Equation of motion for SHM:

$$\frac{d^2x}{dt^2} = -\omega^2 x.$$

Solution: $x = A\sin\omega t + B\cos\omega t$

or $x = A\sin(\omega t + \phi)$.

$$m\frac{d^2x}{dt^2} = -kx.$$

$$\Downarrow$$

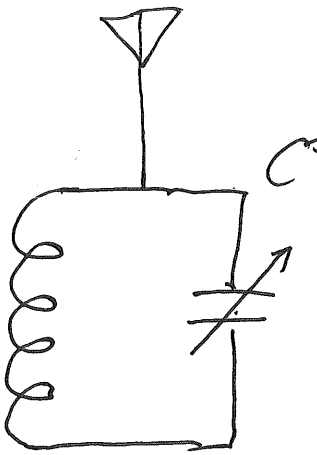
$$\omega^2 = \frac{k}{m} \Rightarrow \omega = \sqrt{\frac{k}{m}}$$

LC oscillation.

Kirchhoff's rule: $L\frac{d^2Q}{dt^2} = -\frac{1}{C}Q.$ *

$$\frac{d^2Q}{dt^2} = -\frac{1}{LC}Q.$$ ← SHM!

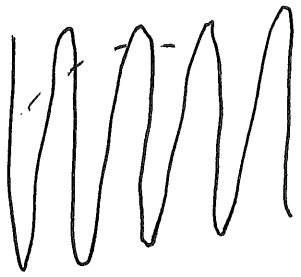
$$\omega^2 = \frac{1}{LC} \Rightarrow \omega = \frac{1}{\sqrt{LC}}.$$

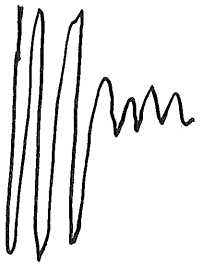


Tuning circuit.

$\frac{1}{\sqrt{LC}}$ match that from radio station

AM.



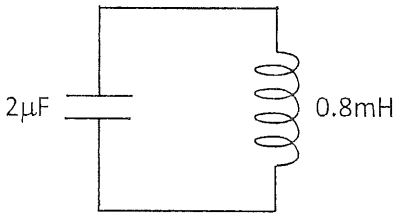


Name: _____

PHY 232 Summer 2016 Class Work

Class 36. LC Circuits Practice

Make sure your calculator is set to radian mode. Consider the following circuit



If the charge in the capacitor is given as $Q = Q_0 \sin(\omega t + \phi)$.

(a) Calculate the value of ω and then the corresponding frequency f and period T.

$\omega = \ldots\ldots$ (known).

$\omega = 2\pi f$

$f = \frac{1}{T}$

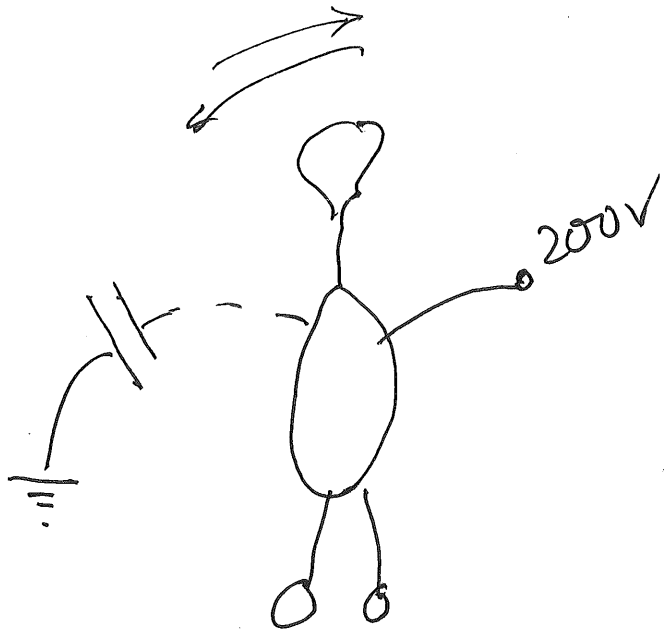
(b) If the charge and current are 2μC and 0.05A at t=0. Determine Q_0 and ϕ.

$Q = Q_0 \sin(\omega t + \phi)$. $\quad 2\mu C = Q_0 \sin\phi$.

(Unknown)

$I = \frac{dQ}{dt} = Q_0 \omega \cos(\omega t + \phi)$. $\quad 0.05 = Q_0 \omega \cos\phi$.

(c) What are the charge and current at $t = 10^{-5}$ s?


200V