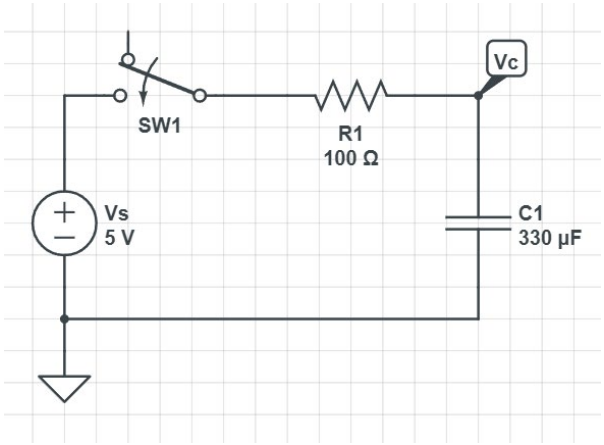
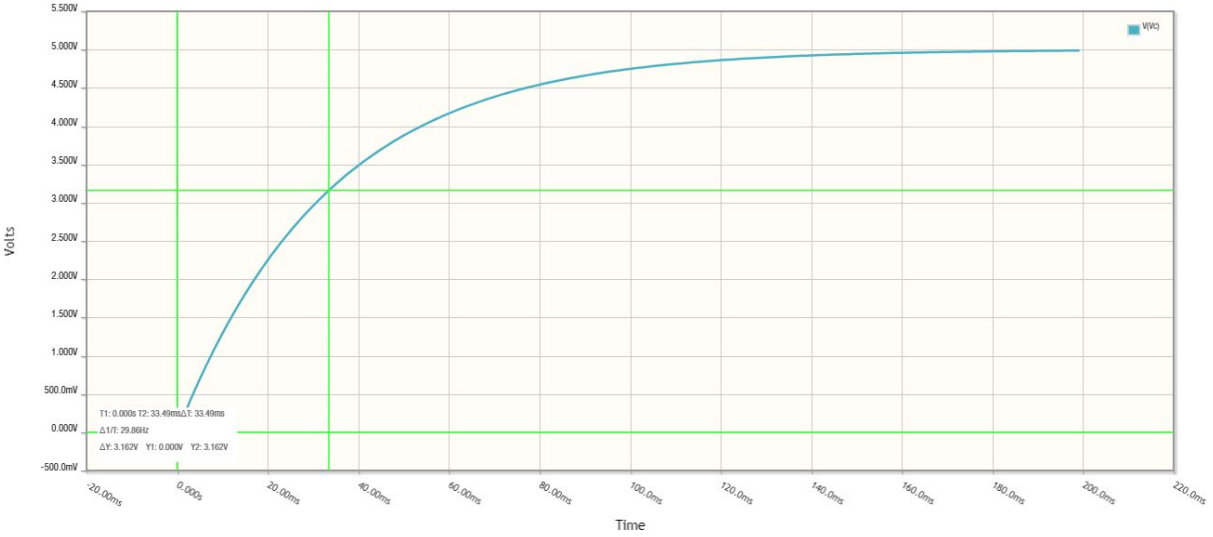
EEP1 ELogBook – Week 7

