

CS 3651: Resistor / Capacitor Lab

Name(s): _____

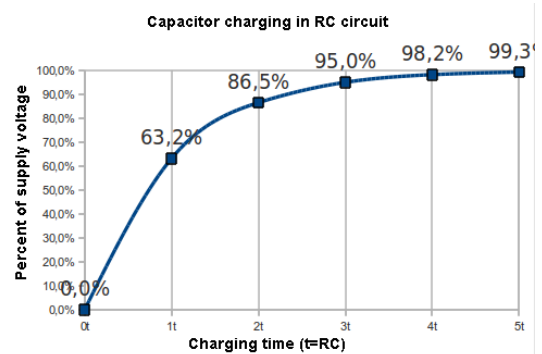
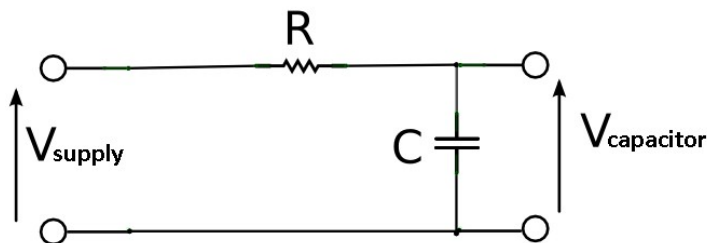
Learning Objectives:

1. Calculating capacitor charge time at specific resistance values
2. Applying knowledge about how capacitors work.
3. Develop familiarity with capacitors.

Step 1: You have been given a capacitor. Determine it's rating. A capacitor stores electrical energy as a "static charge" between two plates. In the case of a cylindrical electrolytic capacitor, the two "plates" are rolled up to give larger surface area. Also, electrolytic capacitors have a polarity, so be sure to place the negative pin towards ground.

Your capacitor rating: _____

Step 2: Build the circuit below such that you can measure the voltage across the capacitor with a multi-meter. Pick a resistance value such that your capacitor's voltage ($V_{\text{capacitor}}$) will reach the voltage provided by your supply (a battery or DC wall-wart - V_{supply}) in approximately 5 seconds. Note that your capacitor will reach 63.2% charged in $\text{Time} = R \times C$ and fully charged in $5 * \text{Time}$.



Your resistor:

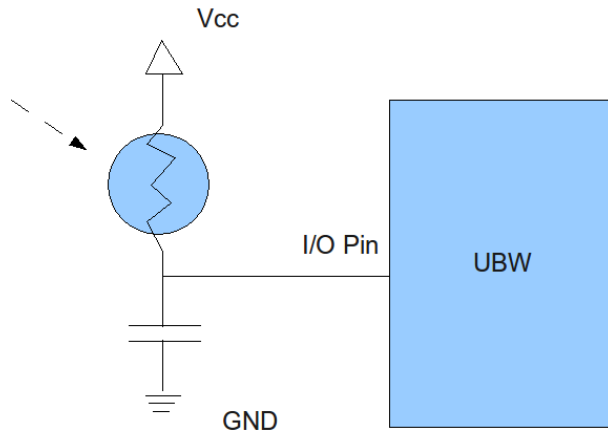
Color Bands: _____

Rated Ohms: _____

Measured actual Ohms: _____

Time for capacitor to reach V_{supply} voltage: _____

Step 3: Build a circuit that uses a photo-resistor to charge a capacitor. Attach a UBW pin to the circuit such that when the pin is set to an output at zero, it will discharge the capacitor. (When the pin is set to an input, the voltage on the pin will rise as the capacitor charges.)



Step 4: Calculate the energy stored in the capacitor using the formula

$$\text{Joules} = 1/2 C * v^2$$

Remember that a Joule is 1 watt of energy for 1 second. $J = W*s$

Joules: _____

Step 5: Write a program that will discharge the capacitor (to zero) by setting the pin to a grounded output. (Will sending the energy into the UBW hurt it? Not if your capacitor is small enough!) Your program should then turn the UBW pin into an input, and check it repeatedly to see how long it takes before the input pin turns high (as the photo-resistor charges the capacitor). Use the time difference to determine the resistance of the photo resistor (as your capacitance has not changed) for three different light values:

Low Light (covered): Time: _____

Normal Light (shadow): Time: _____

Bright Light (window/flashlight) Time: _____