Christian Garcia

ELEN 50 Lab

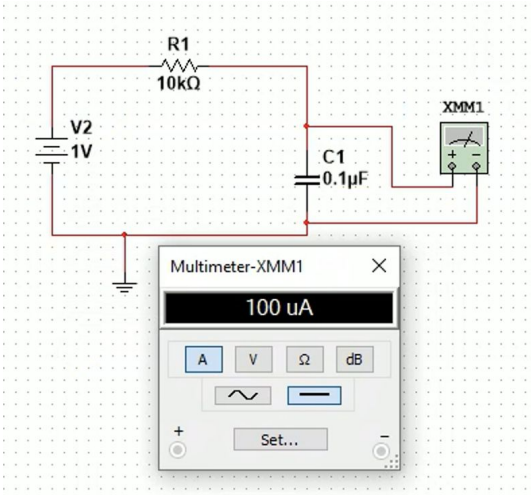
18 November 2020

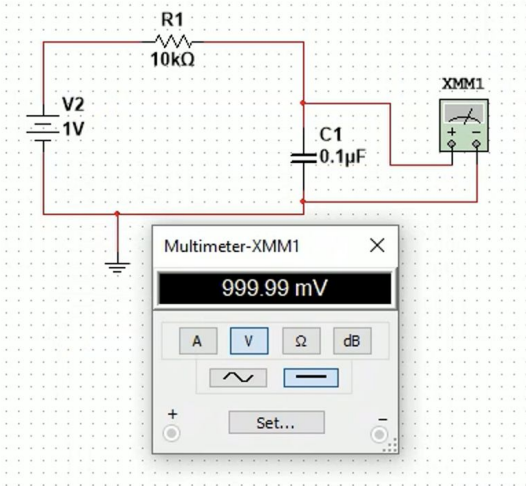
Wednesday 2:15PM

Lab 5 Report

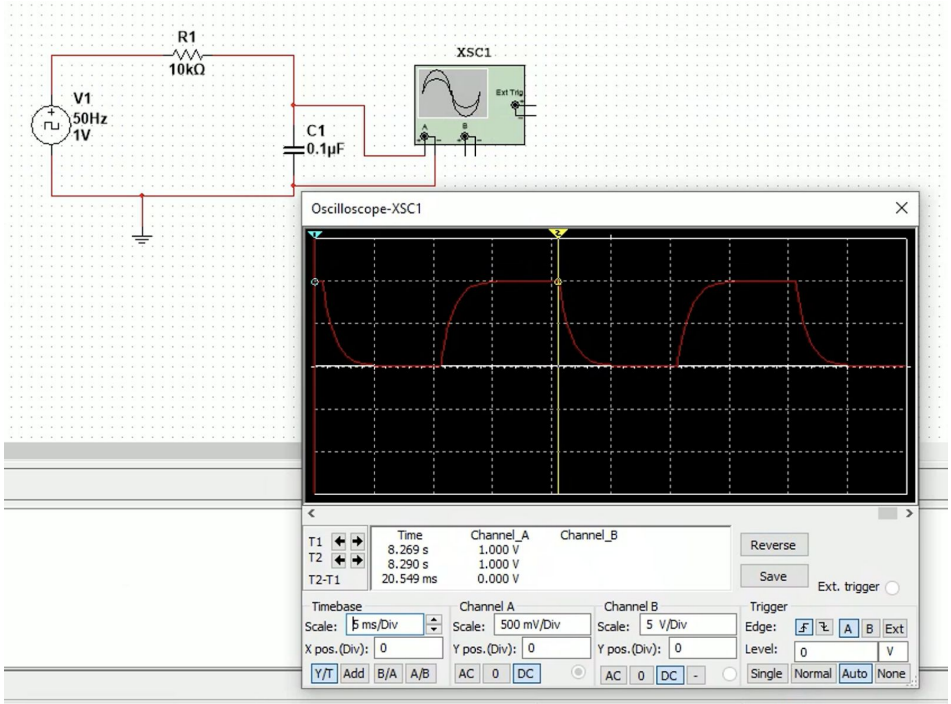
Part A:

