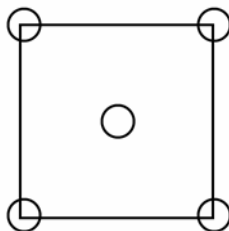


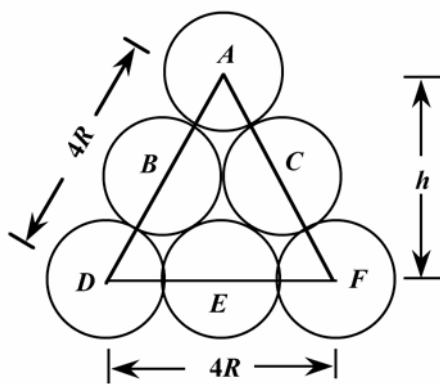
3.53 (a) In the figure below is shown a (100) plane for an FCC unit cell.



For this (100) plane there is one atom at each of the four cube corners, each of which is shared with four adjacent unit cells, while the center atom lies entirely within the unit cell. Thus, there is the equivalence of 2 atoms associated with this FCC (100) plane. The planar section represented in the above figure is a square, wherein the side lengths are equal to the unit cell edge length,  $2R\sqrt{2}$  (Equation 3.1); and, thus, the area of this square is just  $(2R\sqrt{2})^2 = 8R^2$ . Hence, the planar density for this (100) plane is just

$$\begin{aligned} \text{PD}_{100} &= \frac{\text{number of atoms centered on (100) plane}}{\text{area of (100) plane}} \\ &= \frac{2 \text{ atoms}}{8R^2} = \frac{1}{4R^2} \end{aligned}$$

That portion of an FCC (111) plane contained within a unit cell is shown below.



There are six atoms whose centers lie on this plane, which are labeled A through F. One-sixth of each of atoms A, D, and F are associated with this plane (yielding an equivalence of one-half atom), with one-half of each of atoms B, C, and E (or an equivalence of one and one-half atoms) for a total equivalence of two atoms. Now, the area of