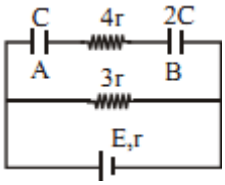
Answer on Question #41706, Physics, Electrodynamics



The charge on A and B will be:

Solution

According to Ohm's law for complete circuit the current in the circuit:

$$I = \frac{E}{r + R},$$

where R is the external resistance of the circuit $\left(R = \frac{3r \cdot 4r}{3r+4r} = \frac{12}{7}r\right)$. So

$$I = \frac{E}{r + \frac{12}{7}r} = \frac{7}{19}\frac{E}{r}.$$

The voltage drop on the internal resistance of the current source is

$$U(r) = Ir = \frac{7}{19}\frac{E}{r} \cdot r = \frac{7}{19}E.$$

The voltage drop on the external circuit is

$$U(R) = E - U(r) = E - \frac{7}{19}E = \frac{12}{19}E.$$

The voltage drop on the external circuit is equal to the sum of voltages on condensers A and B:

$$U(R) = U_A + U_B = \frac{12}{19}E.$$

The charge on A and B will be

$$Q = Q_A = CU_A = Q_B = 2C \cdot U_b.$$

Thus

$$U(R) = U_A + U_B = \frac{Q}{C} + \frac{Q}{2C} = \frac{3}{2}\frac{Q}{C}.$$

The charge on A and B will be

$$Q = \frac{2}{3}CU(R) = \frac{2}{3}C \cdot \frac{12}{19}E = \frac{8}{19}CE.$$

Answer: $\boldsymbol{\frac{8}{19}CE}$.