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Lab 8

1.2 The inductor acts like a capacitor but for AC current, storing energy in the electric field when the battery is connected and quickly releasing it from the collapsed field when the energy is cut.
1.3 & 1.4

Coil	V_rms (V)	I_rms (A)	Z (ohm)	Avg R_L (ohm)	X_L (ohm)	L (mH)
1	6V*.7071= **4.2426**	0.144A*.7071 = **0.102**	41.59	41.54	3.553	50
2	6V*.7071= **4.2426**	0.079A*.7071 = **0.0559**	75.95	75.85	3.769	100

Thought experiment:
When a metal loop comes nearby, the inductance of the circuit changes and this can be measured to change the traffic light.

2.2
Experimental time difference:
Phi = Delta T = 14.264 - 14.260 = 0.004s peak to peak lag
Predicted time difference:
T = Phi/w = tan-1(xl - xc / R)/w = tan^-1((2*pi*5)/100)/(2*pi *5)
= .009 s
This difference can be explained because of the precision of the simulation.

2.3
Experimental time difference:
Phi = 14.346 -14.342 = 0.004 seconds
Predicted time difference:
T = Phi/w = tan-1(xl - xc / R)/w = tan^-1((2*pi*5*0.5)/100)/(2*pi *5)
= .00495 seconds
This difference can be explained because of the precision of the simulation.

2.4
14.379 - 14.375 = 0.004 seconds
Predicted = tan^-1((1/(2pi5*1000000))/200)/(2*pi *5)= 5*10^-12
The voltage lags behind the current.

This difference can be explained because of the precision of the simulation.

2.5
Actual time difference: .002
Predicted time difference: tan^-1((2*pi*5*.5 - 1/(2pi5*1000000))/200)/(2*pi *5)= 0.00249
This difference (about 19.67 percent error) can be explained because of the precision of the simulation.

Thought experiment:
When X_L - X_C is sufficiently close to zero then the i_rms becomes just Vrms / R. So, when X_L = X_C, this will be true. First we solve for v, (2pi*v)* L = 1/((2pi*v) * c) means that
v = 1/(2 pi sqrt(c) *sqrt(L)). Dividing both sides by 2pi to get w_0 yields w_0 = 1/(2 pi^2 sqrt(c) *sqrt(L)). The resonant frequency represents when the phase differences cause the amperage and voltage to peak at the same time. When we operate off resonance, the amperage and voltage do not peak simultaneously.