# 2-25-2019: Practice with Circuits and Capacitance

Monday, February 25, 2019 9:01 AM

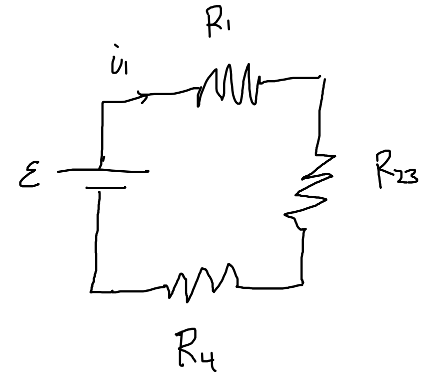
Let's review calculating some fundamental parameters from circuits that we learned last time...

IN SERIES: $R_{eq} = \sum_{i=1}^{n} R_i$

PARALLEL: $\frac{1}{R_{eq}} = \sum_{i=1}^{n} \frac{1}{R_i}$ , $R_{eq(1,2)} = \frac{R_1 R_2}{R_1 + R_2}$

ENTERING THE JUNCTION → $i_1 = i_2 + i_3$ ← LEAVING THE JUNCTION


⇒




① $-i_1 R_1 - i_2 R_2 - i_1 R_4 + \mathcal{E} = 0$

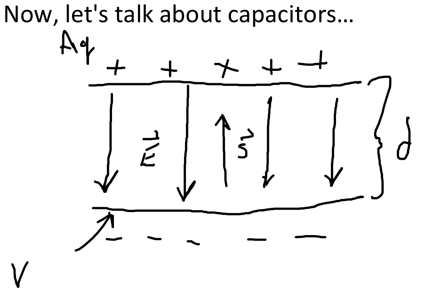
$\Rightarrow i_2 = \boxed{.18\,A}$

$R_{23} = \frac{R_2 R_3}{R_2 + R_3} = 12\,\Omega$

$i_1 = \frac{\mathcal{E}}{R_1 + R_{23} + R_4} = \boxed{.30\,A}$

② $-i_3 R_3 + i_2 R_2 = 0 \Rightarrow i_3 = \boxed{.12\,A}$

Now, let's talk about capacitors...

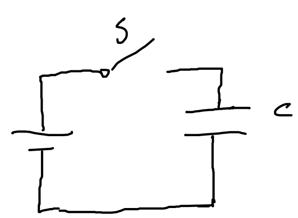



$q = CV \Rightarrow C = \frac{q}{V}$

$q_{net} \neq q$. $q_{net} = 0$.

$1$ Farad $= 1\ F = 1\ \frac{C}{V}$

$1\,\mu F = 10^{-6} F \qquad 1\,pF = 10^{-12} F$




$\varepsilon_0 \oint \vec{E} \cdot d\vec{A} = q_{enc}$

$\varepsilon_0 EA = q_{enc} \Rightarrow E = \frac{q}{\varepsilon_0 A} = \frac{\sigma}{\varepsilon_0} \quad \left(\sigma = \frac{q}{A}\right)$

$$V = -\int \vec{E} \cdot d\vec{s} = Ed = \frac{q}{\varepsilon_0 A} d = \frac{d}{\varepsilon_0 A} q$$

$$C = \frac{q}{V} = \boxed{\frac{\varepsilon_0 A}{d}}$$