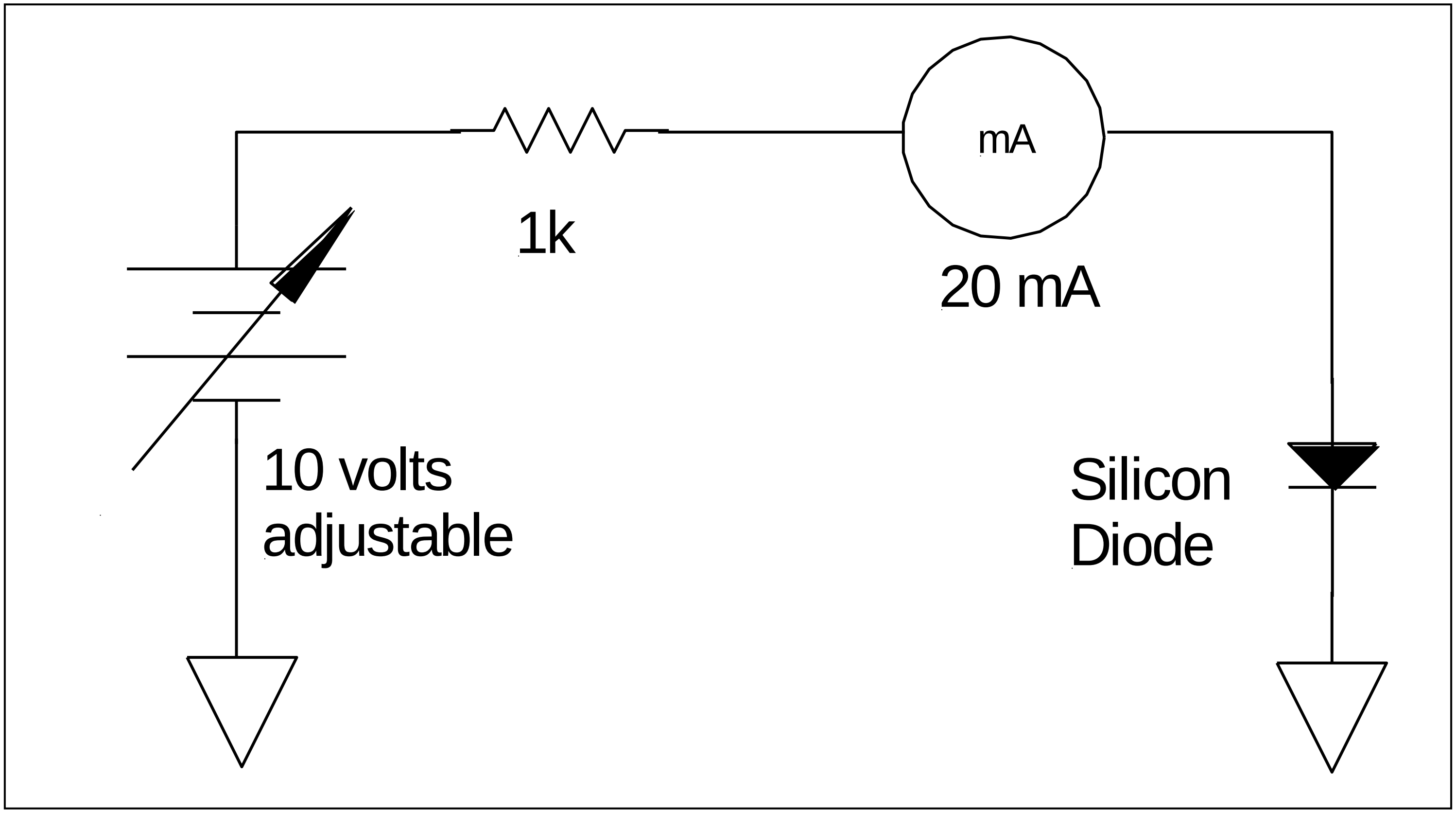
Lab 06

Sierra College CIE-01
Jim Weir 530.272.2203
jweir43@gmail.com
www.rstengineering.com/sierra

