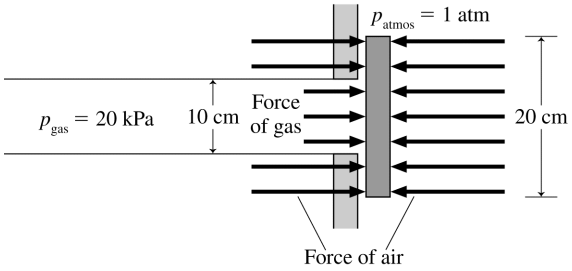
15.10. Visualize:



We assume that the seal is at a radius of 5 cm. Outside the seal, atmospheric pressure presses on *both* sides of the cover and the forces cancel. Thus, only the 10 cm diameter opening inside the seal is relevant, not the 20 cm diameter of the cover.

Solve: Within the 10 cm diameter area where the pressures differ,

$$F_{\text{to left}} = p_{\text{atmos}}A \qquad F_{\text{to right}} = p_{\text{gas}}A$$

where $A = \pi r^2 = 7.85\times10^{-3}\ \text{m}^2$ is the area of the opening. The difference between the forces is

$$F_{\text{to left}} - F_{\text{to right}} = \left(p_{\text{atmos}} - p_{\text{gas}}\right)A = (101{,}300\ \text{Pa} - 20{,}000\ \text{Pa})\left(7.85\times10^{-3}\ \text{m}^2\right) = 639\ \text{N}$$

Normally, the rubber seal exerts a 639 N force to the right to balance the air pressure force. To pull the cover off, an external force must pull to the right with a force ≥639 N.