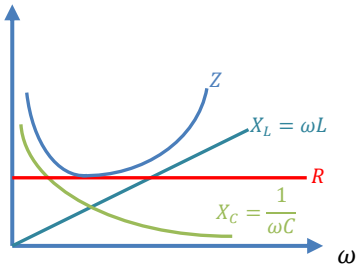
CONCEPT: RESONANCE IN SERIES LRC CIRCUITS



- The impedance of an LRC circuit depends on the frequency of the AC source:
  - The impedance is large at small $\boldsymbol{\omega}$ and at large $\boldsymbol{\omega}$

- Recall that the impedance is $Z =$ _____
  - The SMALLEST value of impedance, $Z = R$, occurs when $X_C = X_L$
  - When this occurs, the circuit is said to be in RESONANCE

- The RESONANT FREQUENCY of an LRC circuit is

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

- Since resonance occurs when the impedance is SMALLEST, the current is LARGEST in resonance for series LRC

EXAMPLE: An AC circuit is composed of a 10 Ω resistor, a 2 H inductor, and a 1.2 mF capacitor. If it is connected to a power source that operates at a maximum voltage of 120 V, what frequency should it operate at to produce the largest possible current in the circuit? What would the value of this current be?

- In a series LRC circuit, the current is the same through the inductor and the capacitor
  - In resonance, since $X_L = X_C$ → The voltage across the inductor and the capacitor is the same

PRACTICE: VOLTAGES IN A SERIES LRC CIRCUIT IN RESONANCE

A series LRC circuit is formed with a power source operating at V_{RMS} = 100 V, and is formed with a 15 Ω resistor, a 0.05 H inductor, and a 200 μF capacitor. What is the voltage across the inductor in resonance? The voltage across the capacitor?