Vacuum Tubes
Elementary Semiconductors
Diodes



1. Equipment: Trainer, Two (2) digital multimeters. Use one of the digital multimeters to set 10.0 volts at the yellow (positive) binding post with respect to the black (common, ground, negative) binding post. Take a 1kΩ (brown-black-red-gold) resistor, the second digital multimeter set on the 20 mA full scale position, and a silicon switching diode (1N4148, 1N914, etc.); connect them as shown in this diagram.

Remember, the stripe on the diode case represents the stripe on the silicon diode schematic symbol, and is called the CATHODE of the diode. The ANODE is the remaining lead and is represented by the little pointy triangle.

Questions:

How much current does the milliammeter say is flowing in this circuit? __________mA

Is the diode FORWARD or REVERSE biased? _________________

Use the first digital multimeter to measure the voltage across the diode; what is the voltage? _______________ volts

Measure the voltage across the resistor. Do the sum of the voltages across the resistor and the diode add up to the power supply voltage? __________

Is the current you measure with the milliameter and the current you calculate with Ohm's Law flowing through the 1kΩ resistor the same (within some experimental error)? __________

3. Reverse the diode (swap anode with cathode). Answer the same 5 questions.

How much current does the milliammeter say is flowing in this circuit (you may wish to set the milliameter to a more sensitive scale (microamperes) to see if there is ANY current flowing at all)? ________________ mA or μA

Is the diode FORWARD or REVERSE biased? ____________________

Use the second digital multimeter to measure the voltage across the diode; what is the voltage? ___________________________ volts

Measure the voltage across the resistor. Do the sum of the voltages across the resistor and the diode add up to the power supply voltage? __________

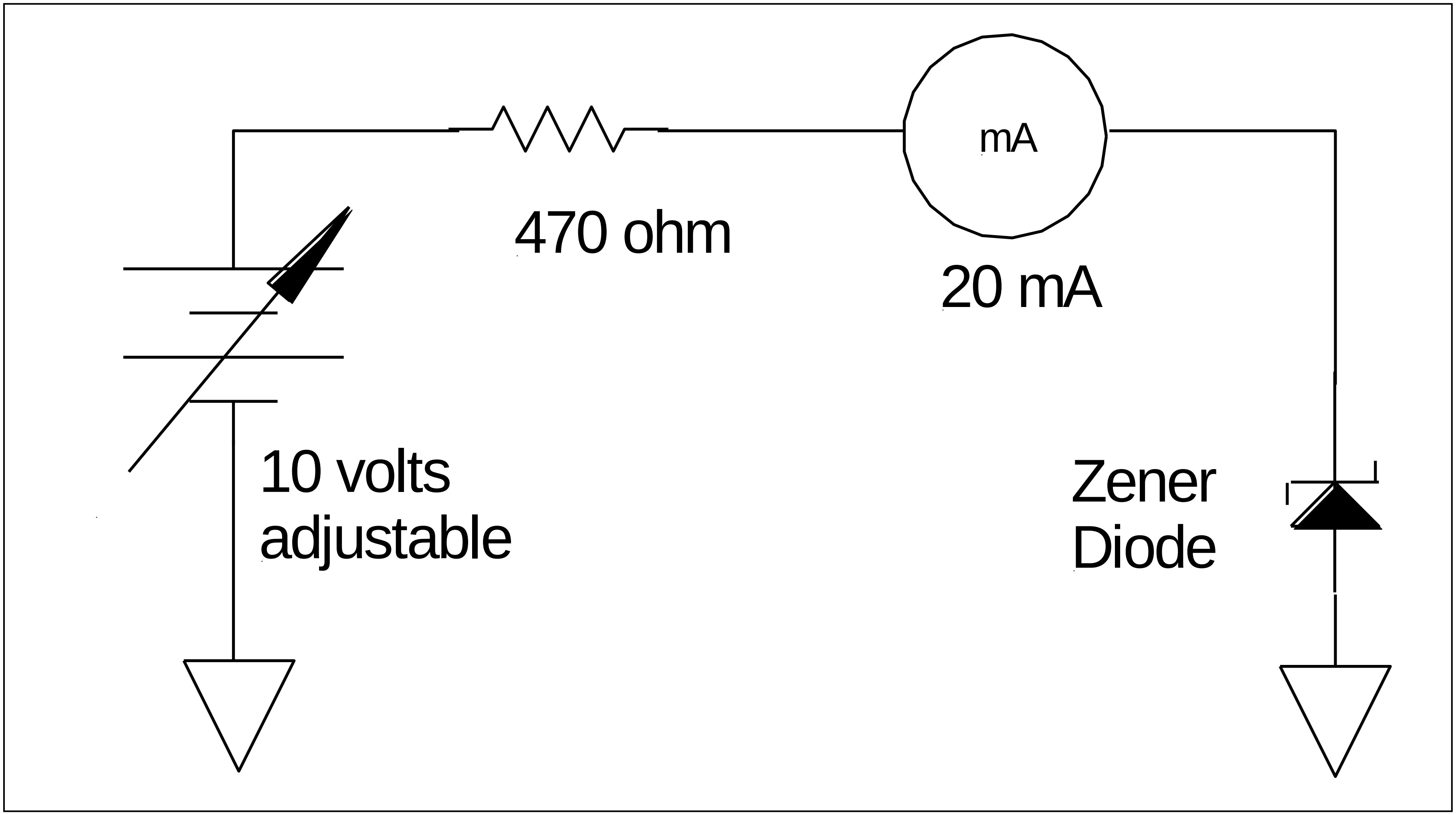
Is the current you measure with the milliameter and the current you calculate with Ohm's Law flowing through the 1kΩ resistor the same (within some experimental error)? __________

