Name:_____ Partner:_____ PH2223 -____

Experiment Sheet for Phase and Impedance in a RLC Circuit

Comparing V_L, V_C, and V_R:

1. Which got a greater share of the source voltage at low frequencies (say 50Hz) the inductor or the capacitor?

    _____

2. Which got a greater share of the source voltage at high frequencies (say 300Hz) the inductor or the capacitor?

    _____

3. Why? Explain why the inductor and capacitor's voltage changes with frequency.

Phase Measurements:

Measured period T = _____

Table 1: Times for Peak Voltages

t_L (s)	t_R (s)	t_C (s)	t_L-t_R (s)	t_C-t_R (s)	t_L-t_C (s)

Table 2: Phase Shifts

	φ_{LtoR}	φ_{CtoR}	φ_{LtoC}
radians (rad)			
degrees (°)			

Sample Calculation: Show at least one of your φ calculations below.

1. For the inductor V _____ (leads or lags) I by _____°.

2. For the capacitor V _____ (leads or lags) I by _____°.

Impeadance:

$V_{RM} =$ _____ , $V_{LM} =$ _____ , $V_{CM} =$ _____ , and $I_M =$ _____

$\qquad$ $X_L = V_{LM}/I_M =$ _____ $\qquad$ which gives $\qquad$ $L = X_L/(2\pi f) =$ _____

$X_C = V_{CM}/I_M =$ _____ and, using the known value of C, $\quad$ $X_C = 1/(2\pi fC) =$ _____

Note if these two methods for finding the reactance of the capacitor gave results that weren't close then you need to redo your measurements and/or calculations.

$$Z = \{R^2 + (X_L - X_C)^2\}^{1/2} = \underline{\hspace{4cm}}$$

V_{SM} (using $Z = V_{SM}/I_M$) = _____ $\qquad\qquad$ V_{SM} (actual) = _____

Was the value you got for V_{SM} using your calculation of Z close to the actual V_{SM} ? _____

Phase Angle for RLC:

Using $\tan(\varphi) = (X_L - X_C)/R$ determine φ. $\varphi =$ _____

Now determine φ using the peak-to-peak time differences for V_S and V_R. $\varphi =$ _____

Explain any differences in your two calculations for φ and show your work in the space below.

What happened to each of the three voltages when you added the iron to the inductor?

Does this mean that the inductance increased or decreased? _____
Using the equations from the Impedance section (above) estimate the new inductance (with the iron).
Show your work.

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ $L \approx$ _____

Resonance:
What did you get for the resonant frequency? $f_o =$ _____
Did this frequency result in V_L and V_C being 180° out of phase and equal in magnitude? _____
Show your work for f_o in the space below.