Physics 861 – Fall 01
Problem set 3 - Due Tuesday, Sep. 29

1. Fill in the blanks. Assuming that n_1, n_2, n_3 are integers:

² The simple cubic lattice points are $(n_1 n_2 n_3)$. The primitive unit cell side is 1. The number of atoms in the cell is _____ .

² The face centered cubic lattice points are $(n_1 n_2 n_3)$ with $n_1 + n_2 + n_3$ even. The conventional unit cell side is taken to be 2 (for convenience). The number of atoms in the cell is _____ .

² The body centered cubic lattice points are $(n_1 n_2 n_3)$ with n_1, n_2, n_3 all even or all odd. The conventional unit cell side is taken to be 2 (for convenience). The number of atoms in the cell is _____ .

² In the simple cubic lattice the shells are:

{ $\langle 100 \rangle$ with 6 points (nearest neighbors) at distance 1

{ $\langle 110 \rangle$ with 12 points (second nearest neighbors) at distance $\sqrt{2}$.

{ $\langle 111 \rangle$ with _____ points at distance _____ .

{ $\langle 200 \rangle$ with _____ points at distance _____ .

² In the fcc the shells are:

{ $\langle 110 \rangle$ with 12 points (nearest neighbors) at distance $\sqrt{2}$.

{ $\langle 200 \rangle$ with _____ points (second nearest neighbors) at distance _____ .

{ $\langle$ _____ $\rangle$ with _____ points at distance _____ .

{ $\langle$ _____ $\rangle$ with _____ points at distance _____ .

² In the bcc the shells are:

{ $\langle 111 \rangle$ with _____ points (nearest neighbors) at distance $\sqrt{3}$

{ $\langle 200 \rangle$ with _____ points (second nearest neighbors) at distance _____ .

{ $\langle$ _____ $\rangle$ with _____ points at distance _____ .

{ $\langle$ _____ $\rangle$ with _____ points at distance _____ .

2. AM's problem 5, page 82

3. AM's problem 1, page 108

You will of course need to work with reciprocal lattices, taking into account also the possible zeros of the structure factor, as in Figure 6.12. The number of points in a shell is not needed for the problem, but can provide additional insight because the diffraction ring will be strong if it comes from a reciprocal lattice shell with many points.

Alternative. AM's problem 1, page 82