4. Rearrange the diode into the FORWARD bias mode.

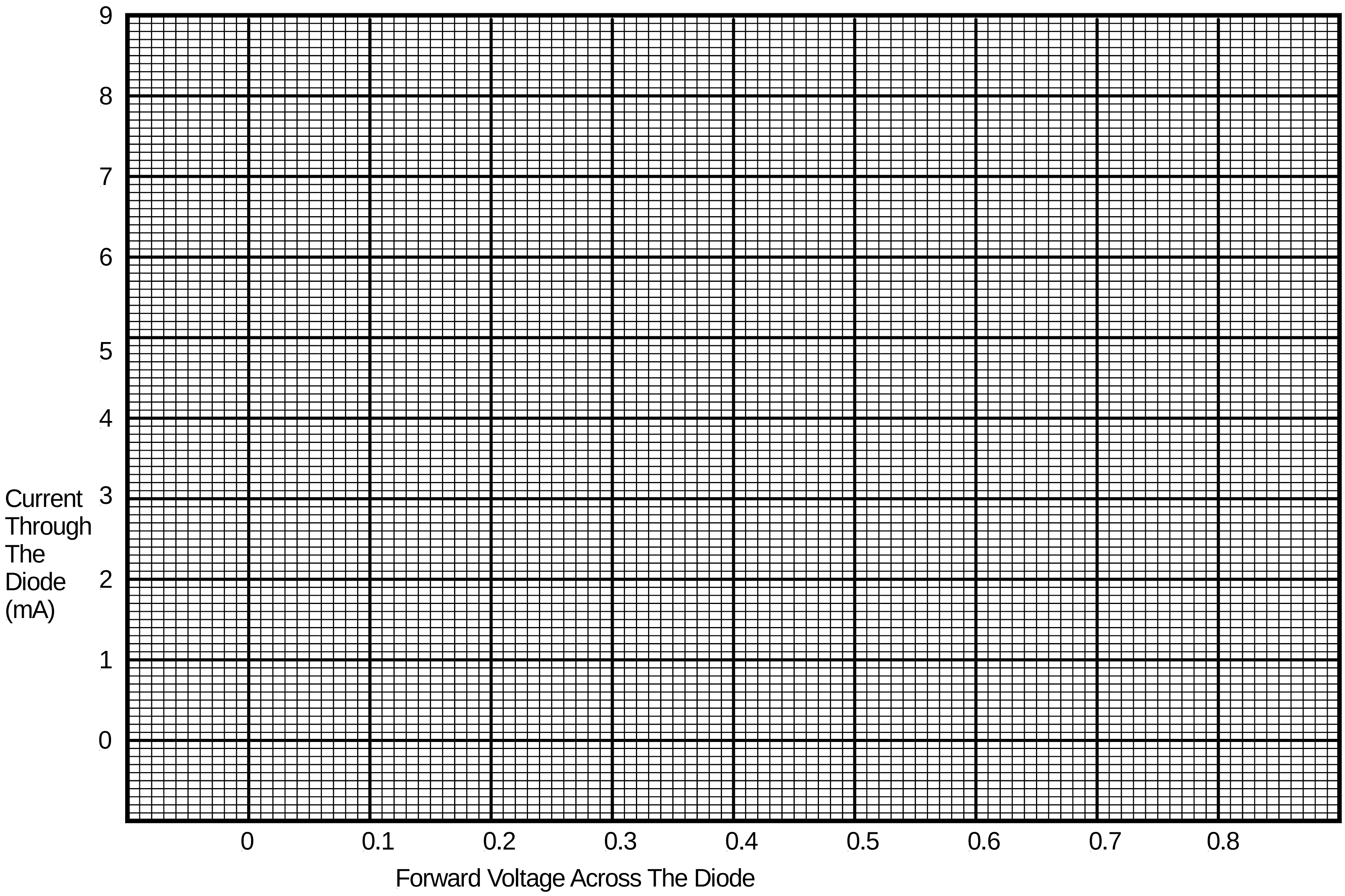
5. Reset the power supply to zero volts at the yellow binding post. SLOWLY bring up the voltage while monitoring both the diode voltage and the current with separate digital multimeters. Record (graph paper included page 6 of this lab) the lowest voltage that gives 0.1 mA (100 µA) of current flow and mark this point on the graph. 0.1 mA is the first small line above the zero current line.

6. While the diode is in this rather sensitive part of the curve, cover the diode so that the overhead lights do not shine on the diode. Did the current change (you may wish to put the milliameter on a more sensitive range to make this measurement)? Shine a bright light directly onto the diode (say, from an LED flashlight that you made on the first night). Did the current change? Einstein said that it should.

