

## Quiz 3

Thursday, February 09, 2012

Your name:

True or false, except 5 and 6. First give your answer. As time permits, explain your answers briefly.

1. If a conventional cell is taken instead of a primitive cell, it means that the volume of the conventional cell is as  $n$  times the volume of the primitive cell, where  $n$  is an integer greater than 1.
2. When a conventional BL is taken instead of a primitive BL, then the structure factor will necessarily vanish on some of the reciprocal lattice points of the conventional BL.
3. Consider a one dimensional crystal ("quantum wire") observed in a three dimensional world like ours. The lattice constant along the wire is  $a$ . The reciprocal BL of this crystal is a series of infinite planes perpendicular to the crystal with spacing  $2\pi/a$ .
4. In some crystals, acoustic phonons may not exist.
5. Diffraction spots become weak at high Miller indices because of the \_\_\_\_\_.  
(a) atomic form factor (b) decreased spacing between lattice planes
6. Two cubes of the same material are given. The dimensions of crystal A are 2 microns in each direction, while the dimensions of crystal B are 1 micron in each direction. An X-ray diffraction experiment is set up and run on these crystals with other conditions completely identical. The beam size is greater than 2 microns, and so the entire crystal is illuminated by X-ray for either crystal. The intensity of the X-ray diffraction spot from crystal A is \_\_\_\_\_ times greater than the intensity of the same X-ray diffraction spot from crystal B. The linewidth of the X-ray diffraction spot from crystal A will be \_\_\_\_\_ times the linewidth of the same X-ray diffraction spot from crystal B.