**Ge114**

**Lab Exercise 2**

Crystal Systems and Symmetry Lab

Reading:

Dutrow & Klein, Ch 6,7, or Klein and Hurlbut, Ch.2 and Ch.3, or Klein, Ch.5,6

Goals:

* Learn about point and space group symmetries and terminology
* Learn to recognize point symmetries
* Determine crystal system from symmetries, and locate crystallographic axes
* Practice determining the Miller indices of crystal faces

**Items to be written up and handed in are in bold type.**

I) In groups, examine the following for symmetry:

5-petal flower: **Why are 5-fold and >6-fold rotation axes not possible in a crystalline structure? Prove your answer**, using p. 115-116 Klein and Hurlbut, or p.221-222 in Klein, as inspiration.

Tennis ball: **List the symmetries you find**. Ignore any writing on the ball. A sketch may be useful.

Escher tessellation:  **List the point symmetries and translation operations** you find. You may want to make a sketch of the tessellation with the symbols for these symmetry elements included.

2) Examine the collection of wooden crystal models tabulated below. **Determine the crystal system of each model listed below but don’t write on the models.** You can use the contact goniometer to measure angles. Crystal systems are determined by the symmetries present in the crystal. You may find it useful to determine the Hermann-Mauguin symbol for each block, as outlined at: www.tulane.edu/~sanelson/eens211/32crystalclass.htm and p.194-197 in Klein or p.66-100 Klein and Hurlbut.

1 2P 5P 31 34P 35 45P 60

68 75P 79 125 165 186 214

3) There are two wooden crystal models, numbers 186 and 60P, in the set of crystals used for problem 2. For each model, **make sketches of the front and top views.** Then, **label the crystallographic axes and the Miller indices of each face on the two crystals**. Note: it is recommended to set the highest symmetry axis as the c axis.

4) Pick one of the crystals from the natural crystals drawer. **Note the crystal system. Draw a sketch of the crystal, and label the crystallographic axes. Are the crystal faces and symmetry perfect for this crystal? What could cause imperfections in the symmetry of the macroscopic crystal in nature?**