AXXXXXXX - Brians Tjipto Meidianto

Studio

Activity 1



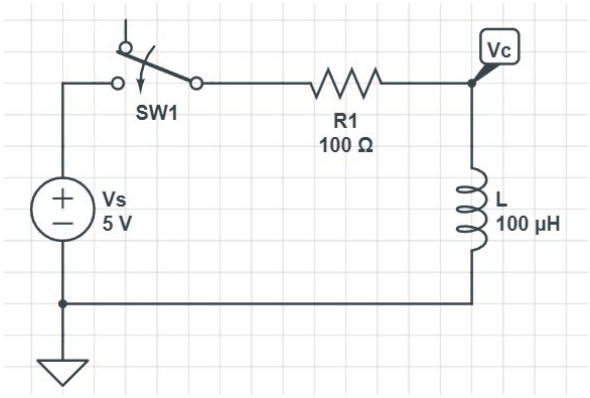


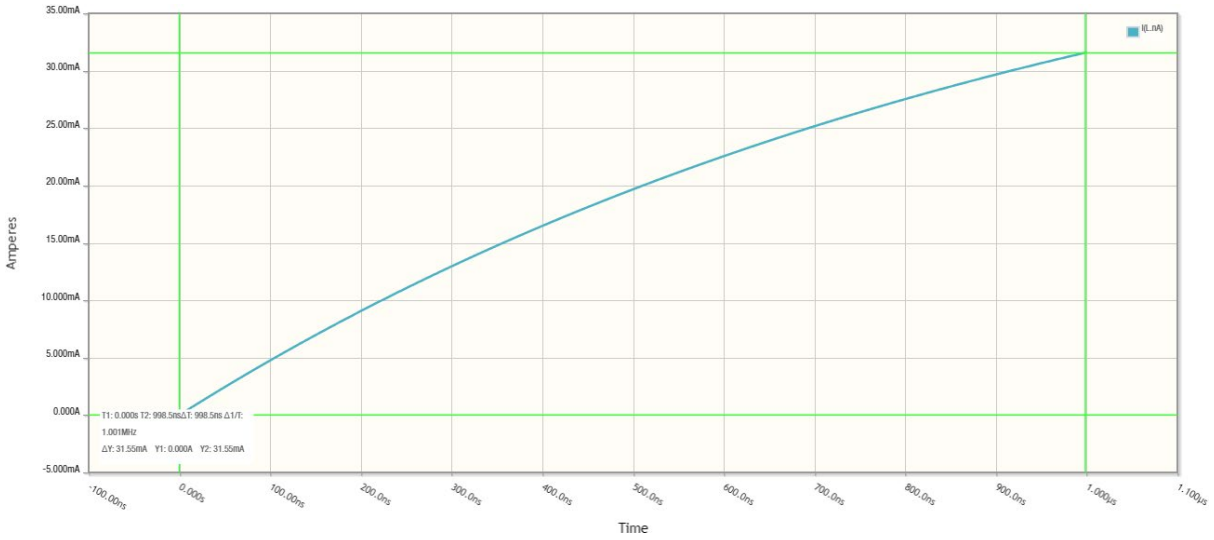
T = 33.49ms

T = R * C = 100 * (330 * 10^{-6}) = 33ms

Both values are the same.

