ε_0 - Permitivity of free space (Vacuum)

$$\varepsilon_0 = 8.85 \times 10^{-12} \frac{C^2}{Nm^2}$$

$$F = \frac{k q_1 q_2}{r_{12}^2} \qquad k = 8.99 \times 10^{9} \frac{Nm^2}{C^2} = \frac{1}{4\pi\varepsilon_0}$$

ε_0 is a measure of how easily an Electric field can Propagate in a Vacuum.

When you have a dielectric K

$$\varepsilon - K\varepsilon_0$$

ε is Permitivity of a medium how easily an electric field Propagates in the medium.

μ_0 – Permeability of free space

or how easily a magnetic field propagates in free space

c – speed of light in a vacuum

$$c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$$

$$v_{light} = \frac{1}{\sqrt{\mu \varepsilon}}$$

pt. charge $V = \frac{kQ}{r}$

$$U_{\substack{\text{between}\\ \text{pt charges}}} = \frac{k q_1 q_2}{r_{12}}$$

$$U = QV$$

$$V_C = -2.16 \times 10^4 \, V$$

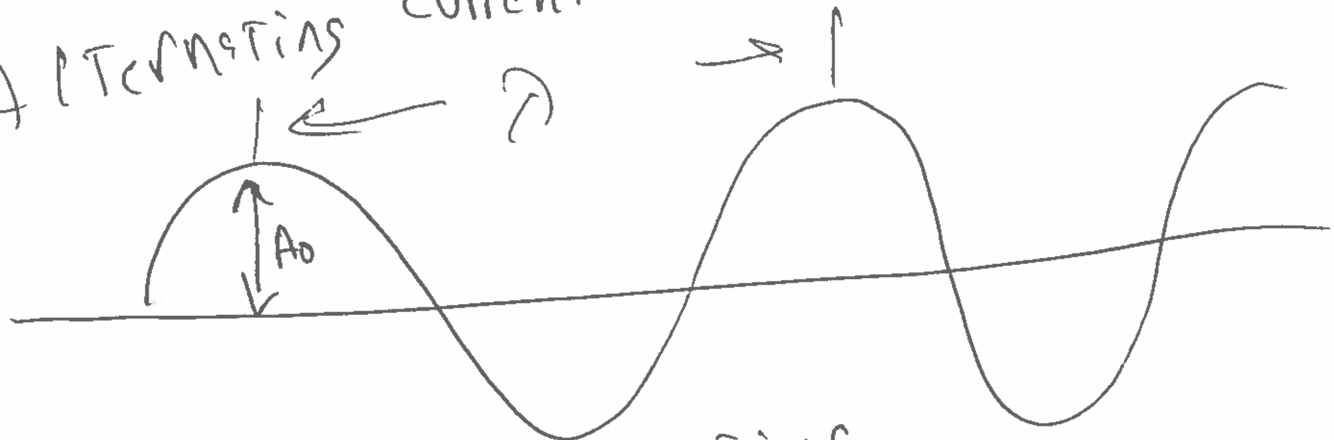
If I placed a $+1\,\mu C$ charge there

$$U = qV = (+1\,\mu C)(-2.16 \times 10^4 \, V)$$

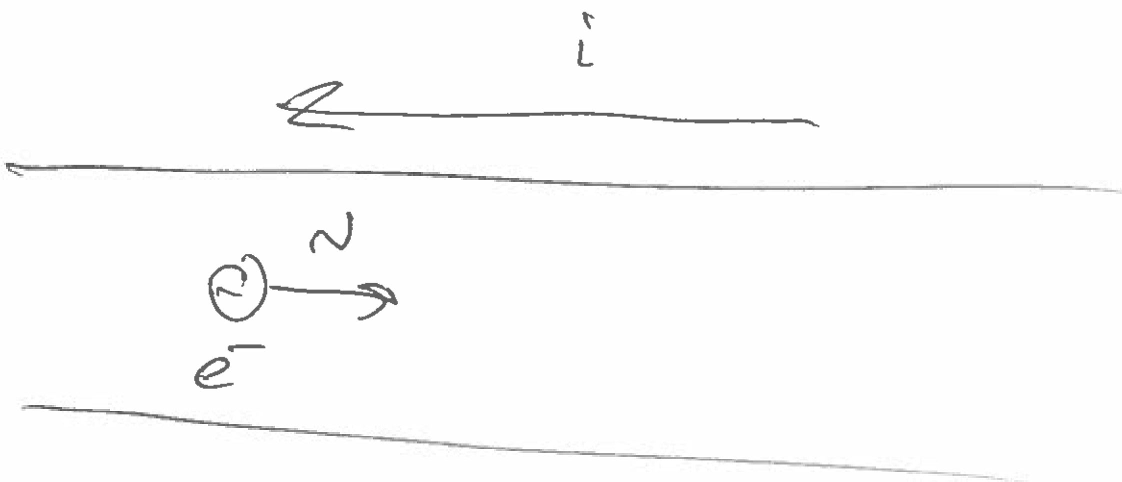
$$U = -2.16 \times 10^{-2} \, J$$

AC circuits

Alternating current



current switching directions

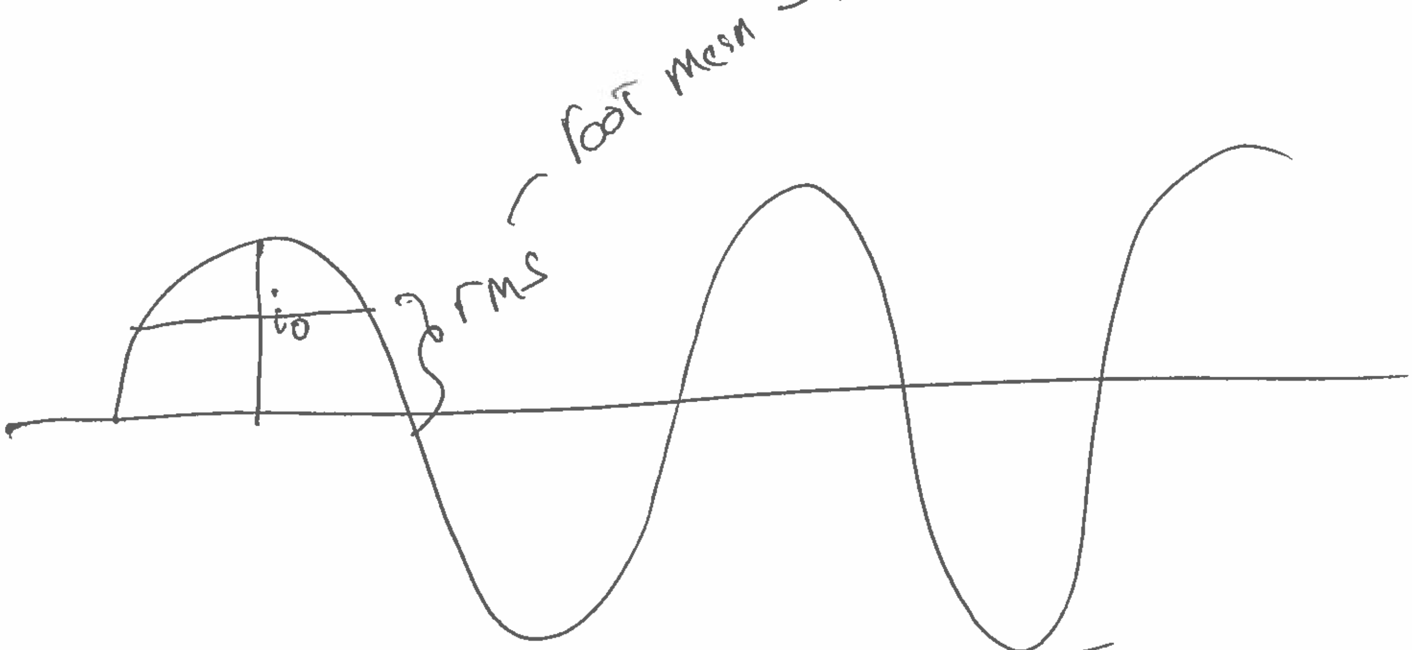


$i = i_0 \sin(\omega t)$ $\quad \omega = 2\pi f$

$V = V_0 \sin(\omega t)$

Ohm's Law still works

$$i = \frac{1}{R} V$$



$\sqrt{(i_{ave})^2}$ related to $\sqrt{2}$

$$V_{rms} = \frac{V_{peak}}{\sqrt{2}}$$

