

Quiz 1

Tuesday, January 26, 2010

Your name:

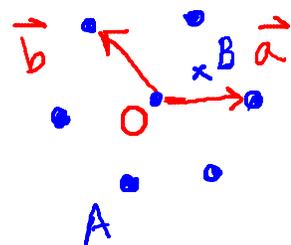
1. Consider a 2D hexagonal lattice. Assume a close-packed structure with one atom at each lattice point. By stacking these layers, an fcc or hcp crystal can be generated.

a) Draw a plan for an fcc crystal. By plan, I mean a top view diagram of the minimum number of stacked layers necessary to show the repeating pattern. The diagram on the right shows a possible beginning of such a plan: some atoms in the first layer (A layer) and one atom in the next layer (B layer) are shown.

Note different symbols used for atoms in different layers. You don't need to calculate the distance between layers, but you do need to note the layering sequence.

b) Draw a plan for an hcp crystal.

c) Consider the two vectors \vec{a} , \vec{b} as shown. We need \vec{c} to define the Bravais lattice for the 3D crystal generated in (a) or (b). Take \vec{c} to be the vector connecting \circ to the \times atom in the diagram. Explain why this is a good choice for (a), but not for (b). Do not answer just by stating the number of atoms in the primitive basis. You need to explain *why*.



A layer \cdot
B layer \times

2. (a) Define legitimate vectors \vec{a}, \vec{b} of your choice that will generate the Bravais lattice for the following 2D crystal. (b) For the given lattice line in each diagram, draw another lattice line that is parallel to it and lies closest to it. (c) Calculate Miller indices for the lattice line in each diagram, with respect to your choice of vectors \vec{a}, \vec{b} in (a).

