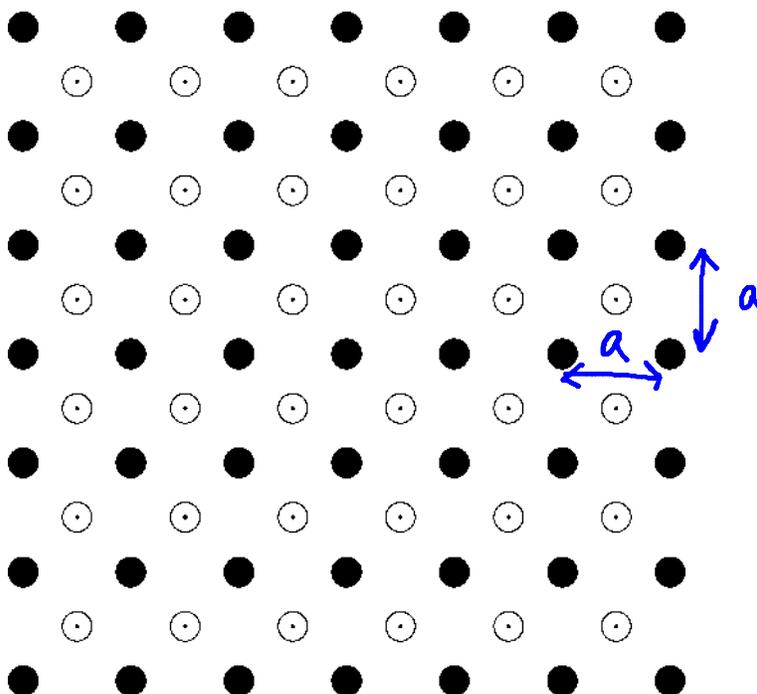


Quiz 3

Tuesday, February 09, 2010

Your name:

1. [20 points] The following square crystal structure is a pretty good description of a Te_2 sub-layer of crystals such as SmTe_3 and LaTe_3 [high temperature "CDW" compounds]. While each of the dots is a Te atom, they are distinguished as type A (filled circles) and type B (empty circles) because their chemical environments are different due to the adjacent atoms in the direction perpendicular to the layer.



- [6 points] Assign atomic form factors $f_A(\vec{G})$ to atom A and $f_B(\vec{G})$ to atom B. Find the structure factor $S_{\vec{G}}$.
- [6 points] Draw the reciprocal lattice for this crystal, with the correct dimensions (in terms of a) specified. Indicate which points would become extinct, if we make the approximation that the two Te atoms are identical.
- [4 points] Under the same approximation, what is the resulting Bravais Lattice (square, rectangular, ...; orientation; unit cell size)? Explain why it makes sense (or not).
- [4 points] For high order spots (large $|\vec{G}|$), the diffraction intensity is generally very weak. What is the origin of the weak intensity at large $|\vec{G}|$?