Chemistry 208—Spring 2008 **Problem Set 1**
Professor K. N. Raymond **Due 02/4/08**

1) a) You hear in a seminar that the site symmetry of a metal complex in a crystal is m3. Your neighbor whispers "what is that point symmetry in the chemists' notation?" How do you answer?

b) Show, using a stereographic projection, that the intersection of two vertical mirror planes 45° apart from one another generates a four-fold axis.

2) Draw a two-dimensional square lattice array (i.e., a = b, $\gamma = 90°$) using dots to represent lattice points (like that in Massa, Fig. 2.5).

a) Outline a primitive unit cell. Identify the $\vec{a}_p$ and $\vec{b}_p$ vectors which define the cell.

b) Identify the smallest centered cell you can find and its edge vectors $\vec{a}_c$ and $\vec{b}_c$. Is it more symmetric? Write the linear equations which relate $\vec{a}_c$ and $\vec{b}_c$ to $\vec{a}_p$ and $\vec{b}_p$.

c) Do your results say anything about the use of centered cells in tetragonal lattices? Explain.

3) Complete the following table

Crystal Type	Hermann-Maugin	Schoenflies
	1	C_1
Monoclinic	2	
	mmm	
Tetragonal	4mm	
	32	D_3
Hexagonal		C_6
	23	
Cubic		O

4) For each of the 2-D patterns given below, outline what you consider to be the "best" unit cell. Each diagram represents an infinitely repeating pattern. If no satisfactory unit cell can be found, say "none". (You may draw directly on the pattern and turn it in.)