

8. Using the data of Tables 4.2 and 4.3, create plots of capacitive reactance versus frequency.

## Data Tables

$$i_{\text{source (p-p)}} = 0.001009 \text{ A} = \frac{V_{\text{pp}}}{R} = \frac{10}{9920.2}$$

note: magnitude of  $X_C$  <sup>Table 4.1</sup>  
 $\frac{V_{\text{pp}}}{I_{\text{source (p-p)}}$

Frequency	$X_C$ Theory ( $\Omega$ )	$V_{C(p-p)}$ Exp	$X_C$ Exp ( $\Omega$ )	% Dev
200	968.68	1.03 V	1020.8	5.37
400	484.34	541 mV	536.1	10.69
600	322.89	346 mV	342.9	6.29
800	242.17	264 mV	261.6	8.03
1.0 k	193.74	206 mV	204.2	5.37
1.2 k	161.45	170 mV	168.5	4.35
1.6 k	121.09	130 mV	128.8	6.40
2.0 k	96.87	103 mV	102.1	5.37

Actual:

$$0.8 \mu F \rightarrow 0.8215 \mu F$$

Table 4.2

$$\frac{V_{C(p-p)} \text{ Exp}}{I_{C(p-p)}} = X_C \text{ Exp}$$

$$2.2 \mu F \rightarrow 2.225 \mu F$$

$$10 k\Omega \rightarrow 9.9102 k\Omega$$

Frequency	$X_C$ Theory (51)	$V_{C(p-p)}$ Exp	$X_C$ Exp (52)	% Dev
200	359.27	376 mV	372.6	3.72
400	179.63	187 mV	185.3	3.17
600	129.76	124 mV	122.9	2.61
800	89.82	94.1 mV	93.3	3.83
1.0 k	72.85	76.2 mV	75.5	5.10
1.2 k	59.88	64.0 mV	63.4	5.92
1.6 k	44.91	48.5 mV	48.1	7.03
2.0 k	35.93	39.4 mV	39.0	8.68

Table 4.3

## Questions

- What is the relationship between capacitive reactance and frequency?

As frequency increases, capacitive reactance decreases, an inverse relationship.

- What is the relationship between capacitive reactance and capacitance?

The relationship between reactance and capacitance is linear, per the formula.

- If the experiment had been repeated with frequencies 10 times higher than those in Table 4.2, what would the resulting plots look like?

The values would be 10 times smaller, but the graph will look the same (exp. decay). per increasing frequency

- If the experiment had been repeated with frequencies 10 times lower than those in Table 4.2, what effect would that have on the experiment?

The values would be 10 times larger, which would no longer hold the

plot

X<sub>1</sub>

dh<sub>5</sub>

+ 42  
460  
800  
700  
600  
500  
400  
300  
200  
100

20	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	1000
20	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	1000
20	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	1000
20	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	1000
20	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	1000

frequency Hz

T 4.3 plot

f / frequency Hz