Activity 2



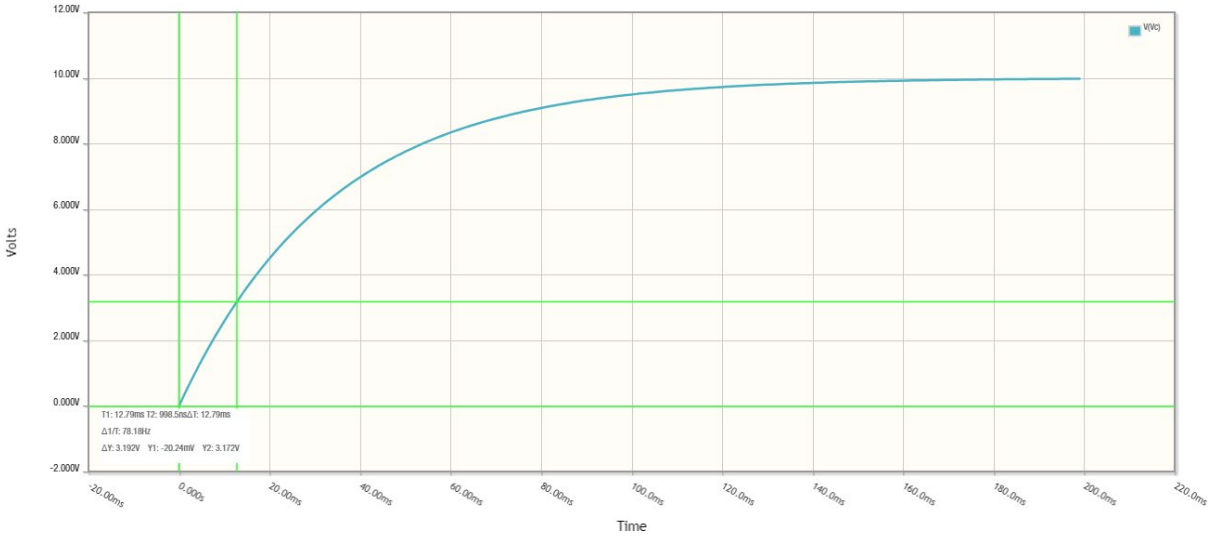


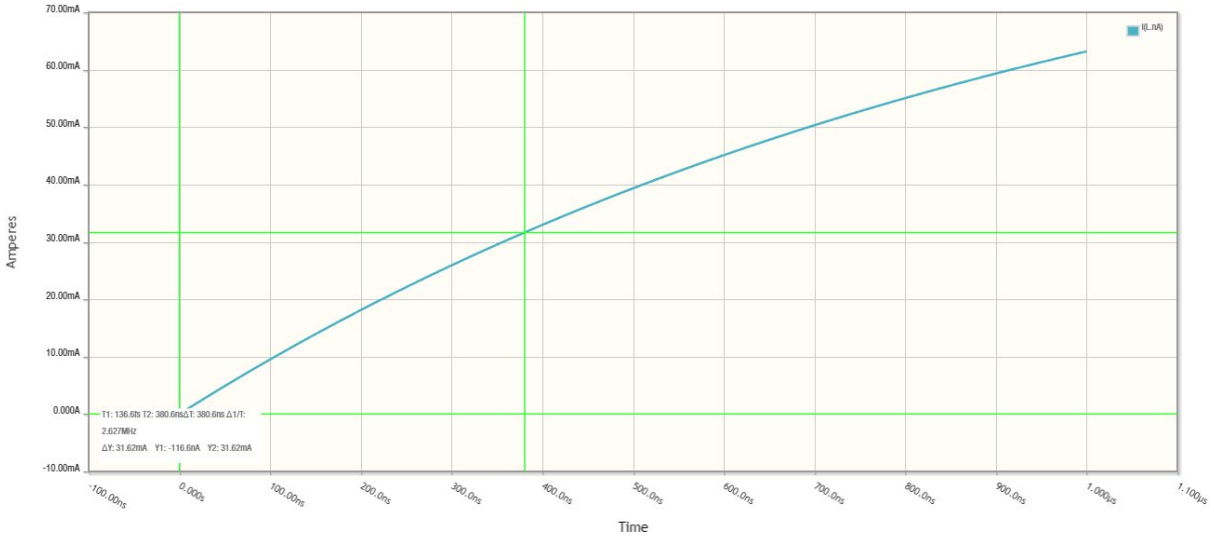
T = 998.5ns

T = L / R = (100 * 10^{-6}) / 100 = 0.000001 = 1000ns

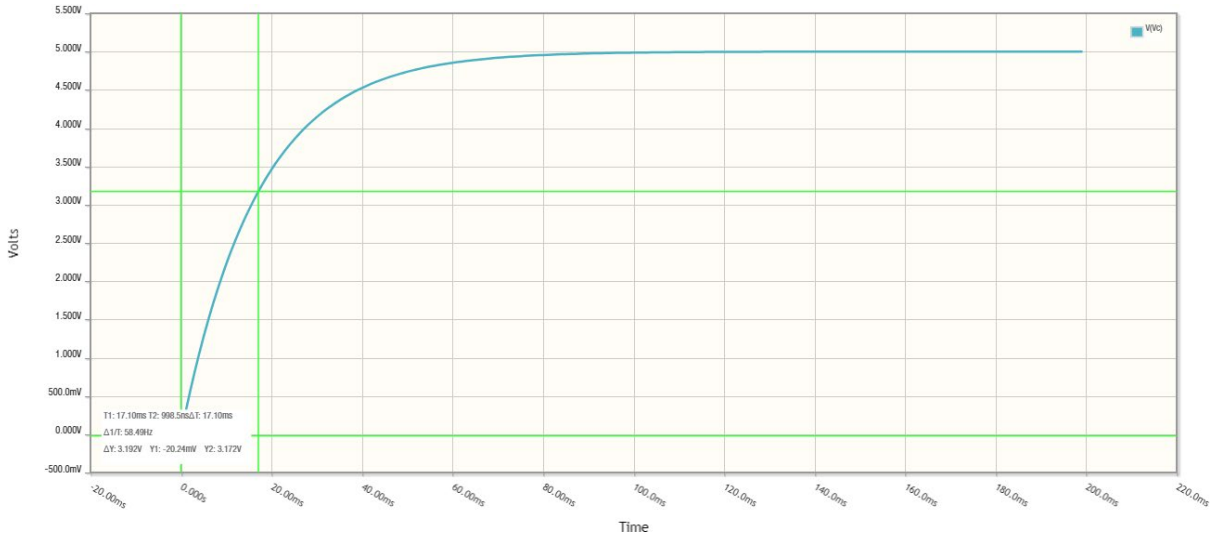
Roughly the same value

