

32. (a) We use Eq. 34-8 and note that  $n_1 = n_{\text{air}} = 1.00$ ,  $n_2 = n$ ,  $p = \infty$ , and  $i = 2r$ :

$$\frac{1.00}{\infty} + \frac{n}{2r} = \frac{n-1}{r}.$$

We solve for the unknown index:  $n = 2.00$ .

(b) Now  $i = r$  so Eq. 34-8 becomes

$$\frac{n}{r} = \frac{n-1}{r},$$

which is not valid unless  $n \rightarrow \infty$  or  $r \rightarrow \infty$ . It is impossible to focus at the center of the sphere.