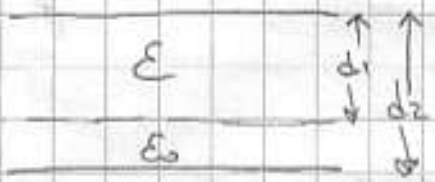
Pauta Ejercicio 6

Antes de separar las placas, el condensador está "cargado" con V_1 luego

$$Q = C \cdot \Delta V = C \cdot V_1 \; ; \; y \; C = \frac{\varepsilon A}{d_1} \quad \text{(condensador plano)}.$$

$$\Rightarrow Q = \frac{\varepsilon A V_1}{d_1}$$

Cuando se separa una de las placas



$$C_1 = C = \frac{\varepsilon A}{d_1} \quad \text{(no cambia)}$$

$$C_2 = \frac{\varepsilon_0 A}{d_2 - d_1}$$

$$\Rightarrow C_{eq} = \left(\frac{1}{C_1} + \frac{1}{C_2} \right)^{-1} \quad \text{(conexión serie)}$$

$$= \left(\frac{d_2 - d_1}{\varepsilon_0 A} + \frac{d_1}{\varepsilon A} \right)^{-1} = \frac{A \varepsilon_0 \varepsilon}{\varepsilon (d_2 - d_1) + \varepsilon_0 d_1}$$

misma x cons. de carga

$$\Rightarrow V_2 = \frac{Q}{C_{eq}} = \frac{\cancel{\varepsilon} A V_1}{d_1} \cdot \frac{\varepsilon (d_2 - d_1) + \varepsilon_0 d_1}{A \varepsilon_0 \cancel{\varepsilon}}$$

$$V_2 = \frac{V_1}{d_1} \left[\frac{\varepsilon}{\varepsilon_0} (d_2 - d_1) + d_1 \right] \quad (\text{Si } d_2 = d_1, V_2 = V_1 \checkmark)$$

$$W = \Delta U = \frac{1}{2} Q^2 \left(\frac{1}{C_{fin}} - \frac{1}{C_{in}} \right) = \frac{\varepsilon^2 A^2 V_1^2}{d_1^2} \left[\frac{\varepsilon (d_2 - d_1) + \varepsilon_0 d_1}{A \varepsilon_0 \varepsilon} - \frac{d_1}{\varepsilon A} \right]$$

$$= \frac{\varepsilon A V_1^2}{d_1^2} \left[\frac{\varepsilon}{\varepsilon_0} (d_2 - d_1) + \cancel{d_1} - \cancel{d_1} \right] = \frac{\varepsilon^2 A V_1^2 (d_2 - d_1)}{\varepsilon_0 d_1^2}$$

$$\left[= \frac{1}{2} \frac{Q}{C_2} \right]$$