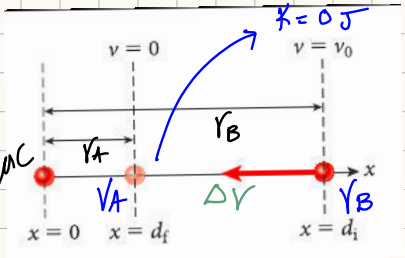


$$\vec{E}(r) = k\frac{q}{r^2}(+\hat{r})$$

$$\Delta E = 0$$

$$\Delta K + \Delta U = 0$$

$$\Delta K + q\Delta V = 0$$

$$K - K_i = -q\Delta V$$

$K = 0$

$$K_i = q\Delta V$$

$$\frac{1}{2}mv_i^2 = q\Delta V \qquad \Delta V = V_A - V_B$$

$$\frac{1}{2}(1.006)(66)^2 = (3\times10^{-6})\Delta V$$

$$\Delta V = 4.356\times10^{6}\ \text{Volts}$$

$$\Delta V = V_A - V_B = 4.356\times10^{6}\ \text{Volts}$$

$$k\frac{q}{r_A} - k\frac{q}{r_B} = 4.356\times10^{6}$$

$$\frac{(9\times10^{9})(4.5\times10^{-6})}{r_A} - \frac{(9\times10^{9})(4.5\times10^{-6})}{0.0420} = 4.356\times10^{6}$$

$$r_A = 7.6123\times10^{-3}\ \text{m}$$

$$r_A = 7.61\times10^{-3}\ \text{m}$$

a) $V(r=\quad ?$

$V_0 = 900\ V$

$V(r=0) = V_0 = 900\ V$

$\Delta V = 0$

$V_0 - V(r=0) = 0$

$V_0 = V(r=0)$

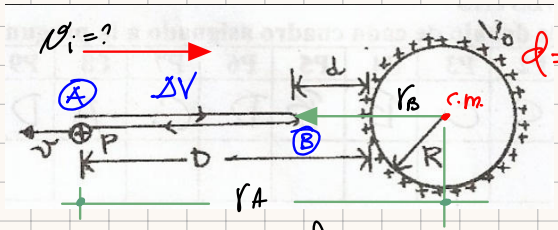
b)

$$V_0 = k_e \frac{q}{r_0}$$

$$900 = (9\times10^9)\frac{q}{0.25}$$

$$q = 2.5\times10^{-8}\ C$$

$$q = 25\ nC$$



$q = +25\ nC$

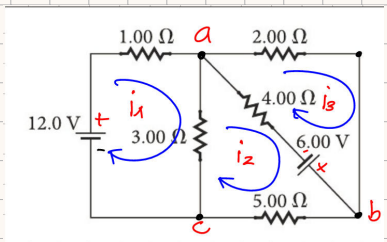
$D = 1.0\ m$

$d = 0.25\ m$

$$V_A = k_e \frac{q}{r_B}$$

$r_B = d + R = 0.50\ m$

$$\Delta V = (9\times10^9)(25\times10^{-9})\left(\frac{1}{0.50}\right) = 450\ V$$



Malla 1: i_1

$$(1+3)\,i_1 - 3\,i_2 = +12$$

$$4i_1 - 3i_2 = 12 \quad (1)$$

Malla 2: i_2

$$(3+4+5)\,i_2 - 4\,i_3 - 3\,i_1 = 6$$

$$12\,i_2 - 3\,i_1 - 4\,i_3 = 6 \quad (2)$$

Malla 3: i_3

$$(4+2)\,i_3 - 4\,i_2 = -6$$

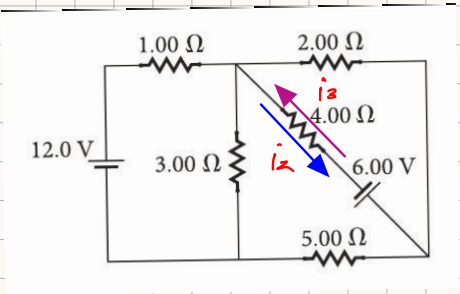
$$6\,i_3 - 4\,i_2 = -6 \quad (3)$$

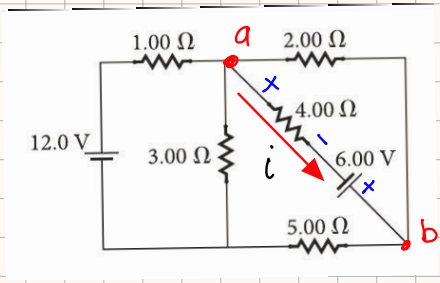
$$\begin{aligned} 4i_1 - 3i_2 &= 12 \\ -3i_1 + 12\,i_2 - 4i_3 &= 6 \\ -4\,i_2 + 6\,i_3 &= -6 \end{aligned}$$

