

Chapter 13

Current in an AC Circuit

13.1 C

13.2 (a) The impedance of the capacitor [176.8 Ω , compared to 8.0 Ω for the resistor and 5.6 Ω for the inductor], (b) 171.4 Ω

13.3 (a) Yes, (b) No, less than

13.4 No

13.5 (a) 180° or π radians, (b) 90° or $\pi/2$ radians, (c) 2.5×10^{-5} s

13.6 (a) -87.3° (note: since 360° corresponds to the total period, an angle of about 90° means that the current is about one-quarter of period out of phase), (b) Before (since the angle is negative; this should make sense since the impedance of the capacitor is greater than the impedance of the inductor), (c) At low frequencies

13.7 No

13.8 Since $Z_{\text{ind}} = Z_{\text{cap}}$ and $Z_{\text{ind}} = \omega L$ and $Z_{\text{cap}} = 1/(\omega C)$, we can plug in to get

$$\omega L = \frac{1}{\omega C}$$

We can then solve for ω by multiplying both sides by ω

$$\omega^2 L = \frac{1}{C}$$

and dividing both sides by L

$$\omega^2 = \frac{1}{LC}$$

and taking the square root.

13.9 (a) 9.97×10^7 Hz, (b) FM