

Problem 8.23 A glass semicylinder with $n = 1.5$ is positioned such that its flat face is horizontal, as shown in Fig. P8.23, and its horizontal surface supports a drop of oil, as also shown. When light is directed radially toward the oil, total internal reflection occurs if θ exceeds 53° . What is the index of refraction of the oil?

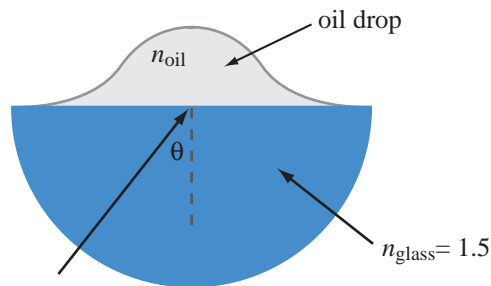


Figure P8.23: Oil drop on the flat surface of a glass semicylinder (Problem 8.23).

Solution:

$$\sin \theta_c = \frac{n_2}{n_1} = \frac{n_{\text{oil}}}{1.5},$$

$$n_{\text{oil}} = 1.5 \sin 53^\circ = 1.2.$$