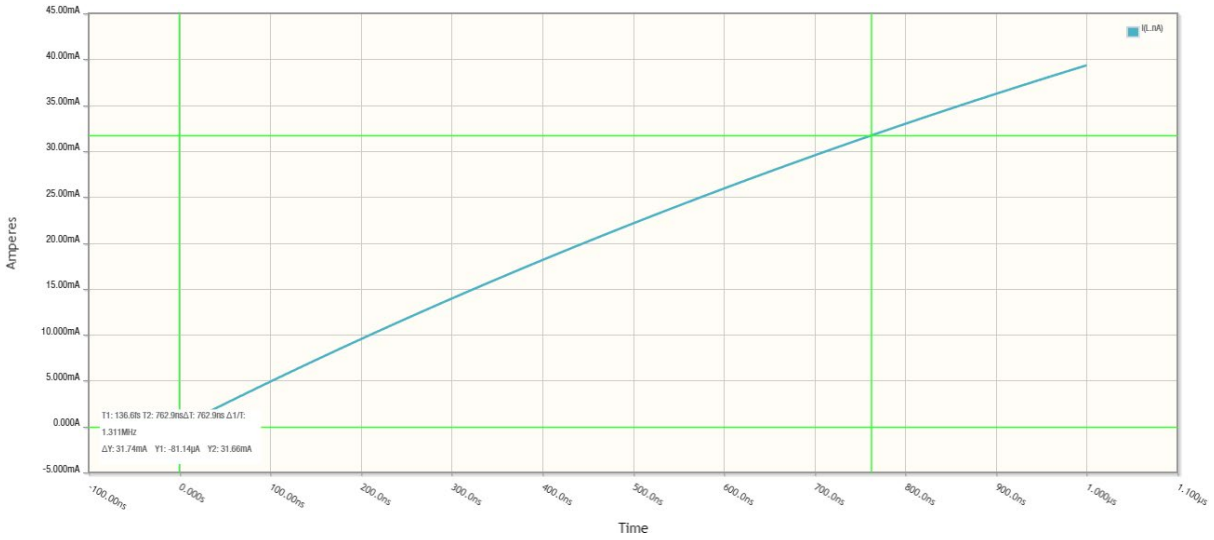
a. Vs to 10 V, the T decreases



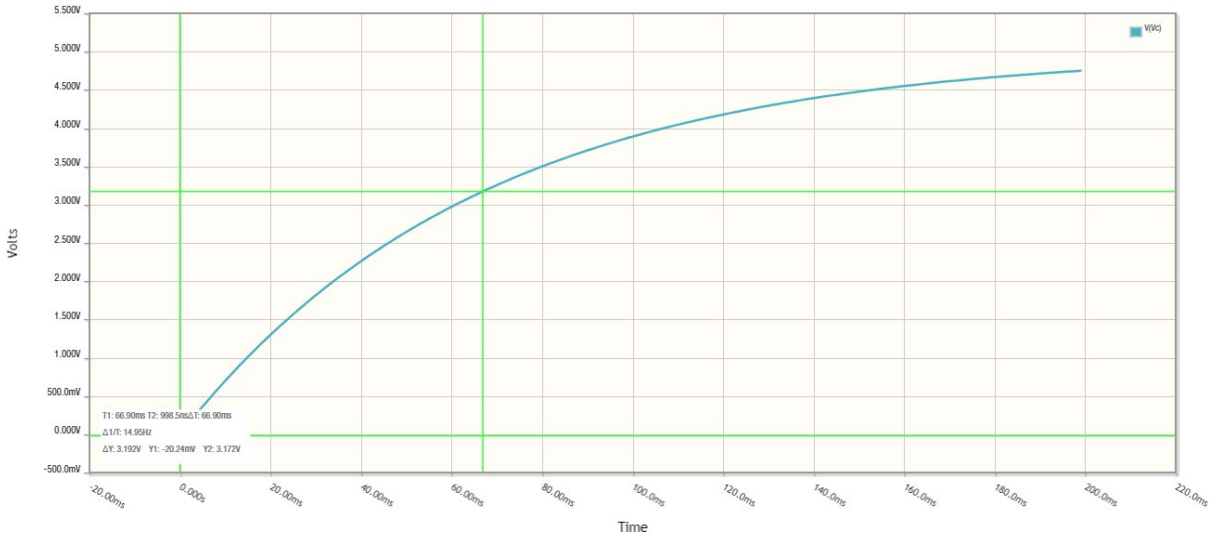


b. R to 50 Ω, the V / I decrease

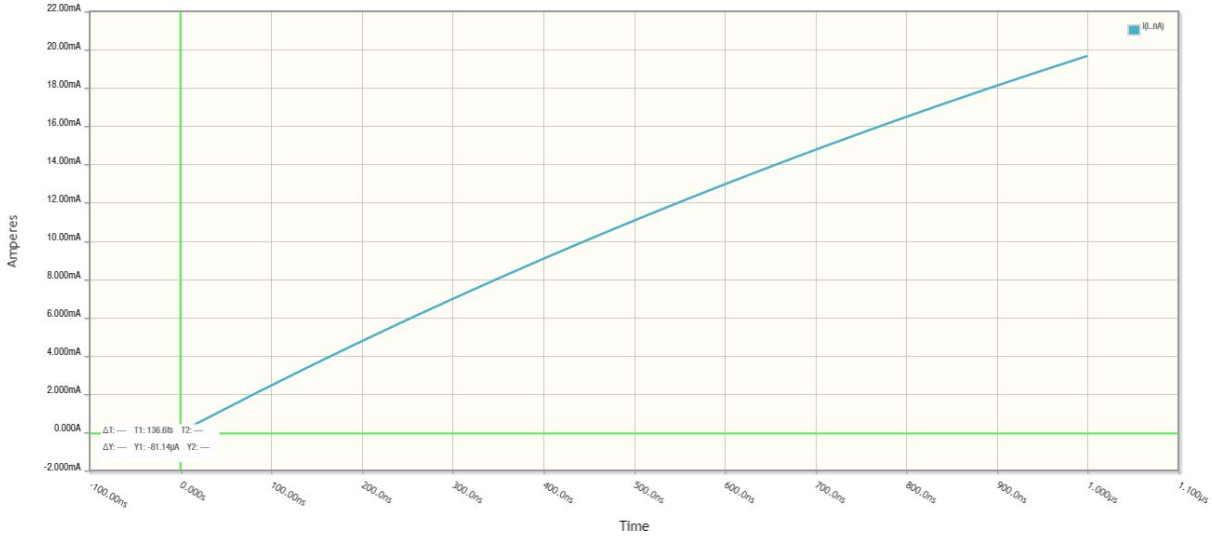




c. C to 660 uF, T doubled



d. L to 200 uH, T doubled

