Igneous rocks lab — Part II
Hand samples of igneous rocks
Due Tuesday 3/7

1. Use the color index and density of the rock to establish whether it is felsic, intermediate, mafic, or ultramafic.

2. Determine whether the rock is volcanic or plutonic based on its texture — phaneritic, aphanitic, porphyroblastic, other?

3. The following generalizations may help you to establish the mineralogy of the rock (exceptions are certainly possible):

**Olivine** does not display cleavage and is distinctly green. Generally it is rounded; it may be altered. Don’t be confused with **epidote** that forms during contact metamorphism, low-grade metamorphism, and in felsic igneous rocks. Other green minerals that form as alteration products include **chlorite** (e.g., after ferromagnesian minerals such as biotite, amphibole, or pyroxene) and **serpentine** (grows during alteration of ultramafic rocks).

**Pyroxene** forms black or green, stubby prisms; orthopyroxene may be yellow-brown. Cleavage is at 90° and is not as perfect as the cleavage of amphibole (see Fig. 1, next page).

**Hornblende** forms elongated prisms that are generally black. Good cleavage at angles of 60° and 120° (see Fig. 2, next page).

**Biotite** is black, except for phlogopite, which may be colorless, yellow, or brown. It has one direction of perfect cleavage (platy cleavage), and may form pseudohexagonal crystals.

**Muscovite** is colorless with one direction of perfect cleavage (platy cleavage).

Look for differences in size, color, weathering characteristics, and textural properties of the **feldspars**. Many **alkali feldspars** are pink. Macroscopic albite twinning is present in **plagioclase** crystals in most mafic and many intermediate rocks. Carlsbad twinning is always macroscopic. Plagioclase may appear very dark (gray or even black) in some mafic rocks.

**Quartz** has no cleavage, and appears smoky gray in many rocks or may be colorless and translucent.

**Nepheline** resembles quartz, but fortunately nepheline and the other feldspathoids weather easily, and tend to appear as pits on weathered surfaces of rock.
Special Difficulties Associated with Volcanic Rocks:

If the rock is volcanic and gray or light-colored you are not likely to be able to identify the mineralogy of the groundmass. And because quartz and alkali feldspar generally appear late in the crystallization history of lava, the mineralogy of the phenocrystic population may prove misleading in establishing the name of the rock. The following observations apply; refer to the ternary diagrams below:

- if there are phenocrysts of quartz, the rock likely has enough silica to be a dacite or rhyolite.

- if there are phenocrysts of sanidine, but not of plagioclase, the rock is almost certainly a trachyte, phonolite, or rhyolite (if there are also quartz phenocrysts). Phonolites are rare.

- if there are phenocrysts of plagioclase, but not of sanidine or quartz, the rock may well be an andesite or basalt. Because plagioclase tends to crystallize early in rocks that eventually may contain considerable alkali feldspar, quartz, or feldspathoid, it also could be a dacite or tephrite, or even a rhyolite or trachyte. Tephrites are rare.
Name the minerals or other constituents that can be identified in the following igneous rocks and record approximate percentages of each mineral if possible. Describe any textural features that can be recognized, and name each rock as precisely as possible.

**Rock number:**

<table>
<thead>
<tr>
<th>Minerals / other constituents</th>
<th>Approximate percentage</th>
</tr>
</thead>
</table>

**Color index:**  
Felsic — Intermediate — Mafic — Ultramafic

**Texture:**

**Rock name:**

__________________________________________________________________________

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**Color index:**  
Felsic — Intermediate — Mafic — Ultramafic

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**Rock name:**

__________________________________________________________________________
Name __________________

Rock number:

Minerals / other constituents: ___________________ Approximate percentage:

Color index:

Felsic — Intermediate — Mafic — Ultramafic

Texture:

Rock name:

__________________________________________________________________________

Rock number:

Minerals / other constituents: ___________________ Approximate percentage:

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Felsic — Intermediate — Mafic — Ultramafic

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Rock name:

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Felsic — Intermediate — Mafic — Ultramafic

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Texture:

Rock name:

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Felsic — Intermediate — Mafic — Ultramafic

Texture:

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Rock number:

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Felsic — Intermediate — Mafic — Ultramafic

Texture:

Rock name:

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Rock number:

Minerals / other constituents: __________________ Approximate percentage: __________________

Color index:

Felsic — Intermediate — Mafic — Ultramafic

Texture: __________________

Rock name: __________________

Rank the above hand samples from most mafic to most felsic:

Most mafic

1 — __________________
2 — __________________
3 — __________________
4 — __________________
5 — __________________
6 — __________________
7 — __________________
8 — __________________
9 — __________________

Most felsic