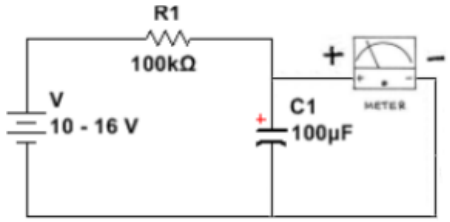
Hands-On Lab - Module 3 : Results

Your Name: _____ **Seat** _____ **Date** _____

CAPACITORS

CHARGING A CAPACITOR



3.1.a) Voltage across capacitor $V_{C@\tau}$ after ***one Tau*** **= 10 seconds;**

$V_{C@\tau}$ = _____ volts

3.1.b) Voltage across capacitor $V_{C@5\tau}$ after ***five Tau*** **= 50 seconds;**

$V_{C@5\tau}$ = _____ volts

3.1.c) Record the unregulated voltage **V** (*after at least two minutes*)

V = _____ volts

Measured Versus Theoretical Values:

The theoretical capacitor voltage *after one* τ should be **≈ *63%*** of supply voltage **V**.

3.1.d) Calculate your *actual One Tau voltage % at 10 seconds*:

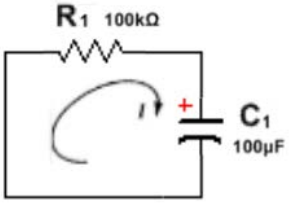
[$V_{C@\tau}$ / V] x 100% = Result @τ _____ %

The theoretical capacitor voltage *after five* τ should be **≈ *99%*** of the supply voltage **V**.

3.1.e) Calculate your *actual Five Tau voltage %at 50 seconds*;

[$V_{C@5\tau}$ / V] x 100% = Result @*5*τ _____ %

DISCHARGING A CAPACITOR



3.2.a) How long does it take to discharge the capacitor to **3.7 volts** when connected only to the 1 MΩ Multimeter? _____ seconds.
(If you do not reach 3.7 volts after about 2 minutes there is an error.)

3.2.b) What is your measured value of $V_{C@\tau}$ after **one Tau** with **100KΩ** and Multimeter (**1MΩ**) in parallel (***R_{equiv} ≈ 90KΩ***) ?

$V_{C@\tau}$ = _____ volts

3.2.c) What voltage did you find for $V_{C@5\tau}$ after five **Tau**?

$V_{C@5\tau}$ = _____ volts

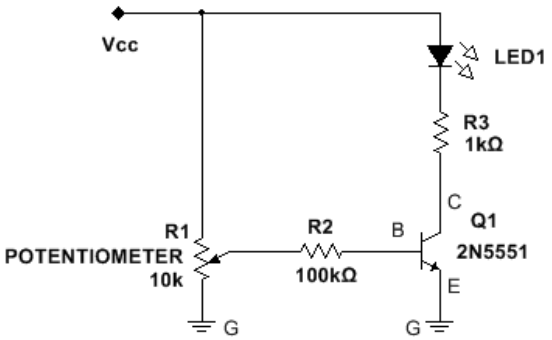
This is Instructor check point 2B.

Revision 150214: This file is available electronically at:
http://www.charlesrubenstein.com/222/**03LabRESULTS.pdf**

MEASURING THE CURRENT GAIN OF A TRANSISTOR

3.3.a) Turn the power **ON** and use the **10Kohm** pot knob to adjust the voltage from **0** to full unregulated supply voltage.

Did this work? (___ YES ___NO) ***If this doesn't work ask for help NOW.***



3.3.b) Using the **10Kohm** pot knob to adjust the voltage available to the 100K resistor in the transistor's base circuit it should be possible to vary the brightness of the LED in the collector circuit. Did this work ? (____ YES ____ NO)

TAKING THE MEASUREMENTS

3.4a) Measure the **voltage V_{R2} across R_2** (the **100Kohm** resistor connected to the base). The voltage **V_{R2}** is: _____volts (measured).

3.4b) *Measure* **V_{BE}** *– the voltage from point B (base) to point E (emitter) – note as the emitter is at ground,* The voltage **V_{BE}** is: _____volts (measured).

3.4c) Calculate the base current using Ohm's Law: **I_B** = _____ **mA**

*(Calculate using Ohms Law [**I = V/R**] - Remember that **volts / Kohms** = **mA**)*

3.4d) Knowing the collector and base currents, calculate the current gain **$h_{FE}=(I_C / I_B)$**

h_{FE} = _____ (a number without units)

Fill in Table 3.1 with the appropriate values for the transistor with a 5 ma collector current.

Instructor check point 3C.

3.4e, f) Adjust the **10Kohm** pot to set **V_{R3}** to be **2.0 volts** across **R_3**. Measure the voltage across **R_2**,, and then measure **V_{BE}** and fill in the second line of Table 3.1. Repeat for **V_{R3}** equals **1.0 volts**) and then calculate the currents and gains.

I_C	V_{R2}	I_B (mA) = V_{R2} / 100K	V_{BE}	$h_{FE} = I_C / I_B$
5 mA				
2 mA				
1 mA				

Table 3.1

Final check:

***BEFORE** you break the circuit apart, please have your instructor review your setup for the last data set of measurements.*