$$i_1 = +4.1647\ A$$

$$i_2 = +1.5529\ A$$

$$i_3 = +0.0353\ A$$





$$i = i_2 - i_3$$

$$i = 1.5529 - 0.0353 = 1.5176\ A$$

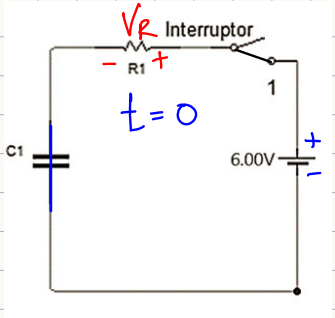
$$i = 1.52\ A$$

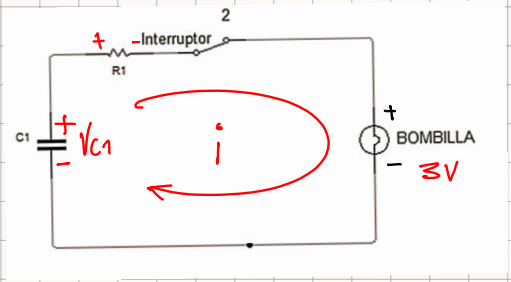
$$V_a - (1.5176)(4) + 6 = V_b$$

$$V_a - 6.0704 + 6 = V_b$$

$$V_a - V_b = 0.0704\ V$$

$$V_{ab} = 0.0704\ V$$





$\tau = (1000)(4700\,\mu F)$

$\tau = 4.7$ seg

$6 = i_{R1}(1000)$

$i_{R1} = 6 \times 10^{-3}$ A

$V_{C1} = 6.0$ Volts

$V_B = 3.0$ Volts

$3 = i\,2000$

$i = 1.5 \times 10^{-3}$ A

$V_{C1} = (1.5 \times 10^{-3})(1000) + 3$

$V_{C1} = 1.5 + 3 = 4.5$ Volts

$$4.5 = 6\left(1 - e^{-t/4.7}\right)$$

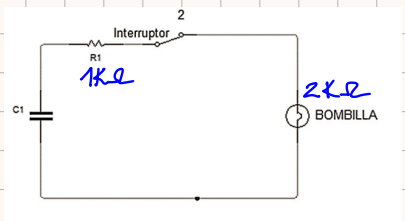
$$\frac{4.5}{6} = 1 - e^{-t/4.7} \quad \therefore \quad t = -4.7 \ln\left(1 - 4.5/6\right)$$

$t = 6.5156$ seg $\quad t = 6.52$ seg

$1.8 = i_f\,2000$

$i_f = 9 \times 10^{-4}$ A

$$i_C = \frac{V_0}{R_T} e^{-t/\tau}$$

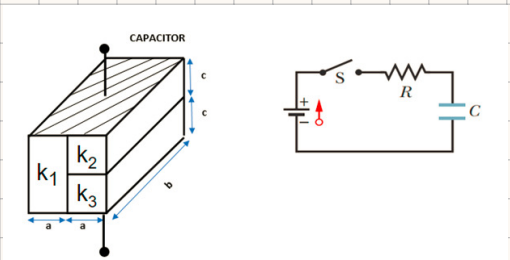


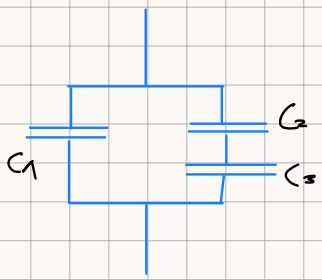
$$\tau' = (3000)(4700) = 14.1 \text{ seg}$$

$$9 \times 10^{-4} = \frac{4.5}{3000} e^{-t/14.1}$$

$$t = -14.1 \ln(0.6) = 7.2026 \text{ s}$$

$$t = 7.20 \text{ s}$$





$$C_1 = \frac{K_1 ab\varepsilon_0}{2c} \qquad C_{eq} = C_1 + \frac{C_2 C_3}{C_2 + C_3}$$

$$C_2 = \frac{K_2 ab\varepsilon_0}{c} \qquad C_{eq} = C_1 + \frac{K_2 K_3 a^2 b^2 \varepsilon_0^2}{c^2} \Big/ K_2 + K_3 \left(\frac{ab\varepsilon_0}{c}\right)$$

$$C_3 = \frac{K_3 ab\varepsilon_0}{c}$$

$$C_{eq} = C_1 + \frac{K_2 K_3 ab\varepsilon_0}{(K_2 + K_3)c}$$

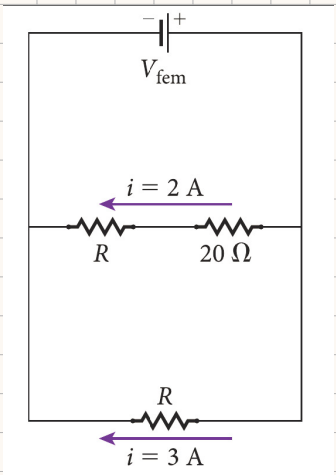
$$C_{eq} = \frac{ab\varepsilon_0}{c}\left[\frac{K_1}{2} + \frac{K_2 K_3}{K_2 + K_3}\right]$$

$$C_{eq} = \frac{(0.05)(0.09)(8.85 \times 10^{-12})}{0.02}\left[\frac{10}{2} + \frac{(5)(12)}{17}\right]$$

$C_{eq} = 1.6984 \times 10^{-11}\ F$ $C_{eq} = 1.70 \times 10^{-11}\ F$

$Q_{max} = (1.6984 \times 10^{-11})(24) = 4.076 \times 10^{-10}\ C$

$Q_{max} = 408 \times 10^{-12}\ C = 408\ pC$



$V_{fem} = 3R$

$V_{fem} = 2(R + 20)$

$2(R + 20) = 3R$

$2R + 40 = 3R$

$3R - 2R = 40$

$R = 40\ \Omega$

$V_{fem} = (40)(3) = 120$ Volts