

3.61 (a) From the data given in the problem, and realizing that  $75.99^\circ = 2\theta$ , the interplanar spacing for the (211) set of planes for Nb may be computed using Equation 3.13 as follows:

$$d_{211} = \frac{n\lambda}{2 \sin \theta} = \frac{(1)(0.1659 \text{ nm})}{(2)\left(\sin \frac{75.99^\circ}{2}\right)} = 0.1348 \text{ nm}$$

(b) In order to compute the atomic radius we must first determine the lattice parameter,  $a$ , using Equation 3.14, and then  $R$  from Equation 3.3 since Nb has a BCC crystal structure. Therefore,

$$a = d_{211} \sqrt{(2)^2 + (1)^2 + (1)^2} = (0.1347 \text{ nm})(\sqrt{6}) = 0.3300 \text{ nm}$$

And, from Equation 3.3

$$R = \frac{a\sqrt{3}}{4} = \frac{(0.3300 \text{ nm})\sqrt{3}}{4} = 0.1429 \text{ nm}$$