GEOL.3090L – EARTH MATERIALS I
IDENTIFICATION OF MINERALS IN HAND SPECIMEN

In this exercise you will identify 50 unknown minerals in hand specimen. In the accompanying table list the number for each specimen, the properties **you used** to identify the mineral, and the mineral name. Characteristics for the various minerals can be found in Chapters 7, 11, 14, and 16 in the textbook. There are also several online data bases that you will find very useful. The links to these are given on the course web site.

Properties of Minerals

Crystal Form. If the specimen shows crystal faces it may be possible to determine the crystal system (isometric, tetragonal, orthorhombic, hexagonal, monoclinic, triclinic) to which the mineral belongs and the symmetry class.

Color. Color is an obvious characteristic and may be an important property in the identification of minerals. Many minerals, however, exhibit a range in color due to slight variations in composition or impurities.

Streak. Streak is the color of the finely powdered mineral. It is produced by rubbing the mineral across an unglazed porcelain plate (streak plate).

Luster. Luster is the way a mineral reflects light from its surface.

Types of luster:

I. Metallic - looks like a metal
II. Nonmetallic
    A. Vitreous - like glass
    B. Adamantine - brilliant like diamond
    C. Resinous - luster like resin

Hardness. The hardness of a mineral is its resistance to scratching. A harder mineral can not be scratched by a softer mineral.

In 1822 the Austrian mineralogist Mohs established a hardness scale consisting of ten common minerals. The first mineral is the softest known, the second is also soft but will scratch the first. The hardest mineral (number 10) is diamond and this mineral will scratch all the other minerals on the hardness scale. Hardness values for some common materials are: fingernail = 2.5, knife blade = 5.5, glass = 5.5.

Mohs' Scale is composed of the following minerals:

1 - talc	6 - orthoclase
2 - gypsum	7 - quartz
3 - calcite	8- topaz
4 - fluorite	9 - corundum
5 - apatite	10 - diamond

Cleavage. Cleavage is the tendency for a mineral to break along certain planes of weakness. Some minerals exhibit no cleavage, others break parallel to one plane, some parallel to two planes and some parallel to three or more planes. You should note the quality of the cleavage - perfect, good, fair, poor - and the angles between the cleavage planes.

Fracture. If a mineral possesses no cleavage it will break along an irregular or curved surface. Fracture surfaces can be described as uneven, splintery or conchoidal. Conchoidal fractures are characteristically curved like the surface of a shell. Glass breaks in this manner.

Density. The density of a substance is its mass per unit volume. Practically one can determine relative density by comparing the weight of standard size, usually a cubic centimeter, minerals. Often the density is expressed as a number which tells you how many times heavier the mineral is than an equal volume of water (this is termed *specific gravity*). Most minerals are 2.5 to 3 times as heavy as water, but others are much heavier. Often a mineral's density is a clue to its identity. You should be able to distinguish high density minerals from lower density minerals by heft (for any two minerals of approximately the same size, hold one in each hand and decide which *feels* heavier).

Taste. Some minerals, such as halite (table salt), have a distinctive taste. ***Caution:*** do not taste any mineral with a metallic luster.

Magnetism. The mineral magnetite can readily be distinguished from other minerals since it is strongly attracted by a magnet.

Chemical Tests. Certain minerals react with acid. For example, when a drop of dilute acid is placed on a mineral containing carbonate (CO_3) a violent bubbling is produced. This results from the fact that CO_2 gas is produced by the chemical reaction between the mineral and the acid. This reaction proves that carbonate is present in the mineral. Two minerals, *calcite* ($CaCO_3$) and *dolomite* [$(Ca,Mg)CO_3$], which are very similar in their physical properties can be distinguished by this simple chemical test. If dilute acid is placed on dolomite a very weak, or no, bubbling occurs. If dilute acid is placed on calcite a violent bubbling is produced.

The same acid can be used to test for the presence of sulfur. Powder some of the mineral by rubbing it on an unglazed porcelain plate and then add a drop of acid. If you can detect the odor of hydrogen sulfide gas (H_2S - smells like rotten eggs) sulfur is present in the mineral.

ALPHABETICAL LISTING OF UNKNOWN MINERALS - HAND SPECIMEN IDENTIFICATION

Albite	Kaolinite
Andalusite	Labradorite
Apatite	Limonite
Arsenopyrite	Magnetite
Augite	Molybdenite
Bauxite	Muscovite
Biotite	Natrolite
Calcite	Nepheline
Chalcopyrite	Olivine
Chlorite	Orpiment
Chromite	Orthoclase
Chrysotile	Pyrite
Cinnabar	Pyrrhotite
Corundum	Quartz
Cuprite	Realgar
Dolomite	Rose quartz
Epidote	Sillimanite
Fluorite	Smithsonite
Galena	Sodalite
Garnet 1	Sphalerite
Garnet 2	Sulfur
Graphite	Talc
Gypsum	Topaz
Hematite	Tourmaline
Hornblende	Tremolite