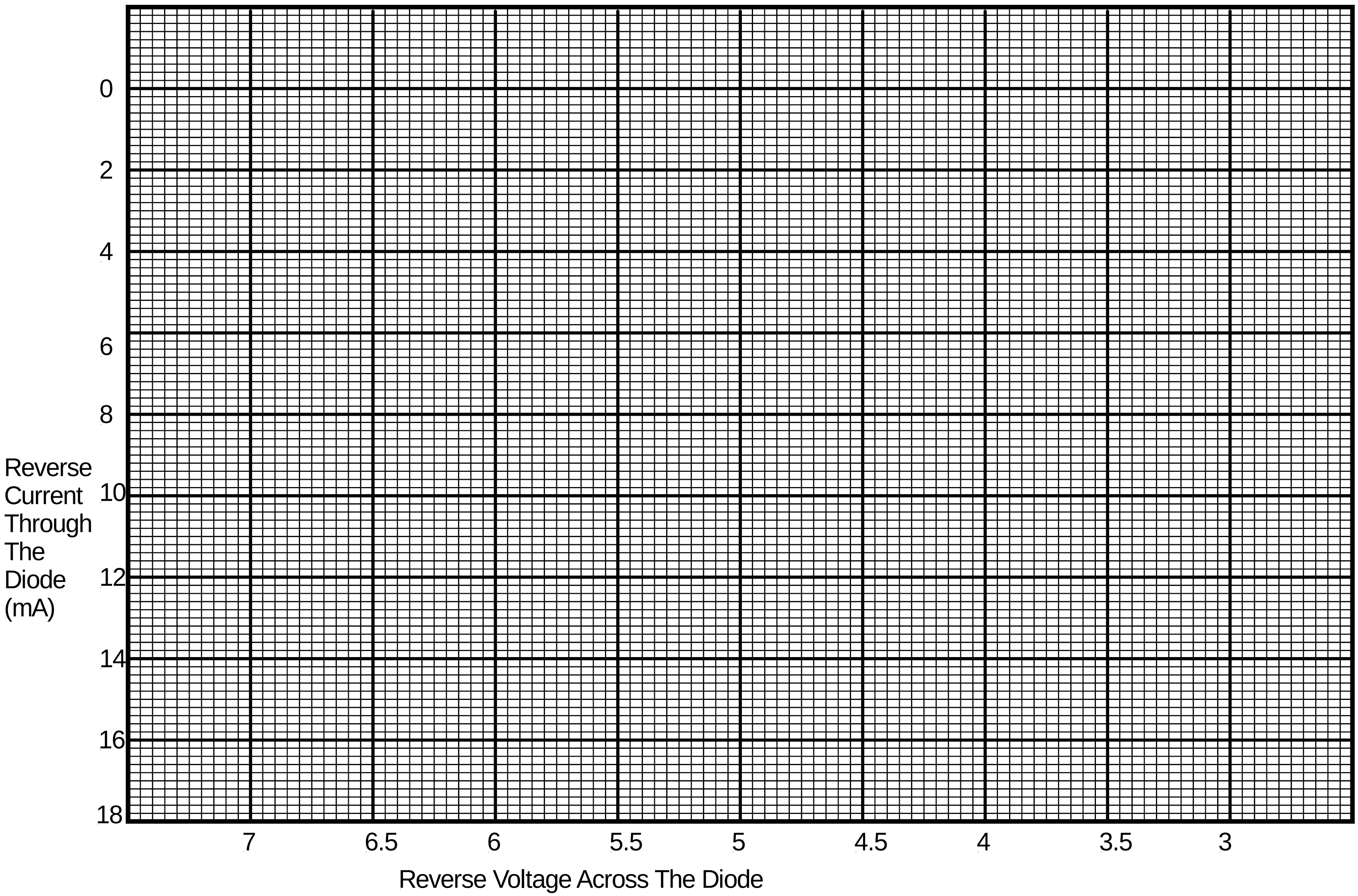
7. Measure and record (on the graph paper) each 0.1 mA increase in current up to 1 mA, and then every mA thereafter (0.1 mA, 0.2 mA, 0.3 mA … 1 mA, 2 mA, 3 mA, and so forth). Draw a smooth curve through each of these data points.



. Repeat steps 5 and 7 for a 5 volt Zener diode connected in REVERSE bias as shown on this diagram. (470 ohms – yellow, violet, brown, gold). Measure in steps of 2 mA per step. Record the results on the graph paper supplied on page 7 of this lab.



Silicon Diode Voltage vs. Current Curve	Scale: NTS Date: 21 Feb '11	Drawn by: OWJ Rev: A	Approved by: Jim Weir	**RST Engineering** 13993 Downwind Court Grass Valley CA 95945 530.272.2203 tech@rst-engr.com	Drawing # Mec-0106a sheet 1 of 1



Zener Diode Voltage vs. Current Curve	Scale: NTS	Drawn by: OWJ	Approved by:	**RST Engineering**	Drawing #
	Date: 21 Feb '11	Rev: A	Jim Weir	13993 Downwind Court Grass Valley CA 95945 530.272.2203 tech@rst-engr.com	MEC-0106b sheet 1 of 1