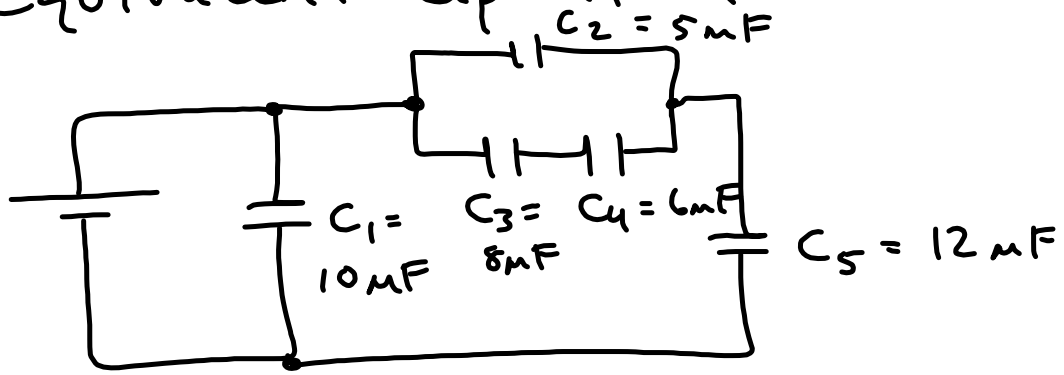
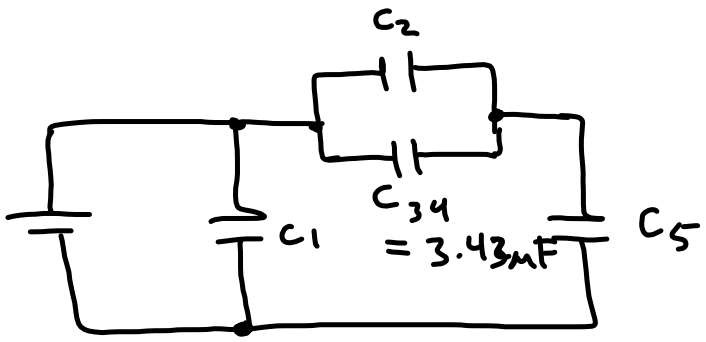
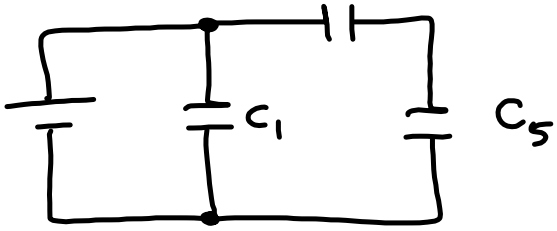
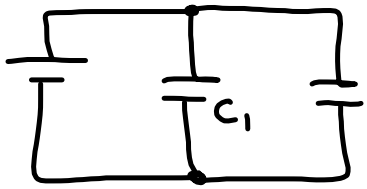
Equivalent Capacitance



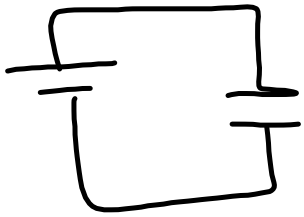


$C_{234} = 8.43\,mF$





$C_{2345} = 4.59\,mF$



$C_{eq} = 14.95\,mF$

Use 8.85E-12 F/m for epsilon_0. A rectangular capacitor has a capacitance of 0.5 F, dielectric constant of 15, and separation distance between the plates of 2 mm. If one side of each plate is 1.5 mm, what is the length of the other side?

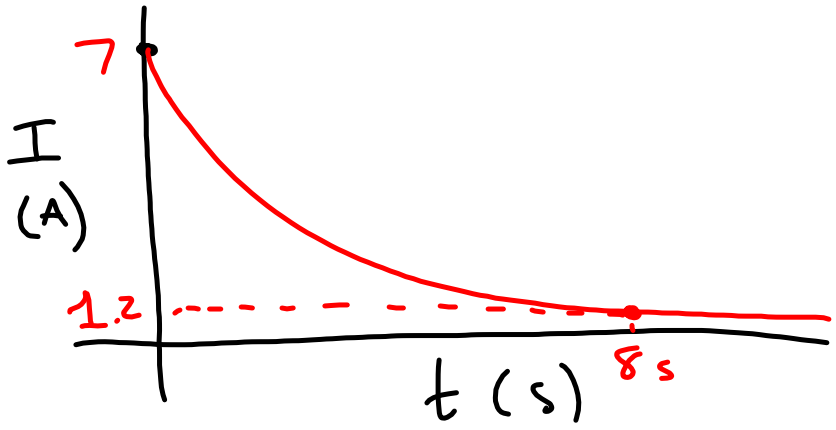
$$C = \frac{K\varepsilon_0 A}{d} \qquad A = lw$$

$$C = \frac{K\varepsilon_0 lw}{d}$$

$$l = \frac{Cd}{K\varepsilon_0 w}$$

$$= \frac{(0.5\,\cancel{F})(0.002\,m)}{(15)(8.85E\text{-}12\,\cancel{F/m})(0.0015\,\cancel{m})}$$

$$= 5021971124\ m \quad * \text{oof.}$$



If C is 30μF, find R

$$I = I_0 e^{-t/RC}$$

$$\ln\left(e^{\frac{-t}{RC}}\right) = \ln\left(\frac{I}{I_0}\right)$$

$I_0 = 7\ A$

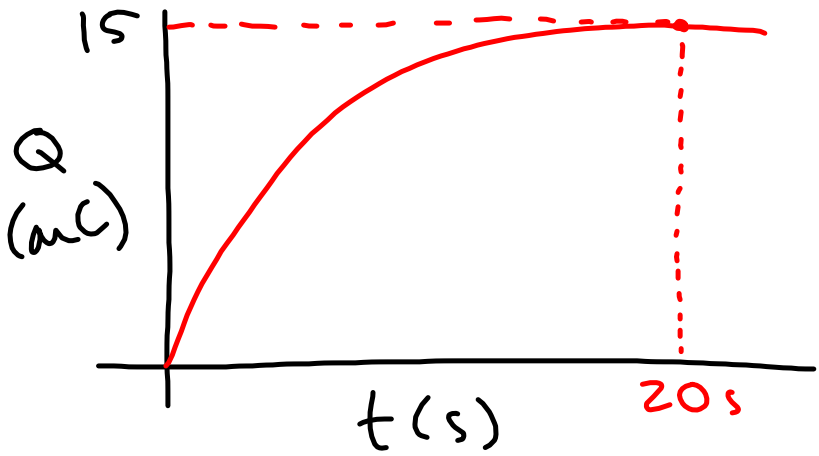
$I = 1.2\ A$

$t = 8\ s$

$$-\frac{t}{RC} = \ln\left(\frac{I}{I_0}\right)$$

$$R = -\frac{t}{\ln\left(\frac{I}{I_0}\right)C}$$

$$= 151206\ \Omega$$



$V = 10\,V$

$C = 1\,F$

$R = ?$

$$Q = CV\left(1 - e^{-t/RC}\right)$$

$$\frac{Q}{CV} = 1 - e^{-t/RC}$$

$$\ln\left(e^{-t/RC}\right) = \ln\left(1 - \frac{Q}{CV}\right)$$

$$-\frac{t}{RC} = \ln\left(1 - \frac{Q}{CV}\right)$$

$$R = -\frac{t}{C\left[\ln\left(1 - \frac{Q}{CV}\right)\right]}$$

$$= 1.33E7\ \Omega$$