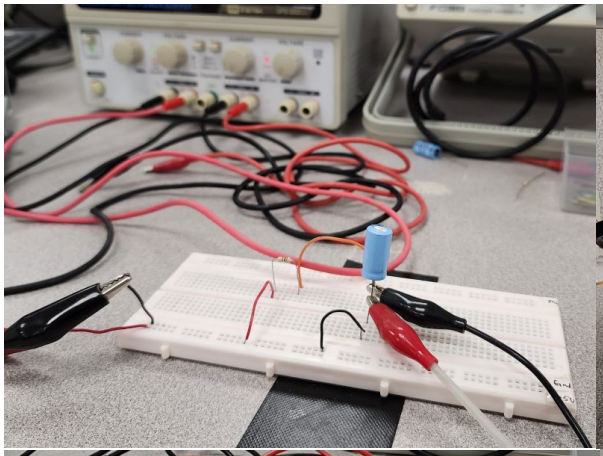


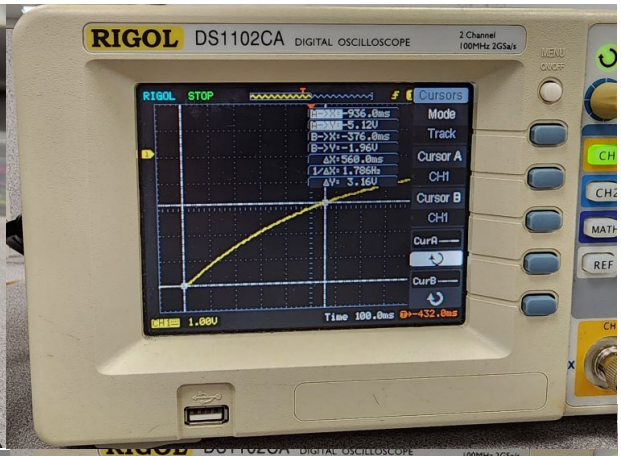
Lab

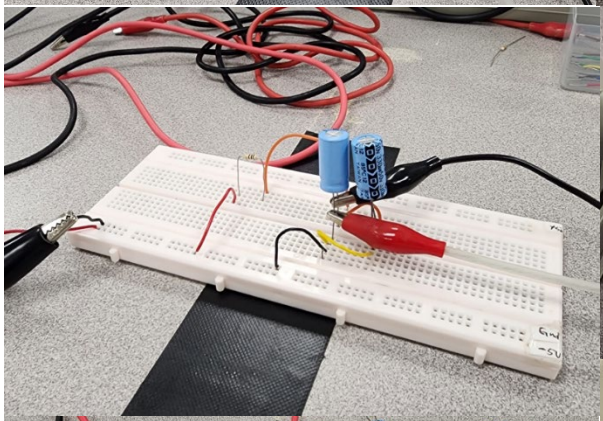
Activity 1

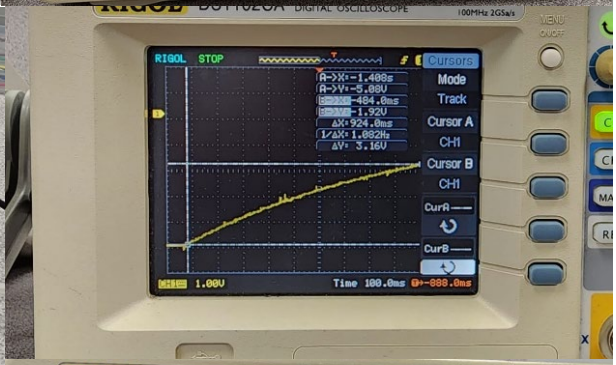
Vs (V)	R (Ω)	C (uF)	T (ms)
5	100	330	560
5	100	660	924
5	200	330	584
z10	100	330	308

