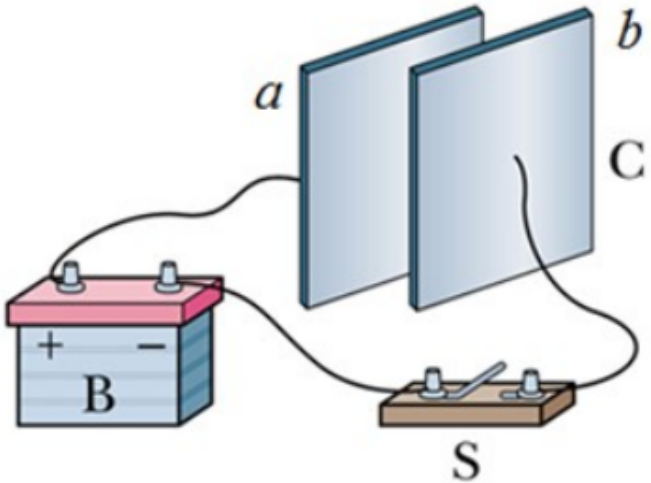
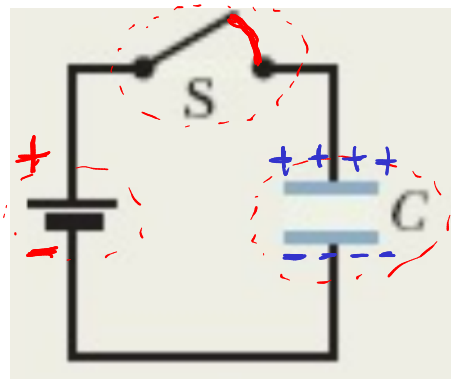
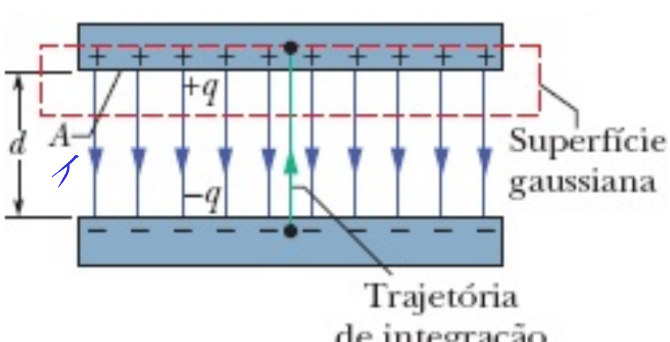
Associação de Capacitores





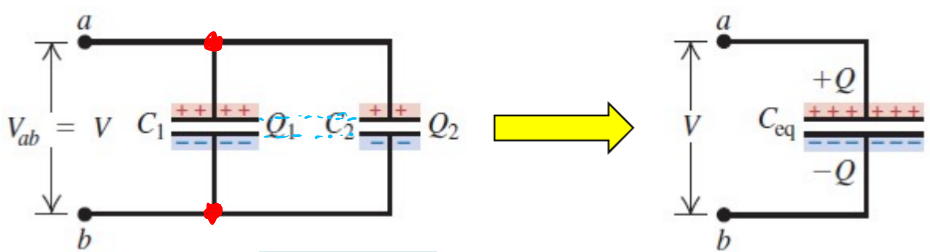


$$q = C\,V$$

$$C = \epsilon_0 \frac{A}{d}$$

Associação de Capacitores - Paralelo

- A diferença de potencial V é a mesma para todos os capacitores;
- A carga total q armazenada nos capacitores é a soma das cargas dos capacitores.
- Capacitor equivalente C_{eq} tem a mesma carga total q e a mesma diferença de potencial V que os capacitores originais.



