

Assignment 2

1. How is the absence of 5-fold rotations in standard crystallography associated with the existence of quasicrystals ?
2. Explain a , n and d glides in 3D crystals using sketches. There are many tutorials on crystal symmetry on the web.
3. Cubic cells always have a -3 or 3 in the space group label. Sketch out the -3 symmetry element in a cube.
4. Sketch the following structures as sections along different heights: (a) hcp along the c direction and fcc along the body diagonal.
5. Sketch 2D objects with the following (normal and color) symmetries: $4mm$, $4'm'm'$, $2m'm'$, $6'$
6. Can you sketch an object with $3'$ symmetry. What does this say about spins at the corners of a triangle ?
7. Calculate the efficiency of packing in the diamond structure. Remember that there are 8 atoms in the cell, and that the atom at $(0,0,0)$ touches the atom at $(1/4,1/4,1/4)$.
8. Sketch the following structure and determine the coordination of each atom (how many neighbors, and at what distance):
 Cu_3Au , $Pm-3m$, $a = 3.74 \text{ \AA}$, Cu at $(\frac{1}{2}, \frac{1}{2}, 0)$ and Au at $(0,0,0)$