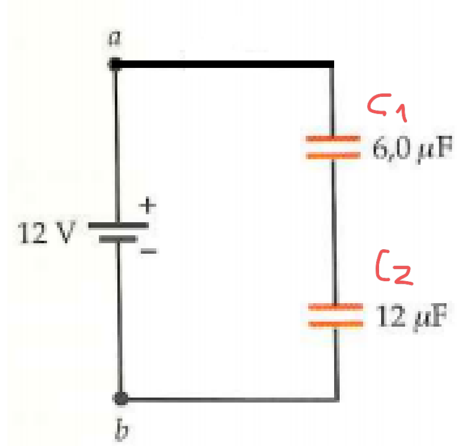
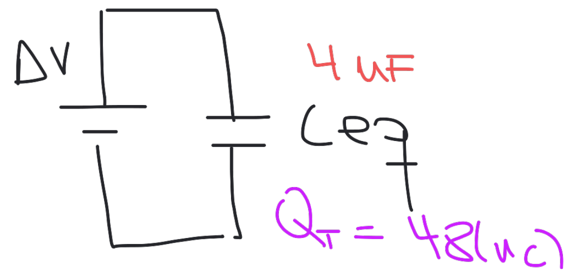
De los circuitos mostrados, determinar la carga y diferencia de potencial para cada capacitor




Serie

Ceq: $C_1$ y $C_2$ en serie

$$\frac{1}{C_{eq}} = \frac{1}{6} + \frac{1}{12} = \frac{3}{12} = \frac{1}{4}$$

$$C_{eq} = 4\,(\mu F)$$

$$C = \frac{Q}{\Delta V} \rightarrow Q_T = C_{eq} \cdot \Delta V_T$$

$$= 4(\mu F) \cdot 12\,(V)$$

$$Q_T = 48\,(\mu C)$$

$$Q_T = Q_1 = Q_2 \quad (\text{en serie})$$

$$\Delta V_1 = \frac{Q_1}{C_1} = \frac{48(\mu C)}{6(\mu F)} = 8\,(V)$$

$$\Delta V_2 = \frac{Q_2}{C_2} = \frac{48(\mu C)}{12(\mu F)} = 4\,(V)$$

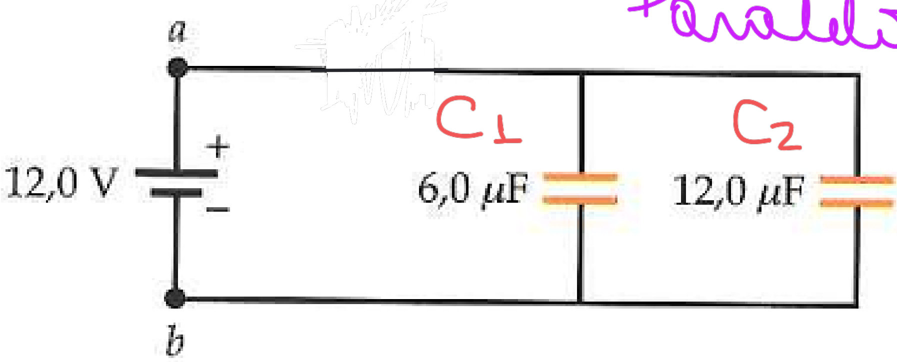
$$\Delta V_T = 12\,(V)$$

✓

# Ejemplos

De los circuitos mostrados, determinar la carga y diferencia de potencial para cada capacitor

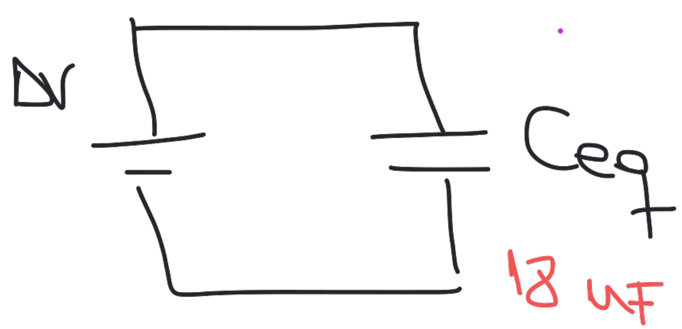
Paralelo.