$$i_{rms} = \frac{i_{peak}}{\sqrt{2}}$$

$$i_p = \frac{1}{R} V_p \quad \text{or} \quad i_{rms} = \frac{1}{R} V_{rms}$$

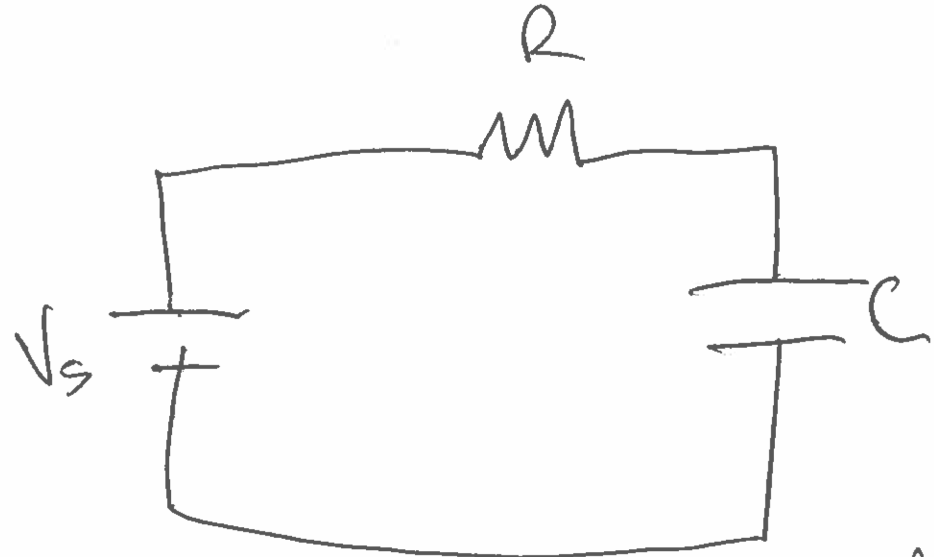
$V_{wall} = \sim 110V$ (rms)

$V_{wall\ peak} \sim 170V$

freq from wall? 60 hz U.S.

50 hz Europe

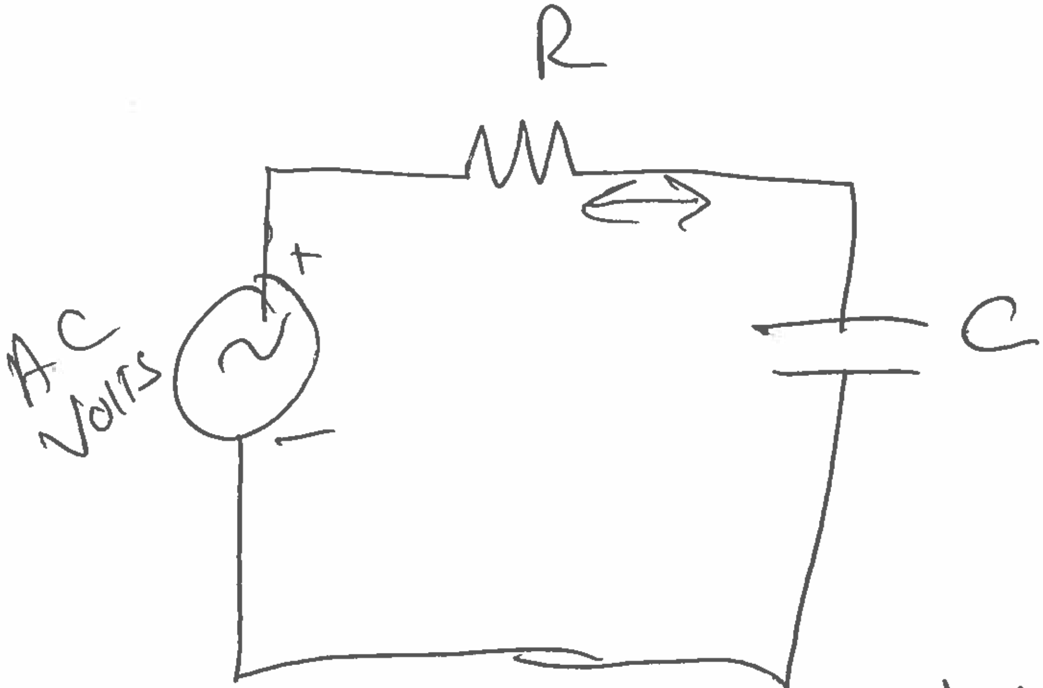
$V_{wall\ Europe} \sim 220V$



what is i after 6τ?

$i \to 0$

what if



$i \to 0$? depends on freq

$X_C = \frac{1}{wC}$ — Capacitive Reactance

Like resistance for a capacitor

$w \to 0$ D.C. current

$X_C \to \frac{1}{0} \to \infty$ (open circuit)

$w \to \infty$ $X_C \to \frac{1}{\infty} \to 0$ (bare wire) for capacitor

$$i = \frac{1}{X_c} V$$

X_c plays role of R for a capacitor