavage and foliated (sheeted) habit. The dark, often black, variety is **biotite**. The transparent variety is **muscovite**. A third common variety, *chlorite*, is green and its habit tends toward small scales, rather than the large sheets of biotite and muscovite. The hardness of micas is around 2.5.
Clay minerals are also important sheet silicates. Their crystals are sub-microscopic. On a macroscopic scale they form earthy masses. They form as weathering products of other silicate minerals.

Amphiboles (e.g., hornblende) are double chain silicates and **pyroxenes** (e.g., augite) are single chain silicates. Amphiboles and pyroxenes are common dark minerals found in intermediate to mafic rocks. Each has 2 cleavages. They can be differentiated by the angle between the cleavages. Amphiboles form long prismatic 6-sided crystals and the angles between the cleavages are 56˚ and 124˚. Hornblende has a splintery cleavage and is more lustrous than augite. Pyroxenes form stubby prismatic crystals and the angles between cleavages are near 90°. The hardness of hornblende and augite is around 5.5.

Olivine, an isolated tetrahedra silicate, is normally found as masses of olive green to brown granules. Each sand-sized olivine crystal has conchoidal fracture and a hardness of 6.5-7.

Other Important Minerals

Calcite is a carbonate mineral (calcium carbonate). Calcite and related carbonates including *dolomite* (calcium magnesium carbonate) are the primary minerals in limestone which is a common sedimentary rock found in the upper crust of the Earth. Calcite has three perfect cleavages which do not meet at 90˚. Its hardness is 3. It dissolves under acidic conditions; it fizzes when dilute hydrochloric acid is dropped on it. Dolomite fizzes only very weakly.