Step 3:

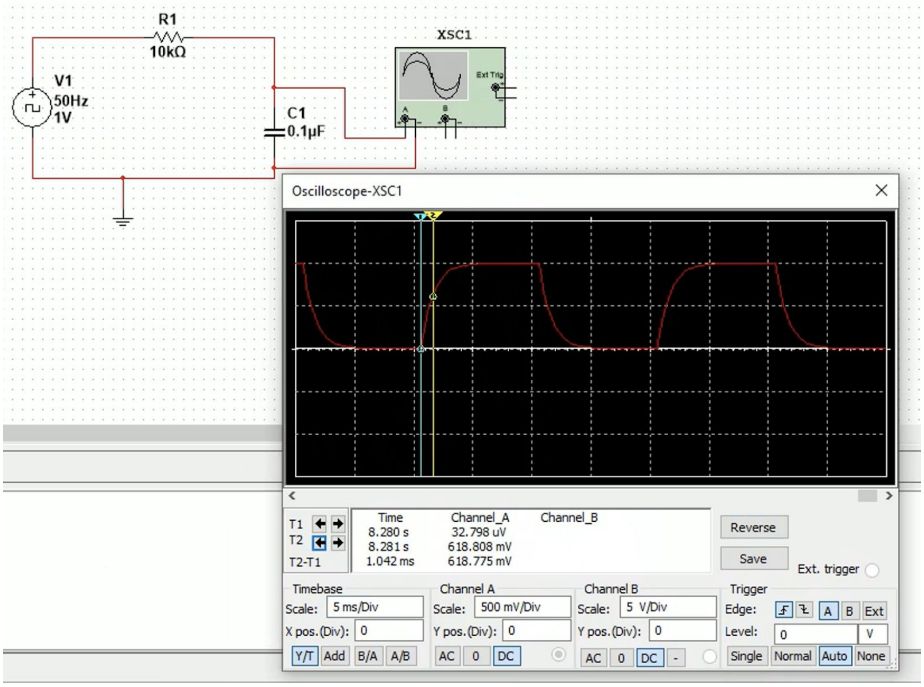




Step 5:



Step 6:



Prelab Time Constant:

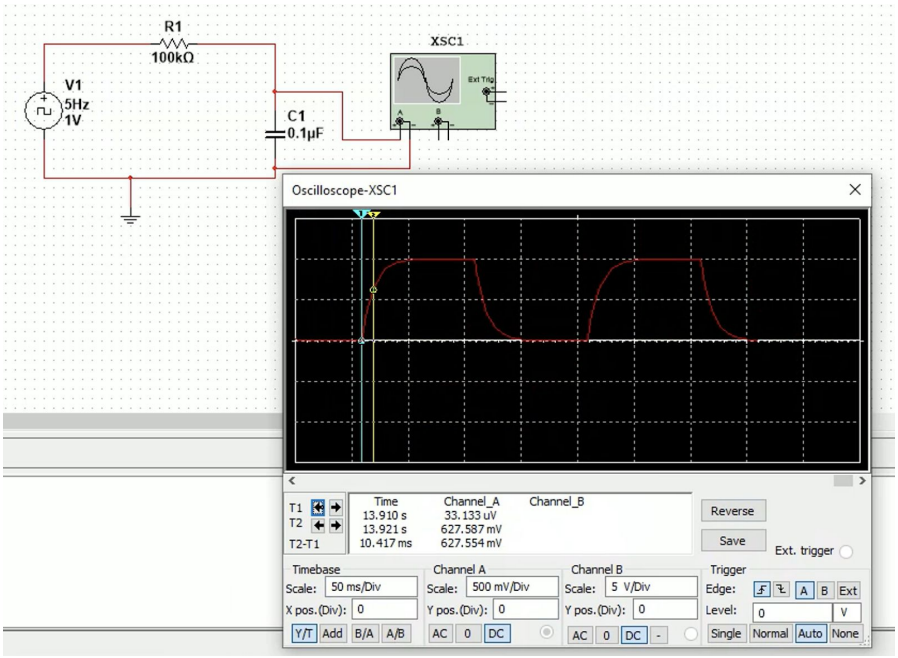
$$\tau = 0.001s \approx 1ms$$

Actual Time Constant:

$$T_2 - T_1 = 1.042ms \approx 1ms$$

Both the theoretical value for my circuit and the actual value calculated for the time constant are almost identical.