$\underline{C_{eq}}$: $C_1$ y $C_2$ en //

$$C_{eq} = 6 + 12 = 18\,(\mu F)$$

$$C = \frac{Q}{V} \rightarrow Q_T = C_{eq} \cdot \Delta V_T$$
$$= 18(\mu F) \cdot 12(V)$$
$$= 216\,(\mu C)$$

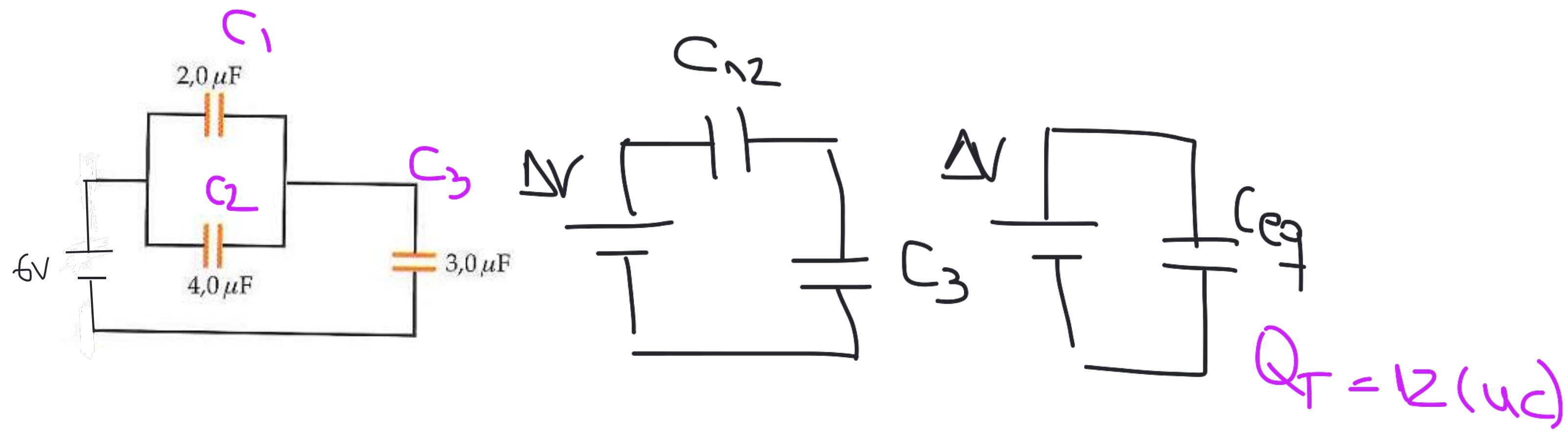



$$\Delta V_T = V_1 = V_2$$

$$\left.\begin{aligned} Q_1 &= C_1 \cdot V_1 = 6(\mu F) \cdot 12(V) = 72(\mu C) \\ Q_2 &= C_2 \cdot V_2 = 12(\mu F) \cdot 12(V) = 144(\mu C) \end{aligned}\right\} Q_T$$

## Ejemplos

De los circuitos mostrados, determinar la carga y diferencia de potencial para cada capacitor




$C_{12}$: $C_1$ y $C_2$ en //

$C_{12} = 2+4 = 6(\mu F)$

$C_{eq}$: $C_{12}$ y $C_3$ en serie

$\frac{1}{C_{eq}} = \frac{1}{6} + \frac{1}{3} = \frac{1}{2}$

$C_{eq} = 2(\mu F)$

$Q_T = C_{eq} \cdot \Delta V_T = 2(\mu F) \cdot 6(V)$

$Q_T = 12(\mu C)$

$Q_T = Q_{12} = Q_3$ (en serie)

$\Delta V_3 = \frac{Q_3}{C_3} = \frac{12(\mu C)}{3(\mu F)} = 4(V)$

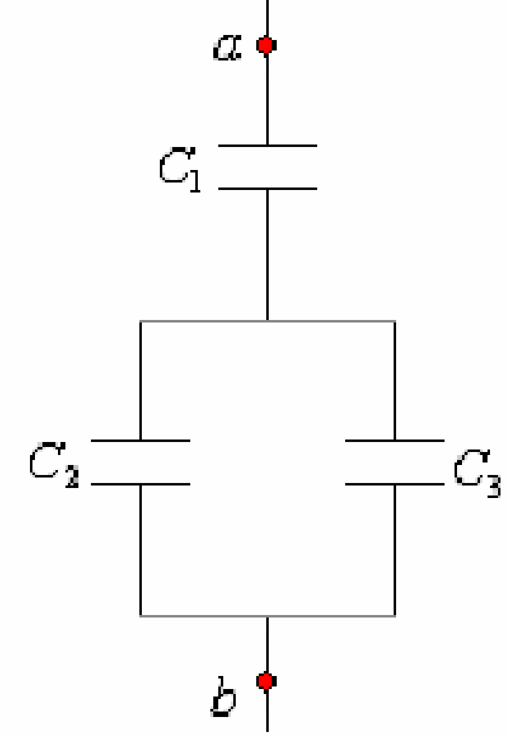
$\Delta V_{12} = \frac{Q_{12}}{C_{12}} = \frac{12(\mu C)}{6(\mu F)} = 2(V)$

