

3.62 The first step to solve this problem is to compute the interplanar spacing using Equation 3.13. Thus,

$$d_{hkl} = \frac{n\lambda}{2 \sin \theta} = \frac{(1)(0.1542 \text{ nm})}{(2) \left(\sin \frac{44.53^\circ}{2} \right)} = 0.2035 \text{ nm}$$

Now, employment of both Equations 3.14 and 3.1 (since Ni's crystal structure is FCC), and the value of R for nickel from Table 3.1 (0.1246 nm) leads to

$$\begin{aligned} \sqrt{h^2 + k^2 + l^2} &= \frac{a}{d_{hkl}} = \frac{2R\sqrt{2}}{d_{hkl}} \\ &= \frac{(2)(0.1246 \text{ nm})\sqrt{2}}{(0.2035 \text{ nm})} = 1.732 \end{aligned}$$

This means that

$$h^2 + k^2 + l^2 = (1.732)^2 = 3.0$$

By trial and error, the only three integers that are all odd or even, the sum of the squares of which equals 3.0 are 1, 1, and 1. Therefore, the set of planes responsible for this diffraction peak is the (111) set.