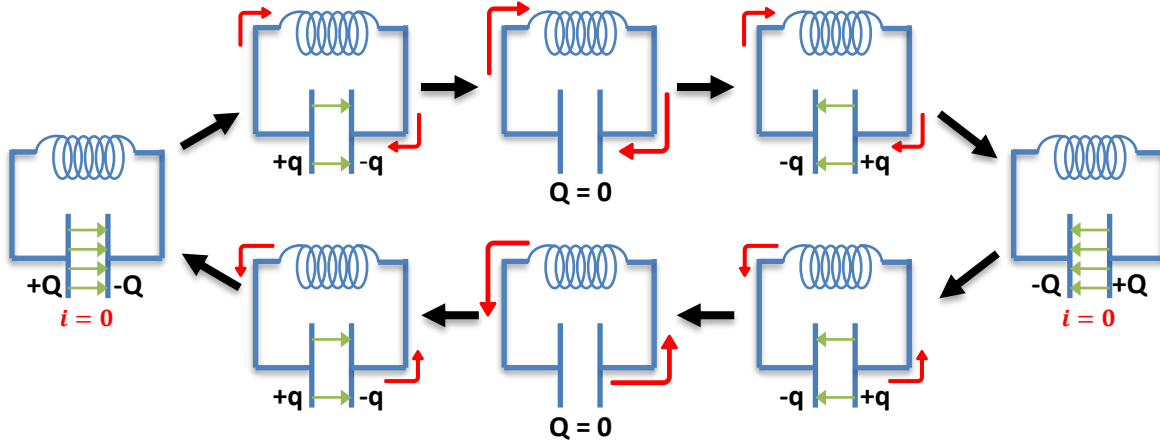


CONCEPT: LC CIRCUITS

- LC Circuits are made up of _____ and _____ and follow an 8-step cycle.



- This system _____ and behaves similarly to **Simple Harmonic Motion** (Block + Spring)

- Because the system oscillates, the **charge** and **current** are represented by _____ functions.

- $q(t) =$ _____

$\omega = \sqrt{\frac{1}{LC}}$ → angular frequency of oscillation

- $i(t) =$ _____

ϕ : PHASE ANGLE → determines starting point of oscillation

- Note:** Make sure calculators are in RADIANS mode!

EXAMPLE: A capacitor with capacitance $5 \times 10^{-9} \text{F}$ initially has charge of magnitude $2 \times 10^{-4} \text{C}$ on each plate. The charged capacitor is then connected to an inductor with inductance 4.0H . During the current oscillations that occur after the circuit is completed, what is the maximum current in the inductor?

PRACTICE: PHASE ANGLE IN LC CIRCUIT

An LC circuit with an inductor of 0.05 H and a capacitor of 35 μF begins with the current of -1A. The capacitor plates have a maximum charge of 2.65mC at any time during the oscillation. What is the phase angle of this oscillation?

EXAMPLE: OSCILLATIONS IN AN LC CIRCUIT

An LC circuit with $L = 0.05 \text{ H}$ and $C = 50 \text{ mF}$ begins with the capacitor fully charged. After 0.1s, the current is 0.2A. Under these conditions, how many seconds does it take for a fully charged plate to transfer all of its charge to the other plate?

CONCEPT: ENERGY IN AN LC CIRCUIT

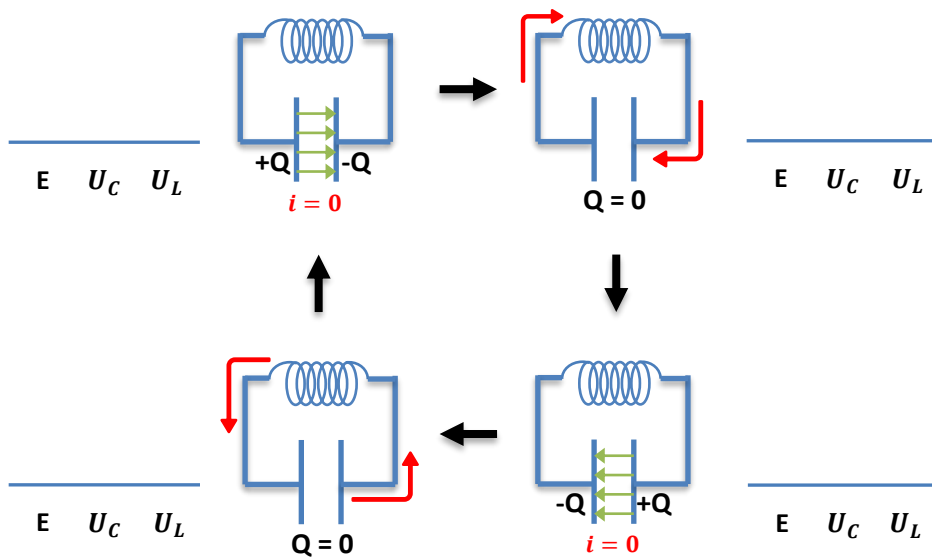
- Because there is no resistance, energy is conserved in an LC circuit:
 - Energy oscillates between _____ energy (Capacitor) and _____ energy (Inductor)

- A capacitor stores ELECTRICAL ENERGY

$$- U_C = \frac{1}{2} CV^2 = \frac{1}{2} QV = \frac{1}{2} \frac{Q^2}{C}$$

- An inductor stores MAGNETIC ENERGY

$$- U_L = \underline{\hspace{2cm}}$$



EXAMPLE: An LC circuit has an 0.1 H inductor and a 15 nF capacitor, and begins with the capacitor maximally charged with 50mC. After 0.1 s, **a)** how much energy is stored by the inductor? **b)** What is the maximum current in the circuit?

PRACTICE: LC CIRCUIT WITH UNKNOWN INDUCTOR

In an oscillating LC circuit in which the capacitance $C = 4\mu\text{F}$ and the maximum voltage across the capacitor $V = 1.50\text{V}$, the maximum current measured across the inductor is 50mA . What is the angular frequency of this LC circuit?