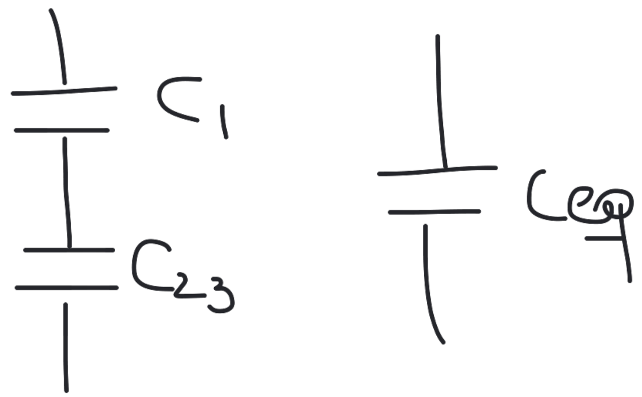
$\Delta V_{12} = \Delta V_1 = \Delta V_2$ (en //)

$Q_1 = C_1 \cdot \Delta V_1 = 2(\mu F) \cdot 2(V) = 4(\mu C)$

$Q_2 = C_2 \cdot \Delta V_2 = 4(\mu F) \cdot 2(V) = 8(\mu C)$

1. En la figura siguiente determinar la capacidad equivalente entre a y b. Donde $C_1 = 2$ µF , $C_2 = 1$ µF y $C_3 = 3$ µF.
2. Si $\Delta v_{ab} = 12$ V, determinar la carga y diferencia de potencial en cada condensador.




$\underline{C_{23}}$: $C_2$ y $C_3$ en //

$C_{23} = 1 + 3 = 4\,(\mu F)$

$\underline{C_{eq}}$: $C_1$ y $C_{23}$ en serie

$\frac{1}{C_{eq}} = \frac{1}{2} + \frac{1}{4} = \frac{3}{4} \rightarrow$

$C_{eq} = \frac{4}{3}\,(\mu F)$

$Q_T = C_{eq}\, V_T$

$Q_T = \frac{4}{3} \cdot 12 = 16\,(\mu C)$

$Q_T = Q_1 = Q_{23}$
(en serie)

$Q_1 = 16\,(\mu C)$

$V_1 = \frac{Q_1}{C_1} = \frac{16\,(\mu C)}{2\,(\mu F)} = 8\,(V)$

$V_{23} = \frac{Q_{23}}{C_{23}} = \frac{16\,(\mu C)}{4\,(\mu F)} = 4\,(V)$

$V_{23} = V_2 = V_3$ (en //)

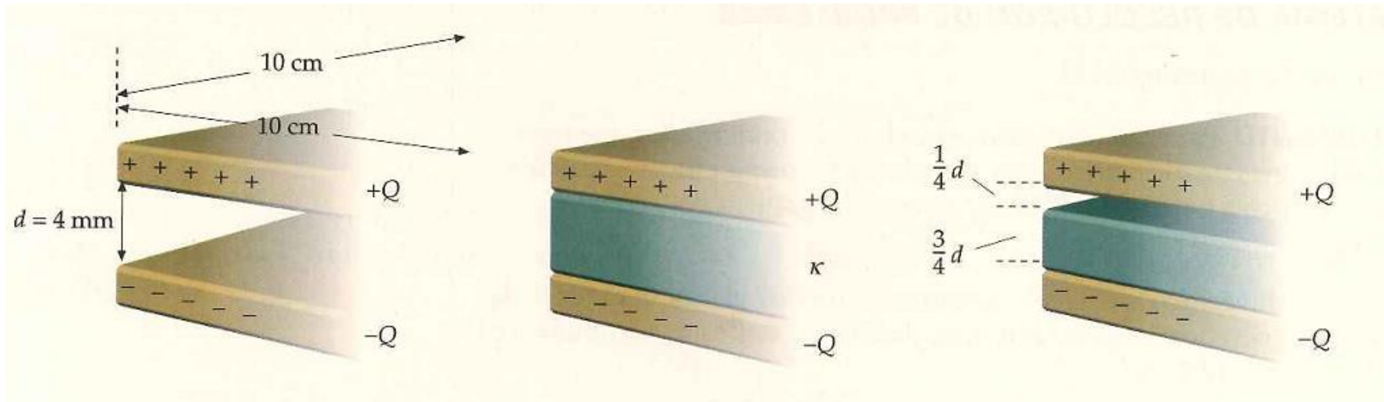
$V_2 = 4\,(V)$ $\quad Q_2 = C_2 \cdot V_2$