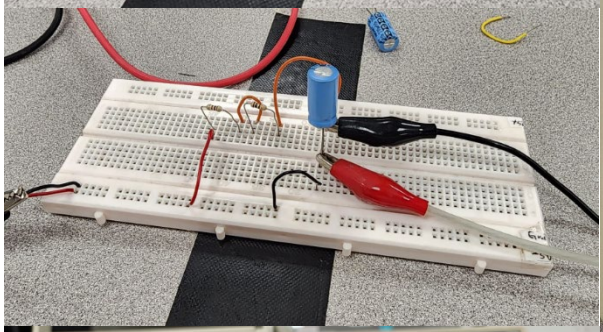
When the Capacitance doubled the time constant also doubled, when the Resistance doubled, increased the time constant by a little bit, conversely, the doubling of the Voltage lead to a decrease in the time constant

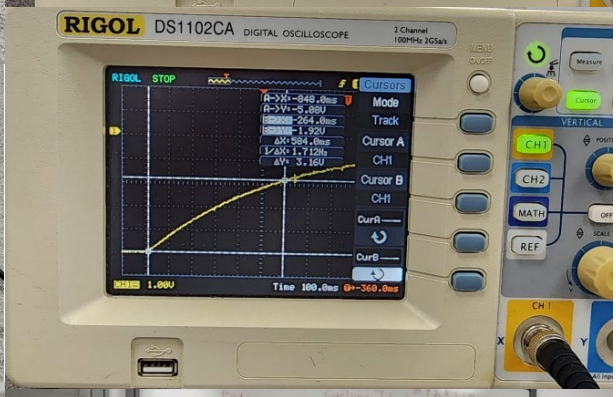


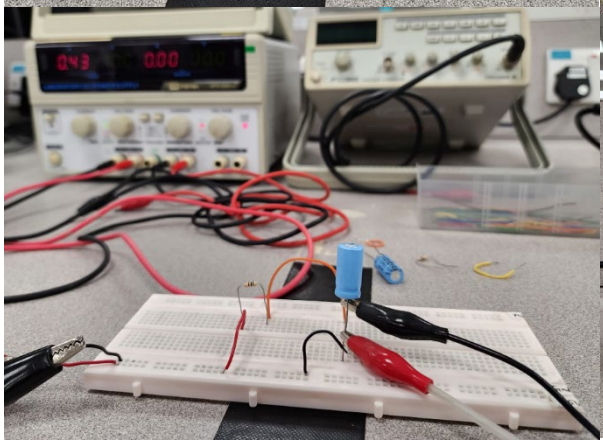

RIGOL DS1102CA DIGITAL OSCILLOSCOPE
2 Channel
100MHz 2GSa/s
RIGOL STOP
Cursors
Mode
Track
Cursor A
CH1
Cursor B
CH1
CurA
CurB
1.00V
Time 100.0ms

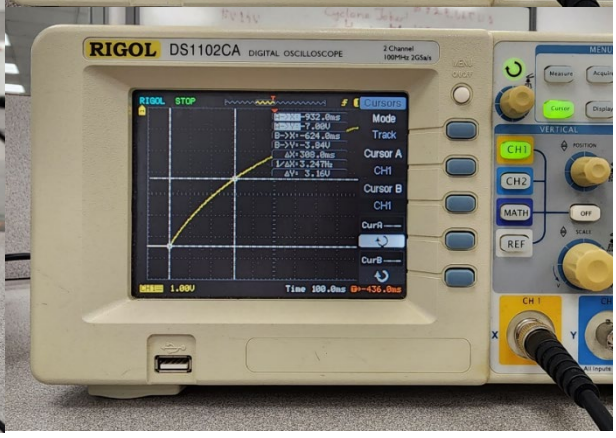



RIGOL STOP
Cursors
Mode
Track
Cursor A
CH1
Cursor B
CH1
CurA
CurB
1.00V
Time 100.0ms

