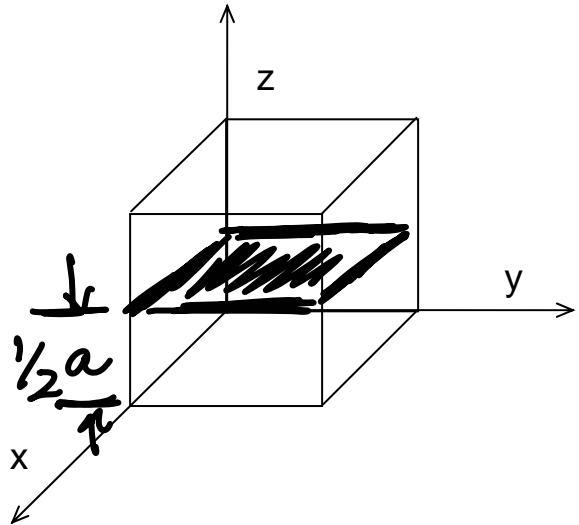
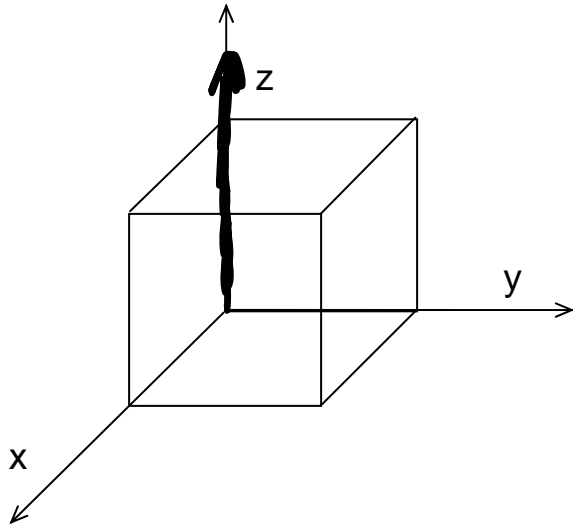


3.091 Fall Term 2004
Homework Quiz #6B
 solution outline

(a) (i) In the cubic unit cell below sketch [002]. (ii) In the cubic unit cell below sketch (002).



(b) Calculate the density of atoms in (001) in molybdenum (Mo). Express your answer in units of $atoms/cm^2$.

Mo is BCC. (001) is the cube face, a square area of $a \times a$. There are atoms at the four corners of the square which are shared with adjacent unit cells; only $1/4$ of the area of each corner atom lies within the square. So the total number of atoms per square can be expressed as $(4 \times 1/4) = 1$.

To get the value of the lattice constant a , we use the relationship between the number of atoms in the unit cell and the number of atoms in a molar volume:

$$\frac{2 \text{ atoms}}{a^3} = \frac{N_{Av}}{V_{molar}}, \quad \therefore a = \left(\frac{2 V_{molar}}{N_{Av}} \right)^{1/3}$$

So now the atom area density is $1/a^2 =$

$$\frac{1}{\left\{ \left(\frac{2 V_{molar}}{N_{Av}} \right)^{1/3} \right\}^2} = \frac{1}{\left(\frac{2 \times 9.41}{6.02 \times 10^{23}} \right)^{2/3}} = 1.01 \times 10^{15} \text{ atoms/cm}^2$$