

### Problem 26.45

a.) Teflon's dielectric constant is 2.1, so its capacitance is:

$$\begin{aligned}C_{\text{with}} &= \kappa \epsilon_0 \frac{A}{d} \\ &= \frac{2.1(8.85 \times 10^{-12} \text{ F/m})(1.75 \times 10^{-4} \text{ m}^2)}{(4.00 \times 10^{-5} \text{ m})} \\ &= 8.13 \times 10^{-11} \text{ F}\end{aligned}$$

b.) The voltage? This is a little convoluted unless you realize that the DIELECTRIC STRENGTH column in Table 26.1 in your text has the units of Volts/meter, which is the units for electric field (in fact, for Teflon, this is  $6.00 \times 10^7 \text{ V/m}$ ). With that:

$$\begin{aligned}V &= Ed \\ &= (6.00 \times 10^7 \text{ V/m})(4.00 \times 10^{-5} \text{ m}) \\ &= 2.40 \times 10^3 \text{ V}\end{aligned}$$