$q_1 = C_1 V$ e $q_2 = C_2 V$ $\Rightarrow$ $q = q_1 + q_2$ $\Rightarrow$ $q = (C_1 + C_2)V \Rightarrow q = C_{eq} V$

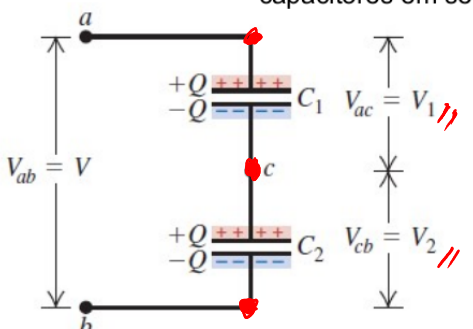
$q_{eq} = C_{eq} V$

$$C_{eq} = (C_1 + C_2) \Rightarrow C_{eq} = \sum_{j=1}^{n} C_j$$

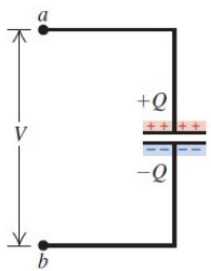
Associação de Capacitores - Série

- A carga q armazenada é a mesma em todos os capacitores;
- V é a soma dos potenciais entre as placas de cada capacitor

capacitores em série



capacitor equivalente



C_{eq}

$q_1 = C_1 V_1$ e $q_2 = C_2 V_2$ $\Rightarrow$ $V = V_1 + V_2 = \left(\frac{q}{C_1} + \frac{q}{C_2}\right) = q\left(\frac{1}{C_1} + \frac{1}{C_2}\right) = \frac{q}{C_{eq}}$

$q_1 = q_2$

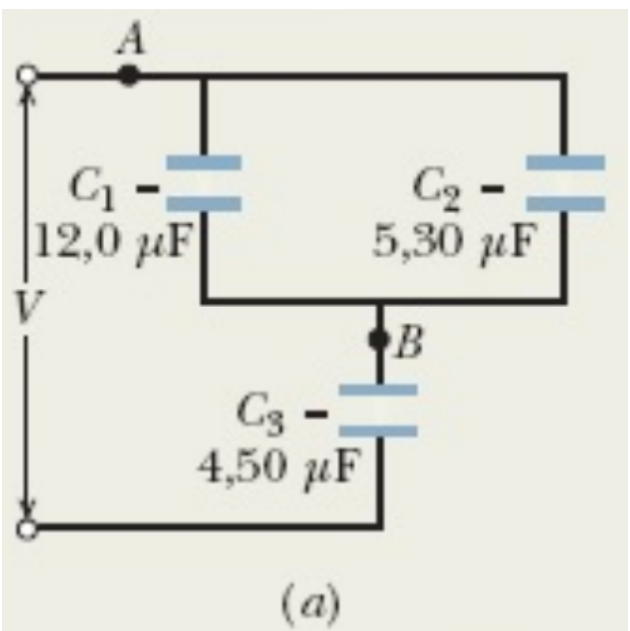
$$\frac{1}{C_{eq}} = \sum_{j=1}^{n} \frac{1}{C_j}$$

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \ldots + \frac{1}{C_n}$$

Exemplo 25.02 Capacitores em paralelo e em série

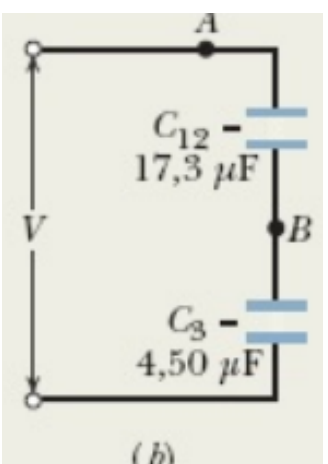
(a) Determine a capacitância equivalente da combinação de capacitores que aparece na Fig. 25-10*a*, à qual é aplicada uma diferença de potencial *V*. Os valores das capacitâncias são os seguintes:

$$C_1 = 12{,}0\,\mu\text{F}, \quad C_2 = 5{,}30\,\mu\text{F}, \quad \text{e} \quad C_3 = 4{,}50\,\mu\text{F}.$$