$Q_2 = 1 \cdot 4 \rightarrow Q_2 = 4\,(\mu C)$

$V_3 = 4\,(V)$ $\quad Q_3 = C_3 \cdot V_3$

$Q_3 = 3 \cdot 4 \rightarrow Q_3 = 12\,(\mu C)$

Un condensador plano tiene placas cuadradas de lado 10 cm y una separación $d = 4$ mm. Un bloque dieléctrico de constante $k = 2$ tiene dimensiones 10 cm × 10 cm × 4 mm. (*a*) ¿Cuál es la capacidad sin dieléctrico? (*b*) ¿Cuál es la capacidad si el bloque dieléctrico llena el espacio entre las placas? (*c*) ¿Cuál es la capacidad si otro bloque dieléctrico de dimensiones 10 cm × 10 cm × 3 mm se inserta en el condensador cuyas placas están separadas 4 mm?

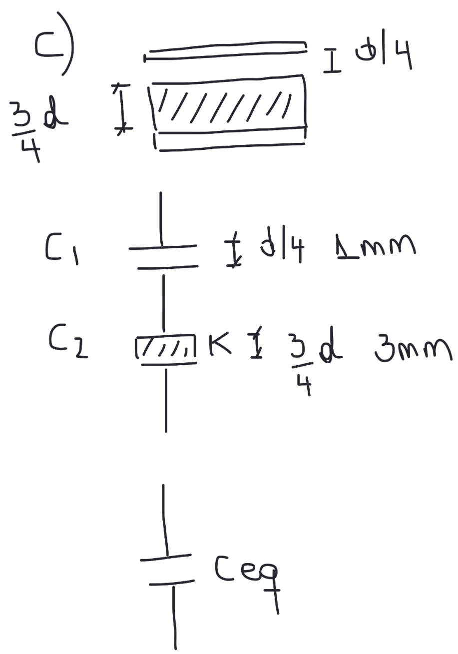



a) $C_0 = \dfrac{\varepsilon_0 A}{d} = \dfrac{8{,}85\times10^{-12}\cdot 0{,}1\cdot 0{,}1}{4\times10^{-3}} = 2{,}2\times10^{-11}\,(F)$

b) $C = KC_0 = 2\times 2{,}2\times10^{-11}$

$C = 4{,}4\times10^{-11}\,(F)$

c)




$C_1 = \dfrac{\varepsilon_0 A}{d} = \dfrac{8{,}85\times10^{-12}\cdot 0{,}1\cdot 0{,}1}{1\times10^{-3}}$

$C_1 = 8{,}85\times10^{-11}\,(F)$

$C_2 = \dfrac{K\varepsilon_0 A}{d} = \dfrac{2\cdot 8{,}85\times10^{-12}\cdot 0{,}1\cdot 0{,}1}{3\times10^{-3}}$

