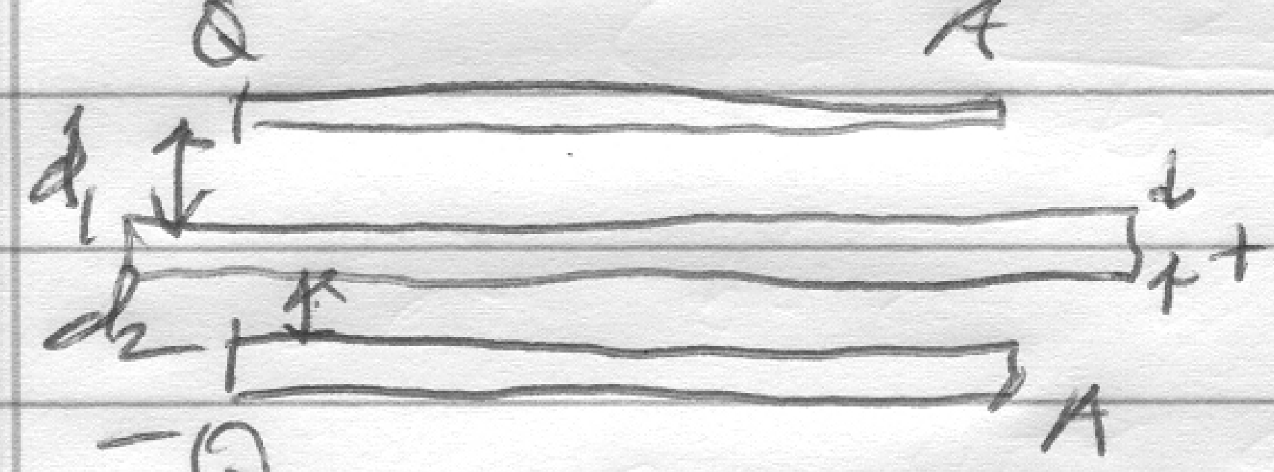
W 6-12 $\qquad C_0 = \frac{\varepsilon_0 A}{d}$



We can assume Q is constant. (E unchanged) $\Delta\phi$ within the conducting plate is $= 0$, so

$$\Delta\phi = E d_1 + E d_2 = \frac{\sigma}{\varepsilon_0}(d_1+d_2) = \frac{Q}{\varepsilon_0 A}(d_1+d_2)$$

$$C = \frac{Q}{\Delta\phi} = \frac{\varepsilon_0 A}{d_1+d_2}$$

$$\Delta C = C - C_0 = \varepsilon_0 A\left(\frac{1}{d_1+d_2} - \frac{1}{d}\right) = \varepsilon_0 A\,\frac{d-(d_1+d_2)}{d(d_1+d_2)}$$

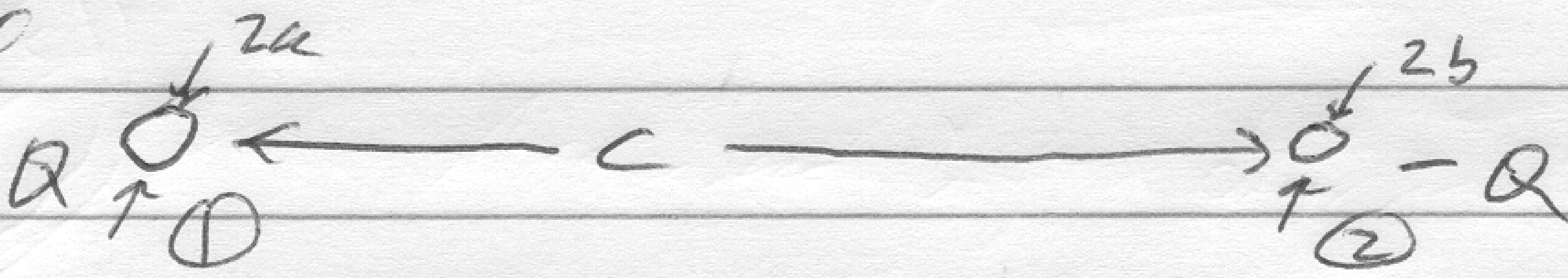
now $d = d_1 + d_2 + t$ $\quad$ so $d - (d_1+d_2) = t$

and $d_1 + d_2 = d - t$

$$\underline{\Delta C = \frac{\varepsilon_0 A t}{d(d-t)}}$$

$\Delta\phi$ is unchanged by sheet position, so <u>C same</u>

<u>W. 6-14</u>



Find potential of each, potential difference, then capacitance. Since $c \gg a, b$, we can assume spherically symmetric charge distributions on spheres.

$$\phi_1 = \frac{KQ_1}{a} - \frac{KQ}{c} \qquad \text{self + due to } 2$$

$$\phi_2 = \frac{-KQ}{b} + \frac{KQ}{c}$$

$$\Delta\phi = \phi_1 - \phi_2 = KQ\left(\frac{1}{a} + \frac{1}{b} - \frac{2}{c}\right) = \frac{Q}{4\pi\varepsilon_0}\left(\frac{1}{a} + \frac{1}{b} - \frac{2}{c}\right)$$

$$\underline{C = \frac{Q}{\Delta\phi} = 4\pi\varepsilon_0\left(\frac{1}{a} + \frac{1}{b} - \frac{2}{c}\right)^{-1}}$$