26.41

Datos

$V_{co} = 12\ V$

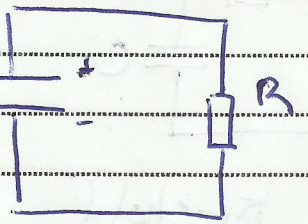
$R = 3.4 \cdot 10^6\ \Omega$

$V_{cf} = 3\ V$

$t = 4\ s$

$C = ?$

$\tau = ?$



Aplicando la ley de Kirchhoff

$$-\frac{q}{C} + iR = 0 \qquad \text{como } i = \frac{dq}{dt}$$

$$-\frac{q}{C} + R\frac{dq}{dt} = 0 \qquad \frac{dq}{dt} = -\frac{q}{RC}$$

el signo aparece debido a que la carga disminuye

$$\frac{dq}{q} = -\frac{dt}{RC} \Rightarrow \int_{q_0}^{q}\frac{dq}{q} = -\int_0^t \frac{dt}{RC}$$

$$\ln q\Big|_{q_0}^{q} = -\frac{t}{RC}\Big|_0^t \qquad \ln q - \ln q_0 = -\frac{t}{RC} - \frac{0}{RC}$$

$$\ln\frac{q}{q_0} = -\frac{t}{RC}$$

Aplicamos exponencial en ambos lados

$$q = q_0 e^{-t/RC}$$

¡como $q = C\Delta V$, se puede sustituir!

$$CV_{cf} = CV_{co}e^{-t/RC}$$

$$V_{cf} = V_{co}e^{-t/RC}$$

$$\frac{3}{12} = e^{-t/RC}$$

$$\ln\frac{3}{12} = -\frac{t}{RC} \Rightarrow C = -\frac{t}{R\ln\frac{3}{12}} = 8.49 \cdot 10^{-7}\ F$$