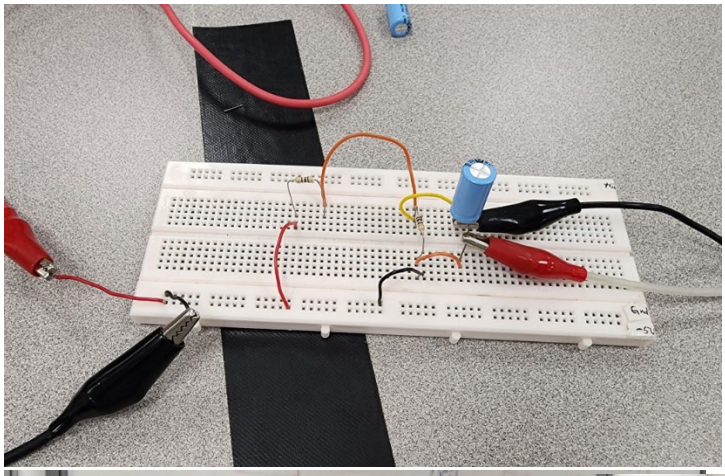


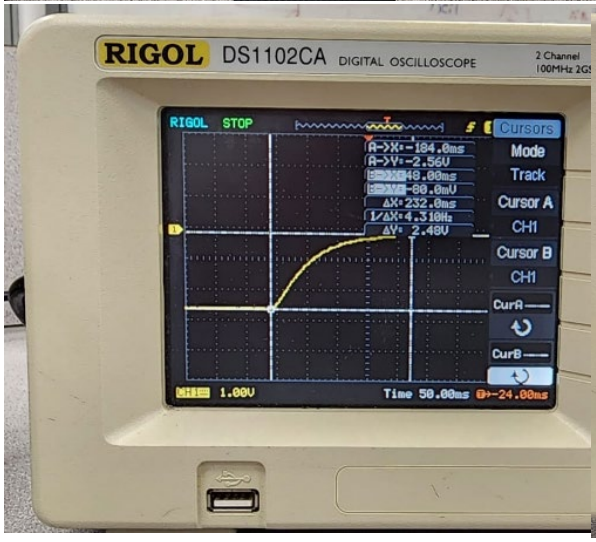

RIGOL DS1102CA DIGITAL OSCILLOSCOPE
2 Channel
100MHz 2GSa/s
RIGOL STOP
Cursors
Mode
Track
Cursor A
CH1
Cursor B
CH1
CurA
CurB
1.00V
Time 100.0ms
CH1
CH2
MATH
REF

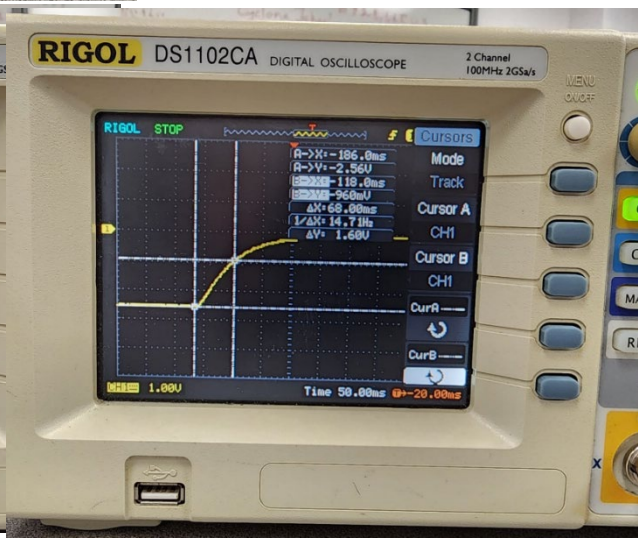



RIGOL DS1102CA DIGITAL OSCILLOSCOPE
2 Channel
100MHz 2GSa/s
RIGOL STOP
Cursors
Mode
Track
Cursor A
CH1
Cursor B
CH1
CurA
CurB
1.00V
Time 100.0ms
CH1
CH2
MATH
REF

Activity 2







It takes 68ms to get to the time constant

It takes approximately 232ms to get fully discharged at 2.48V

During charging, the capacitor is connected to a voltage source through the resistor.

During discharging, the capacitor discharges through the resistor.

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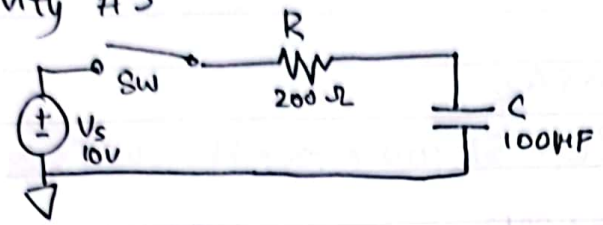
Activity #3

1.



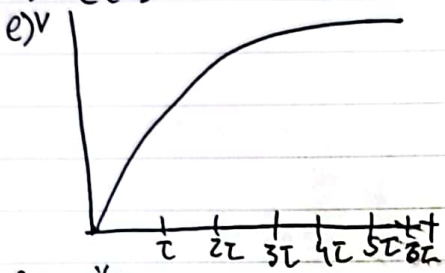
a) $i(0) = \frac{10}{200} = 0.05A$ ✱

b) $t = 5\tau = 5RC = 100MF \times 200\Omega \times 5 = 0.1s$ ✱

c) $I=0 \rightarrow$ open circuit

d) $V_C(t) = V_s(1-e^{-\frac{t}{\tau}}) = 10(1-e^{-\frac{t}{0.02}})$ ✱

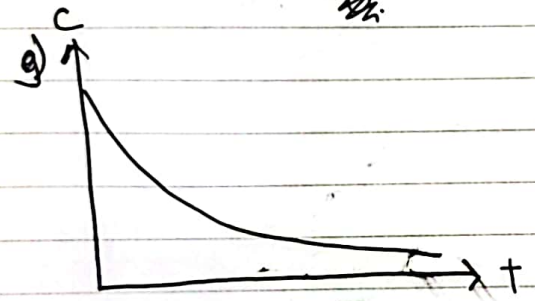
e)



