# Materials 218/UCSB: Assignment II

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1. Sketch an n glide

2. Can you sketch an object with the Shubnikov symmetry $3'$ (black-white) ? What does this tell you about three spins at the corners of an equilateral triangle ?

3. What is the structure and space group of the crystal formed by alternately stacking square lattices of identical atoms as in the picture below:
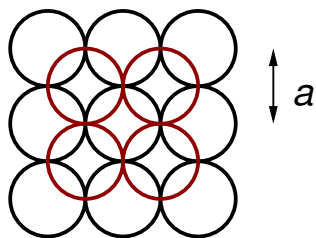
   What are the cell parameters of the crystal ?

4. Sketch the following structures as sections at different heights in the specified projections:

   - hcp along [001] (also written [0001])
   - fcc down 110

5. Plot the following structure as sections, and then attempt a plot of the full cell. How is the structure related to a more familiar one. How many Cu neighbors does each Au have and *vice-versa* ?

   Cu_3Au; Space Group $Pm\bar{3}m$ (221); $a = 3.74$ Å.

Atom	x	y	z
Au	0	0	0
Cu	1/2	1/2	0

6. Plot the ordered rock salt structure of the battery material $LiCoO_2$, as sections[1] along the c axis:

   $LiCoO_2$; Space Group $R\bar{3}m$ (166); $a = 2.815$ Å $c = 14.072$ Å.

Atom	x	y	z
Li	0	0	0
C0	0	0	1/2
O	0	0	0.238

7. Calculate the geometric Madelung potential on a cation that forms a part of a 1D chain, if it's nearest neighbors are anions at a distance of 1, second nearest neighbors are cations at a distance 2, third nearest neighbors are anions at a distance 4 and so on.

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[1] There are 12 — just plot the first four from the bottom