

Capacitors

- Power, energy, charge

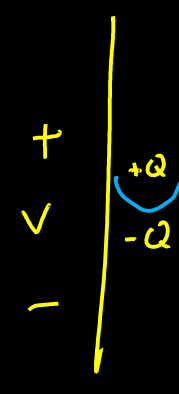
$$p(t) = v(t) \cdot i(t) \quad \text{brain cells}$$

$$\begin{aligned} w(t) &= \int p(t) dt \\ &= \int v(t) \cdot \frac{dq(t)}{dt} dt \\ &= \int v(t) C \frac{dv}{dt} dt \\ &= C \int v(t) dv \end{aligned}$$

$$\begin{aligned} &= C \frac{1}{2} v^2 \\ w(t) &= \frac{1}{2} C V^2 \quad \text{brain cells} \end{aligned}$$

energy stored in a capacitor

$$Q = C V \quad \text{brain cells}$$



$Q \sim$ gallons

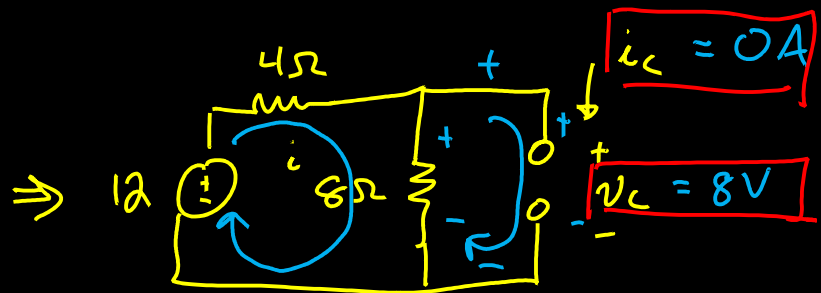
Capacitors

- DC Steady State

steady-state DC input $\Rightarrow \frac{+}{-} \frac{1}{T} \Rightarrow \begin{matrix} 0 \\ + \\ - \end{matrix} \frac{v_c}{-}$

$$\pi = \frac{1.5V}{AA}$$

Ex



$$\begin{aligned} i & \Rightarrow \begin{cases} i = \frac{12}{4+8} = 1A \\ v_c = v_8 = i \cdot R = 1 \cdot 8 = 8V \end{cases} \\ v_{\text{divider}} & \left[v_c = v_8 = 12 \cdot \frac{8}{8+4} = 12 \cdot \frac{8}{12} = \boxed{8V} \right] \end{aligned}$$