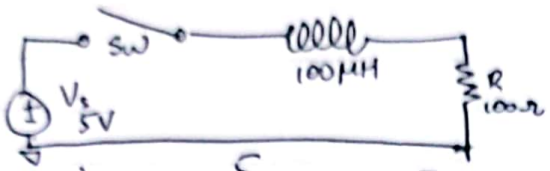
f) $i(t) = \frac{V_s - V_c(t)}{R}$

$= \frac{10 - 10(1-e^{-\frac{t}{0.02}})}{100} = 0.05 \times e^{-50t} A$ ✱

g)



2.



a) $i(0) = \frac{5}{100} = 0.05A$

b) $t = 5\tau = \frac{L}{R} = \frac{100mH}{100\Omega} = 5RL = 5 \times 100 \times 100\mu H = 0.05s$

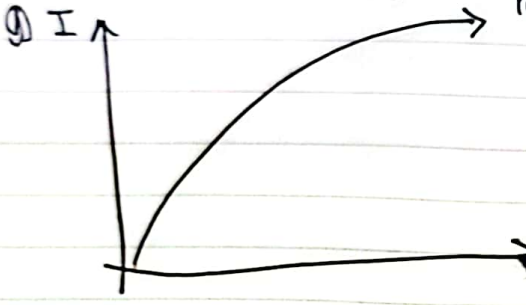
c) $i = 500\ A$

d) $V_L = (e^{-R+/L}) = (e^{-100t/0.001})$

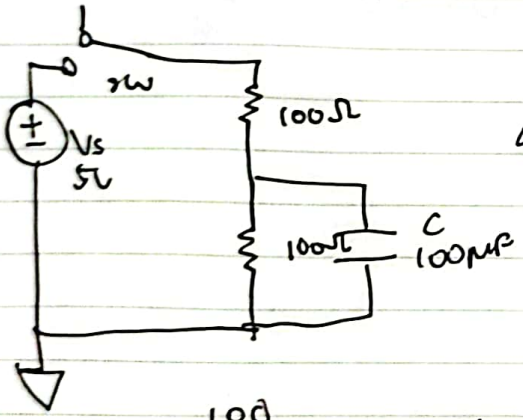
e)

f) $I = \frac{V}{R}(1 - e^{-\frac{R}{L}t}) = \frac{5}{100}(1 - e^{\frac{100t}{0.001}})$

g)



3.



a) $5 \times \frac{100}{100+100} = 2.5V$

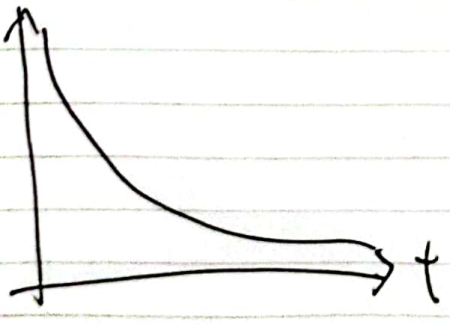
b) $-2.5V$

c) $5\tau = 5RC = 100\mu F \times 500 \times 5 = 0.025s$

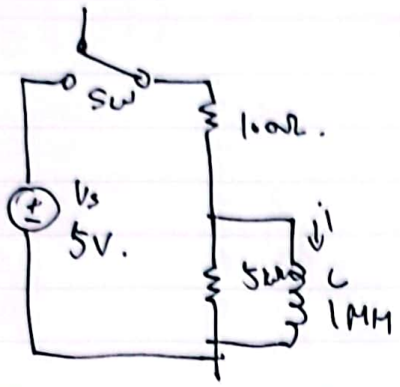
d) $V(t) = V_S(1 - e^{-\frac{t}{\tau}}) = 2.5(1 - e^{-\frac{t}{0.025}})$

e) $\frac{2.5(1 - e^{-\frac{t}{0.025}})}{200} = \frac{1}{200}$ $t = 0.025s$

f)



4.



a) $I = \frac{5}{100} = 0.05A$.

b) $I = -0.05A$.

c) $V = IR = -0.05 \times 5k\Omega = -250V$

d) $V = 5000 \times i(t)$

$$i(t) = I_0 e^{-\frac{t}{\tau}}$$

$$\tau = \frac{L}{R} = \frac{10^{-6}}{5000} = 2 \times 10^{-10} s$$

$$V(t) = -250 e^{-5 \times 10^{8} t} V.$$