**Phys219_2017 - Ryan Kaufmann/Exp. 3 (Diodes and Transistors)/Prelab assignment for Exp 3**

SIGNED by Ryan Kaufmann Oct 23, 2017 @10:35 AM PDT

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# Experiment 3: Semiconductor Diodes and Transistors

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## 3.1 Prelab Exercise

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To start, we made a plot for the I-V curve or a diode using certain parameters. We assumed that $I_0$ was 10 microamperes, and T was 300 Kelvin. We then plotted the function over -0.3V to 0.3V. The Plotfunction.py script gave us the following graph:

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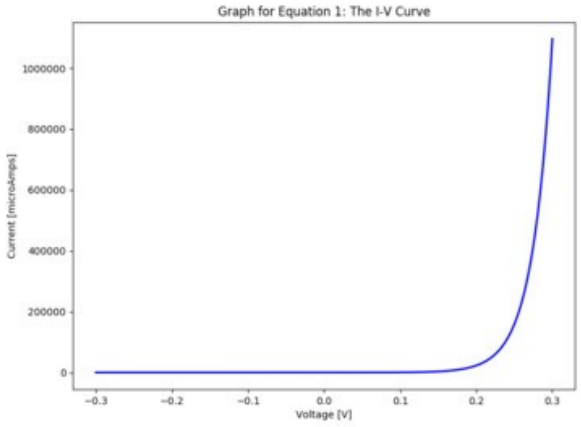


**PrelabI-VCurve.png(27.7 KB)**

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Using the same pretend diode, we also looked at a solution where we had measured the voltage drop over the resistor and the input voltage into the diode. Using these two values we could get the voltage drop across the diode as well as the current running through the diode. We calculated the following:

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$$V_r = +1.8V$$

$$V_{in} = +2.0V$$

$$V_d = V_{in} - V_r = 2.0V - 1.8V = +0.2V$$

$$I(V_d) = I_0(e^{\frac{V_d}{T*k_B}} - 1) = 10(e^{\frac{0.2}{300*8.617*10^{-5}}} - 1)\mu A = 22.898mA$$

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In the last part of the prelab, we want to make a circuit that provides a DC offset so that the base-emitter junction is forward biased even if the input signal has no DC component. In order to do this, we will take advantage of the Vcc input, which is typically a constant voltage. We can use this to provide a base voltage as our Vb, by providing a resistance branch to connect to Vb in the transistor, giving us the following diagram for a fixed base bias:

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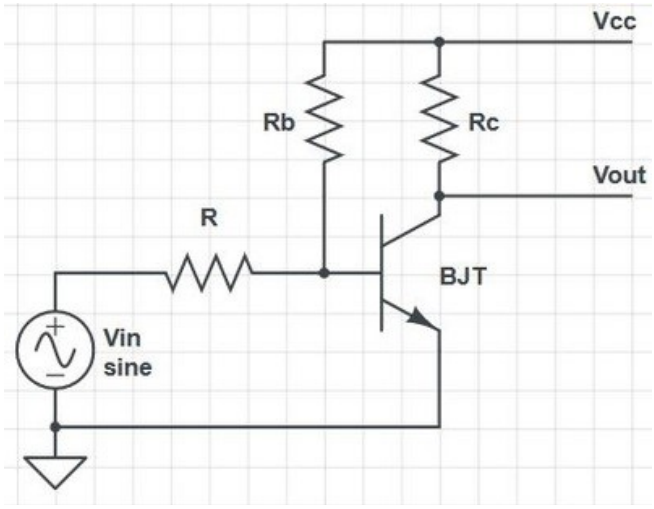


**CircuitDiagram.JPG(36.9 KB)**