

29. **REASONING** The refractive index n_{Liquid} of the liquid can be less than the refractive index of the glass n_{Glass} . However, we must consider the phenomenon of total internal reflection. Some of the light will enter the liquid as long as the angle of incidence is less than or equal to the critical angle. At incident angles greater than the critical angle, total internal reflection occurs, and no light enters the liquid. Since the angle of incidence is 75.0° , the critical angle cannot be allowed to fall below 75.0° . The critical angle θ_c is determined according to Equation 26.4:

$$\sin \theta_c = \frac{n_{\text{Liquid}}}{n_{\text{Glass}}}$$

As n_{Liquid} decreases, the critical angle decreases. Therefore, n_{Liquid} cannot be less than the value calculated from this equation, in which $\theta_c = 75.0^\circ$ and $n_{\text{Glass}} = 1.56$.

SOLUTION Using Equation 26.4, we find that

$$\sin \theta_c = \frac{n_{\text{Liquid}}}{n_{\text{Glass}}} \quad \text{or} \quad n_{\text{Liquid}} = n_{\text{Glass}} \sin \theta_c = (1.56) \sin 75.0^\circ = \boxed{1.51}$$
