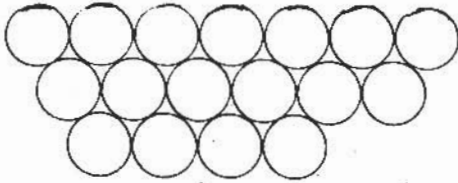


12.108 Lab #4: Packing of Spheres

1. 2D close packing.

- a) What is the 2D space group of a hexagonally packed plane of circles? Draw the unit cell on the diagram below.



2. Hexagonal close packing of equal spheres in 3D.

- a) Take at least three sheets of hcp spheres and make a 3D structure of the form ABABAB... . How many spheres touch a given sphere?
- b) How many different shaped voids are there?
- c) What are the coordination numbers (CN#'s) for those voids?
- d) Sketch one sphere and draw in the position of the tetrahedral and octahedral voids around it.
- e) Why are they called tetrahedral and octahedral voids?
- f) List the symmetry elements for this structure and identify its 3D-point group.

3. Cubic close packing of equal spheres in 3D.

- a) Take at least three hcp sheets and make a 3D structure of the form ABCABCABC..... How many other spheres does one sphere touch?
- b) How many different shaped voids are there?
- c) What are the coordination numbers (CN#'s) for these voids?
- d) Sketch one sphere and draw in the position of the tetrahedral and octahedral voids around it. Is it the same arrangement as you got for question 2d?
- e) List the symmetry elements for this structure and identify its 3D-point group.

4. Tetragonal sheets.

- a) Using the tetragonal sheets, you can make one of the above structures. Which one?
- b) Now use the hexagonal close packed sheets to make that structure. Now can you find the tetragonal sheets in the structure? Approximately what angle do the tetragonal sheets make with the hexagonal sheets?