Step 7:

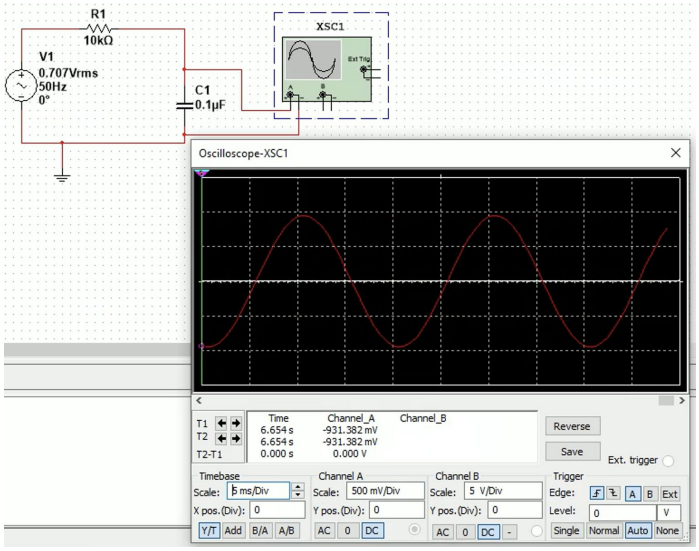


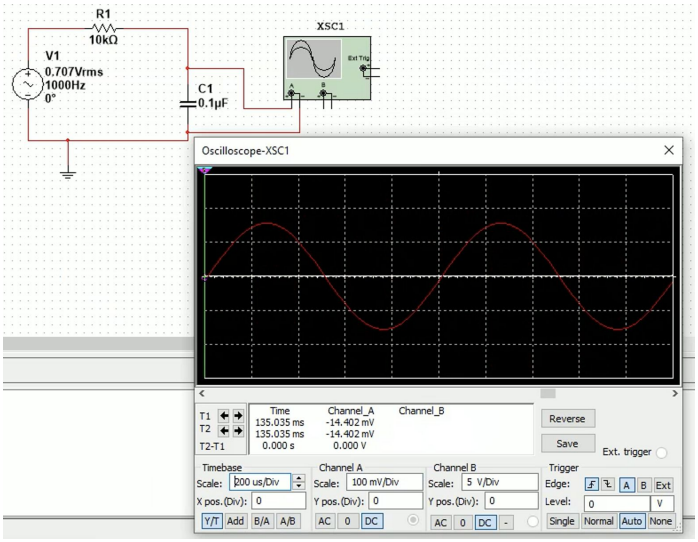
$\tau = 10.417ms$

We notice that by increasing the resistance by a factor of 10 and by decreasing the frequency by a factor of 10 the ratio between the two time constants is 10. This can be explained through the equation for the time constant $\tau = RC$, by keeping the capacitor constant, we can see that if we increase the resistance by a factor of 10 the time constant will also increase by a factor of 10.

$\frac{\tau_2}{\tau_1} = 10.417/1.042 = 9.997 \approx 10$

Step 8:

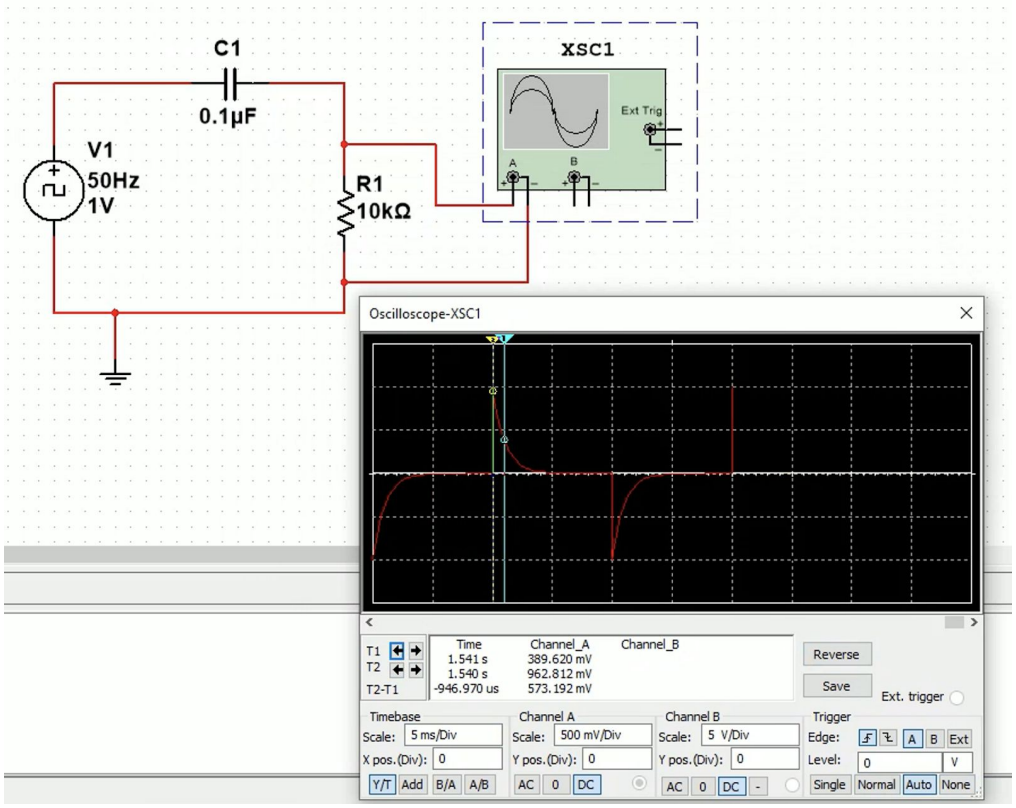




The change we notice in Step 8 is with the amplitude of the wave. At 50Hz we can see the wave with an amplitude of 500 mV/div but at 1kHz we need 100mV/div. This shows that with an increase in frequency the amplitude of the wave will decrease.

Part B:

Step 1:



Prelab Time Constant:

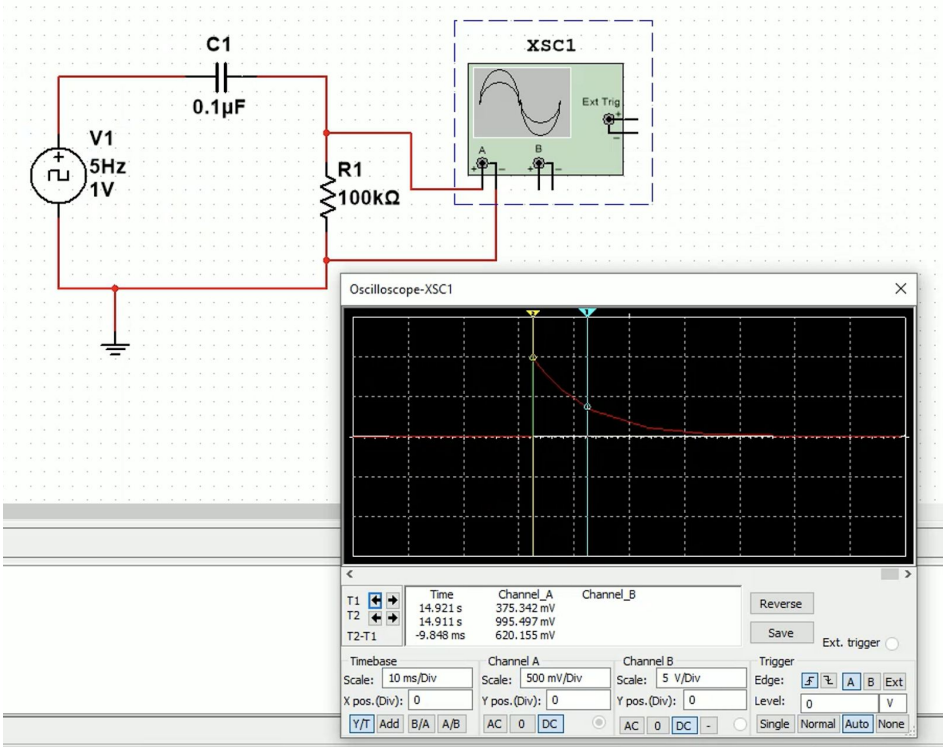
$$\tau = 0.001s \approx 1ms$$

Actual Time Constant:

$$T_2 - T_1 = 0.946\mu s \approx 1ms$$

Both the theoretical value for my circuit and the actual value calculated for the time constant are almost identical.

Step 4:

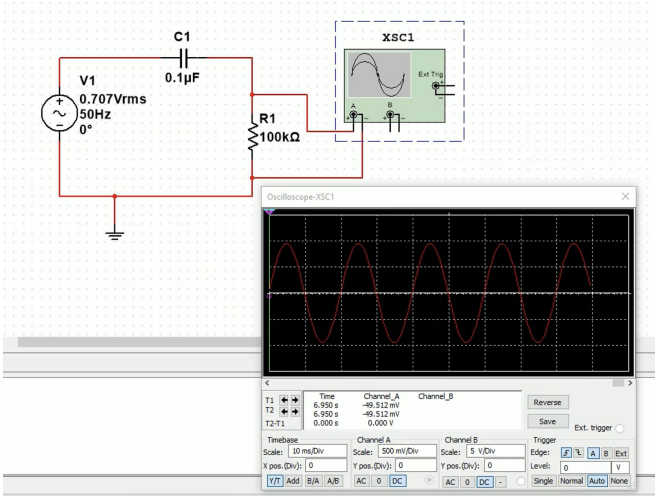


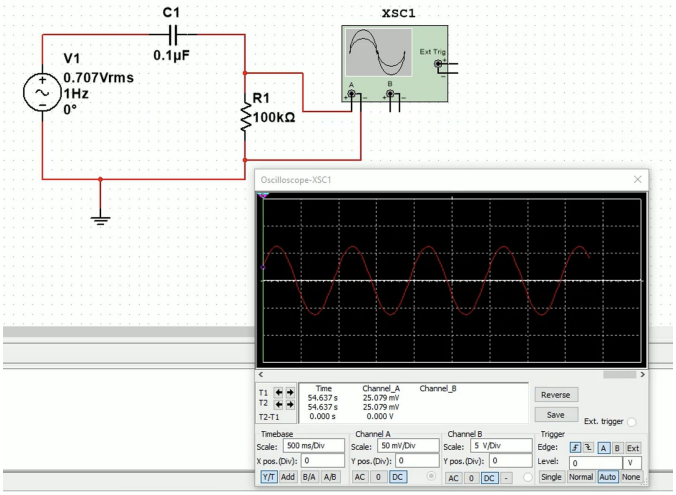
$\tau = 9.848ms$

We notice that by increasing the resistance by a factor of 10 and by decreasing the frequency by a factor of 10 the ratio between the two time constants is 10. This can be explained through the equation for the time constant $\tau = RC$, by keeping the capacitor constant, we can see that if we increase the resistance by a factor of 10 the time constant will also increase by a factor of 10.

$\frac{\tau_2}{\tau_1} = 9.848/0.946 = 10.41 \approx 10$

Step 5:





The change we notice in Step 5 is with the amplitude of the wave. At 50Hz we can see the wave with an amplitude of 500 mV/div but at 1Hz we need 50mV/div. This shows that with an decrease in frequency the amplitude of the wave will decrease.

Part D:

2.

	$10k\Omega$	$100k\Omega$
Theoretical	1ms	10ms
Actual	1.042ms	10.417ms
% Error	4.2%	41.7%

4.

Part A - Low Pass

Part B - High Pass