

8. (a) We use Eq. 26-17:

$$C = 4\pi\epsilon_0 \frac{ab}{b-a} = \frac{(40.0 \text{ mm})(38.0 \text{ mm})}{(8.99 \times 10^9 \frac{\text{N}\cdot\text{m}^2}{\text{C}^2})(40.0 \text{ mm} - 38.0 \text{ mm})} = 84.5 \text{ pF} .$$

(b) Let the area required be  $A$ . Then  $C = \epsilon_0 A/(b-a)$ , or

$$A = \frac{C(b-a)}{\epsilon_0} = \frac{(84.5 \text{ pF})(40.0 \text{ mm} - 38.0 \text{ mm})}{(8.85 \times 10^{-12} \frac{\text{C}^2}{\text{N}\cdot\text{m}^2})} = 191 \text{ cm}^2 .$$