

You are given a capacitor with a capacitance C_1 . At time $t = 0$, the voltage across this capacitor is V_0 .

$$C_1 = 2 \text{ nF}$$

If a constant current I_1 flows through the capacitor, how long will the capacitor take to charge up to a charge of 10 nC?

$$V_0 = 3 \text{ V}$$

$$I_1 = 2 \text{ mA}$$

$$V_0 = 3 \text{ V}$$

$$Q = C \cdot V$$

$$V_{\text{END}} = \frac{Q_{\text{END}}}{C_1} = \frac{10 \cdot 10^{-9}}{2 \cdot 10^{-9}} = 5 \text{ V}$$

$$i = C \frac{dV}{dt}$$

$$\Downarrow$$
$$V_{\text{END}} = V_0 + \frac{1}{C} \int_{t_0}^t I_1 dt = V_0 + \frac{I_1}{C} \cdot t$$

$$t = (V_{\text{END}} - V_0) \cdot \frac{C}{I_1} = (5 - 3) \cdot \frac{2 \cdot 10^{-9}}{2 \cdot 10^{-3}}$$

$$t = 2 \cdot 10^{-6} \text{ s}$$

$$\boxed{t = 2 \text{ } \mu\text{s}}$$