This assignment is due Monday, October 6.

(1) A transmission Laue pattern is made of a cubic crystal having a lattice parameter of 4 A. The x-ray beam is horizontal. The $[0\bar{1}0]$ axis of the crystal points along the beam towards the x-ray tube, the $[\bar{1}00]$ axis points vertically upward, and the $[001]$ axis is horizontal and parallel to the photographic film. The film is 5.00 cm from the crystal.

(a) What is the wavelength of the radiation diffracted from the $(\bar{3}\bar{1}0)$ planes ?

(b) Draw the most relevant two dimensions of the reciprocal lattice. Use a graph paper or square-grid ruled paper (such as engineering paper or make your own grid). Draw in the vectors $\vec{q}$ and the incident and scattered wave vectors ($\vec{k}_0$ and $\vec{k}_S$) for (a).

(2) Determine, and list in order of increasing angle, the values of 2θ and (hkl) for the first three lines (those of lowest 2θ values) on the powder patterns of substances with the following structures, the incident radiation being $Cu-K\alpha$:
(a) simple cubic ($a=3.00 A$)
(b) simple tetragonal ($a=2.00 A; c=3.00A$)
(c) simple tetragonal ($a=3.00 A; c=2.00A$)
(d) simple rhombohedral (trigonal) ($a=3.00 A; \alpha=80^{\circ}$)