Prelab: Due at the beginning of your lab section.

1. Plot (using Excel or other software) the theoretical current ratio versus voltage,

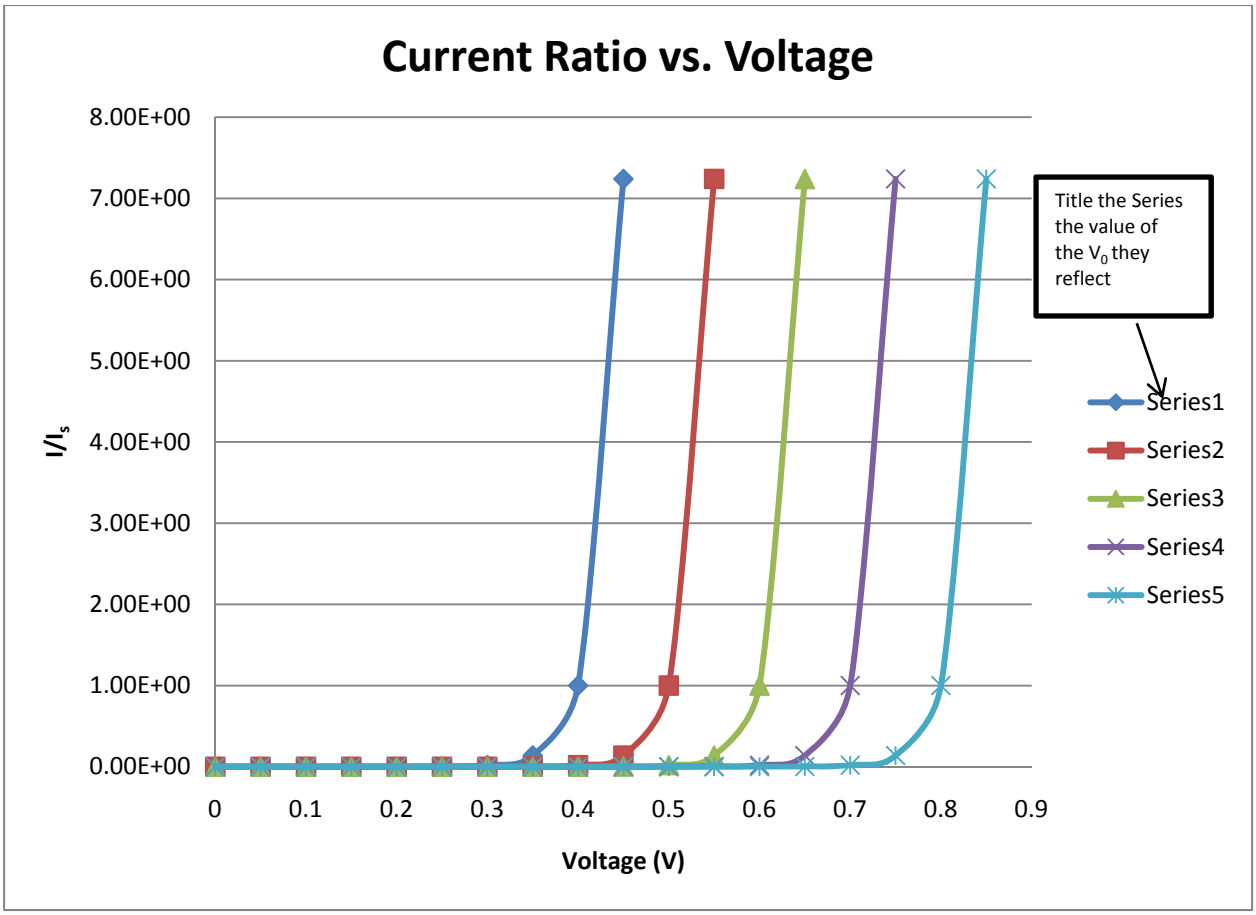
$$\frac{I}{I_S} = e^{\frac{-qV_0}{kT}}(e^{\frac{qV}{kT}} - 1)$$

for five values of the diode drop V_o ranging from V_o=0.4 V to 0.8 V at room temperature (293 K). Here q is the charge on an electron, and k is Boltzman's constant. Do not plot results greater than E+00 (ex. 7.24E+00) otherwise you cannot see the "turn-on". (See attached example Excel plot for reference.)

2. An ohmmeter actually reads current, not resistance, and does so by applying voltage across the leads (this is why you must be careful not to kill an ohmmeter by applying voltage to it, across its own power supply). Because there is a minimum amount of current the meter can detect, it increases the applied voltage for the higher resistance scales. If the meter is designed to read about 0.05 μA of current, what voltage is required for the 20 kΩ scale? the 20 MΩ scale?
3. The voltage on a capacitor discharging through a resistor is:

$$V = V_0 e^{-\frac{t}{RC}}$$

What value of capacitor is required so that the capacitor discharges by 20% (V=0.8Vo) during every half cycle of a 50 Hz oscillation$\left(t = \frac{1}{2f}\right)$, when R=10 k Ω?


Current Ratio vs. Voltage
8.00E+00
7.00E+00
6.00E+00
5.00E+00
4.00E+00
3.00E+00
2.00E+00
1.00E+00
0.00E+00
I/Is
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Voltage (V)
Title the Series the value of the V0 they reflect
Series1
Series2
Series3
Series4
Series5