BASIC REQUIREMENTS

You will construct two separate circuits and analyze each of them as required below.

**Circuit 1: RC Circuit**

You will construct a series RC circuit and then observe the charging and discharging curves. You will have to choose values for R and C that can be read with the typical operational window of the Lab Quests. These can be determined by appropriate attention to the theory of this type of electrical circuit.

**HINT:** In addition, the capacitor when nearing full charge will behave like a very large resistance. These phenomena will cause your voltmeter to give erroneous readings when in parallel to the capacitor. Part of your methodology will be to devise a work around to this issue and explain it in your paper.

**Circuit 2: PN Diode Analysis**

Obtain a simple PN junction diode. Effect a basic reading on the function and operation of such a diode. Perform an experiment of your own design that will measure the Vi curve of your diode from a small negative potential i.e. reverse bias) through to a point of positive potential (forward bias) where the diode Vi behaviour is linear. You should develop your learned theory so that you can compare it to your observations. (i.e. O – C residuals or other such verification method). Derivation and conformation with experiment of the transient current is expected.

**Circuit 3: Transistor Analysis**

Obtain a simple NPN or PNP transistor with known properties from the manufacturer. These specifications can usually be obtained via the Internet if the manufacturer and model number of the transistor are known. You are to select a transistor with an hfe ~ 100 -- 200. Do NOT select a MOSFET or other such switching transistor for this experiment. Effect a basic reading on the function and operation of such a transistor. Perform an experiment of your own design that will measure the amplification curves of your transistor for 4 different base currents. This is a plot of ic versus VCE. You should develop your learned theory so that you can compare it to your observations. (i.e. O – C residuals or other such verification method).

ESSENTIAL REPORT INFORMATION

Your report will follow all the constraints given in the course package. However, it will conform to the page limit set forth below. The resistance of the CBL/detector will begin to affect the readings you get from the voltage probe. You will have to sort this out. You are expected to discuss the symmetry or lack thereof of the RC AP Physics C 1718 - Lab Manual 13 profiles. Your report must indicate if your research confirms or challenges the accepted situation and why you think this is so.

PAGE LIMIT

**5 pages + 1 page** with the marking rubric on one side and a signature page on the reverse indicating the duties performed by each member. Please print them on BOTH sides of the paper.

EQUIPMENT AND/OR THEORETICAL RESTRICTIONS

You may use digital and / or analog voltmeters. You may also use Netbooks / TI8x / CBL voltmeters if you wish and the equipment is available. You must use Kirchhoff's work to solve these circuits. **Thevenin and Norton equivalents are not permitted in this analysis.** You may however, show how these theorems confirm to the work you have done, but your analysis cannot be justified exclusively by Norton or Thevenin Theorems.

SUBMISSION TYPE

1. Paper. Double-sided. Attached should be the signature page and the, include the formal report marking rubric found in this document. On it you need to indicate the aspects of the lab to which each member contributed and bears the signatures of all group members as an indication of agreement with this workload distribution.

2. .pdf file sent by email. This email must be time tagged prior to midnight on the established due date. This file will be archival. It should be **absolutely identical** to the paper submission.

**NOTE**: if there are differences between the paper and .pdf submissions, I will mark the poorer of the two papers.