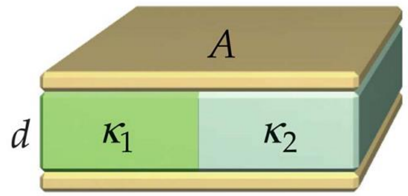
$C_2 = 5{,}9\times10^{-11}\,(F)$

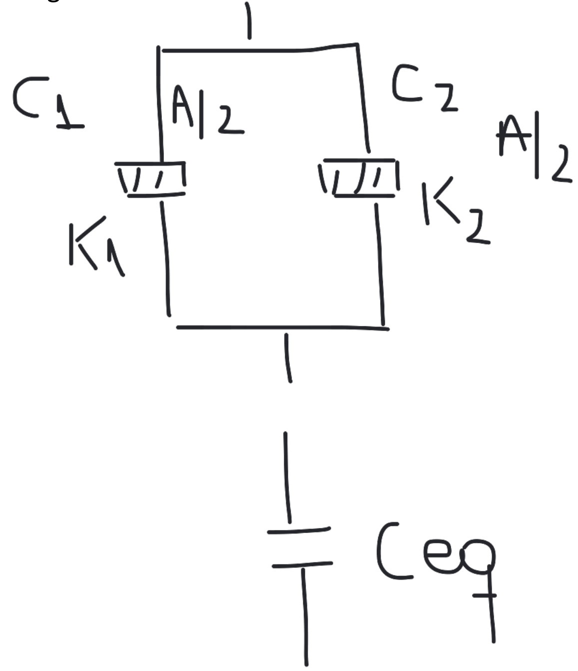
<u>Ceq</u>: $C_1$ y $C_2$ en serie

$\dfrac{1}{C_{eq}} = \dfrac{1}{C_1} + \dfrac{1}{C_2} =$

$C_{eq} = 3{,}5\times10^{-11}\,(F)$

Determinar la capacitancia equivalente de los siguientes condensadores:




$C_0$ (vacío)

$$C_0 = \frac{\varepsilon_0 A}{d}$$

$C_0$

$$C_1 = \frac{K_1\, \varepsilon_0 A}{2d} = \frac{K_1}{2} C_0$$

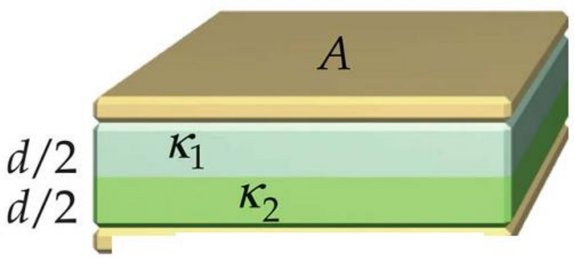
$$C_2 = \frac{K_2\, \varepsilon_0 A}{2d} = \frac{K_2}{2} C_0$$

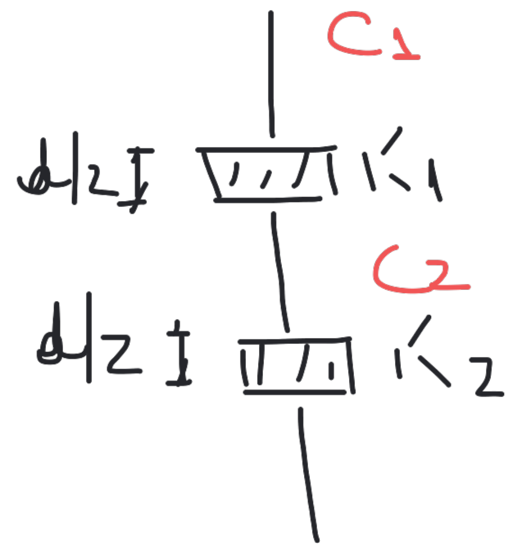
$\underline{C_{eq}}$: $C_1$ y $C_2$ en //

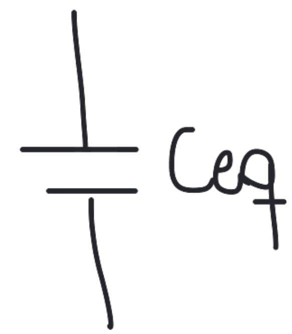
$$C_{eq} = \frac{K_1 C_0}{2} + \frac{K_2 C_0}{2}$$

$$C_{eq} = \frac{C_0}{2}(K_1 + K_2)$$

Determinar la capacitancia equivalente de los siguientes condensadores:




$$C_0 = \frac{\varepsilon_0 A}{d}$$

$C_0$

$$C_1 = \frac{K_1 \varepsilon_0 A}{d/2} = 2K_1 C_0$$

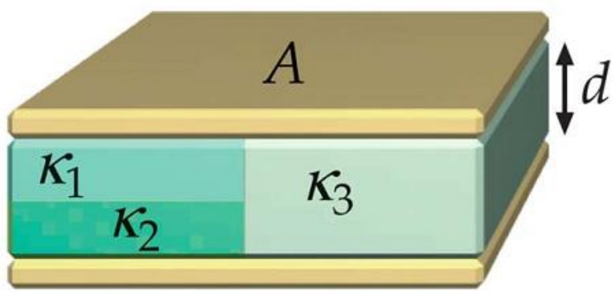
$$C_2 = \frac{K_2 \varepsilon_0 A}{d/2} = 2K_2 C_0$$

