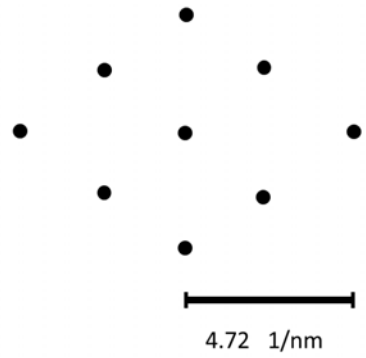
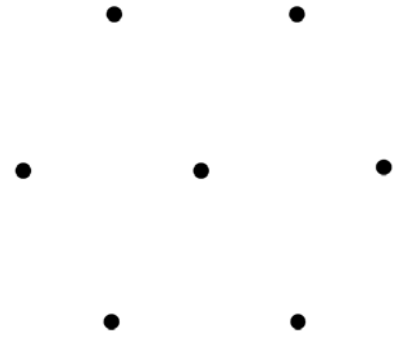
Tutorial questions - Lectures 4+5

1. What is more general: Bragg's law or the Ewald's sphere construction? Explain your answer.
2. For GaAs with unit cell parameter a=0.565nm, calculate g_{200} and g_{111}.
3. The following shows a diffraction pattern of a sphalerite semiconductor viewed along <110> zone axis. Calculate its lattice parameter.



4. Index the following simple cubic diffraction pattern. Which zone axis is it from?



5. Calculate the wavelength of 30kV electrons typically used in an SEM.
6. Sketch how a transmission electron diffraction pattern of a simple cubic crystal differs along <100> zone axis without and with the electron beam tilted off the zone axis.
7. The following is a list of systematic absences of reflections for all lattice types.

lattice	absence of $g_{hk\ell}$
P	none
C	h+k odd
I	h+k+ℓ odd
F	h, k and ℓ not all odd or all even

Write down which of the following reflections can exist in simple cubic, bcc and fcc structures: {100}, {110}, {111},{200}, {210},{211}.

8. Using the above result, how can you distinguish a bcc from an fcc lattice using the diffraction pattern?