$$C_{12} = C_1 + C_2$$

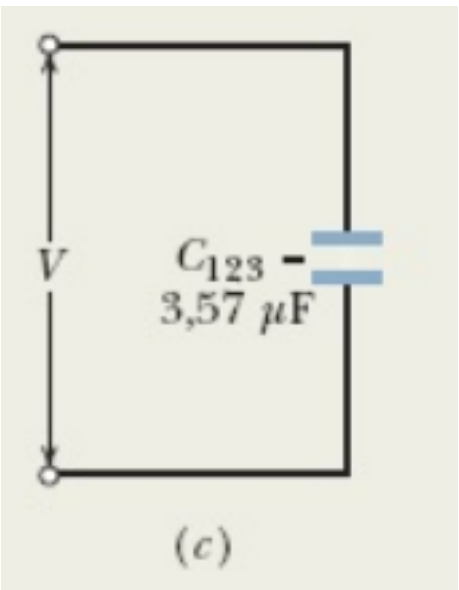
$$C_{12} = 12 + 5{,}3 \Rightarrow C_{12} = 17{,}3\,\mu\text{F}$$



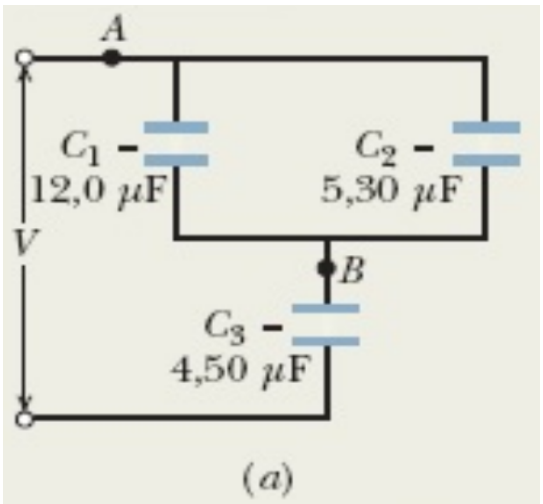
$$\frac{1}{C_{123}} = \frac{1}{C_{12}} + \frac{1}{C_3}$$

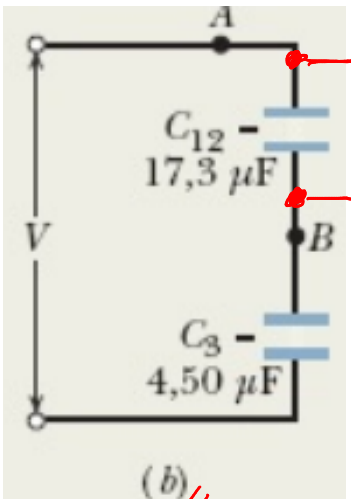
$$C_{123} = \frac{C_{12} \cdot C_3}{C_{12} + C_3}$$

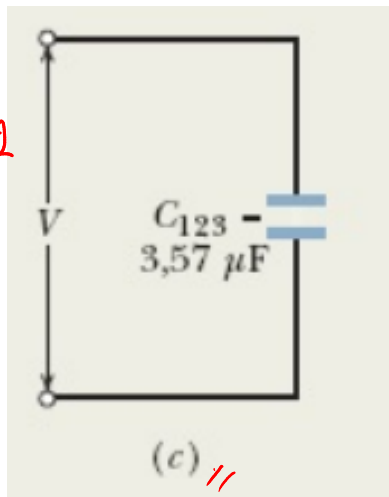
$$C_{123} = \frac{17,3 \cdot 4,5}{17,3 + 4,5} \Rightarrow C_{123} = 3,57\ \mu F$$



(b) A diferença de potencial aplicada aos terminais de entrada da Fig. 25-10*a* é $V = 12{,}5$ V. Qual é a carga de C_1?







$q_{123} = C_{123} V$

$q_{123} = 3{,}57 \cdot 12{,}5$

$q_{123} = 44{,}64\ \mu C$

$q_{12} = C_{12} V_{12}$

$V_{12} = \frac{q_{12}}{C_{12}} \Rightarrow V_{12} = \frac{44{,}64}{17{,}3}$

$V_{12} = 2{,}58$ V

$q_1 = C_1 V_1$

$V_1 = V_{12}$

$q_1 = C_1 V_{12}$

$q_1 = 12 \cdot 2{,}58$

$q_1 = 31\ \mu C$

$U_1 = \frac{1}{2} C_1 V_1^2$

$U_1 = 4 \cdot 10^{-5}\ J$

$V_1 = E\ d_{//}$

$E_1 = \frac{V_1}{d_1}$ //