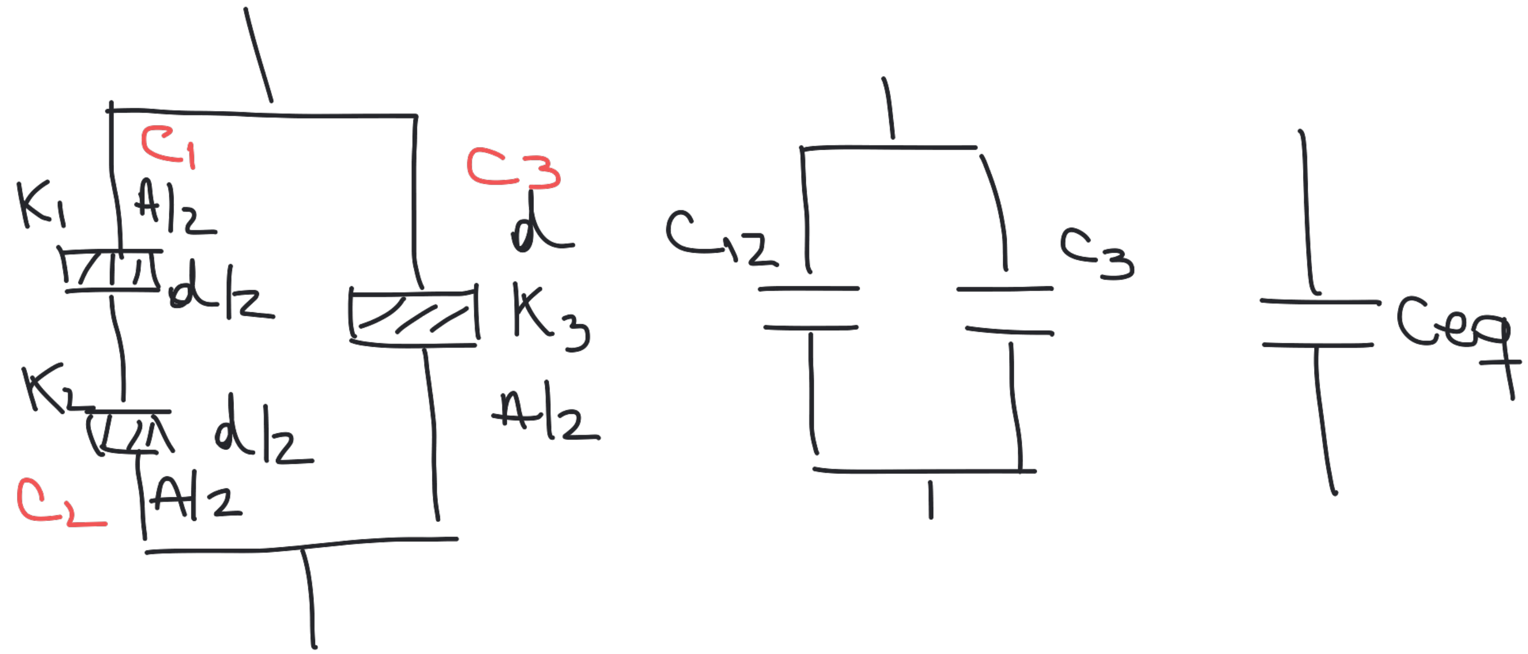
$C_{eq}$ : $C_1$ y $C_2$ en serie

$$\frac{1}{C_{eq}} = \frac{1}{2K_1 C_0} + \frac{1}{2K_2 C_0} = \frac{K_2 + K_1}{2 C_0 K_1 K_2}$$

$$C_{eq} = 2C_0 \left( \frac{K_1 K_2}{K_1 + K_2} \right)$$

Determinar la capacitancia equivalente de los siguientes condensadores:




$$C_0 = \frac{\varepsilon_0 A}{d}$$

$$C_1 = \frac{K_1 \overset{C_0}{\varepsilon_0 \cdot A}\, \cancel{2}}{\cancel{2} \cdot d} = K_1 C_0$$

$$C_2 = K_2 C_0$$

$$C_3 = \frac{K_3 \varepsilon_0 A}{2d} = \frac{K_3}{2} C_0$$

$\underline{C_{12}}$: $C_1$ y $C_2$ en serie

$$\frac{1}{C_{12}} = \frac{1}{K_1 C_0} + \frac{1}{K_2 C_0} = \frac{K_2 + K_1}{K_1 K_2 C_0}$$

$$C_{12} = C_0 \left( \frac{K_1 K_2}{K_1 + K_2} \right)$$

$\underline{C_{eq}}$: $C_{12}$ y $C_3$ en //

$$C_{eq} = C_0 \left( \frac{K_1 K_2}{K_1 + K_2} \right) + \frac{K_3 C_0}{2}$$