Electronics Lab 2: Diodes

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In this lab, the V-I curves for germanium and silicon diodes were measured using a voltage/current divider.

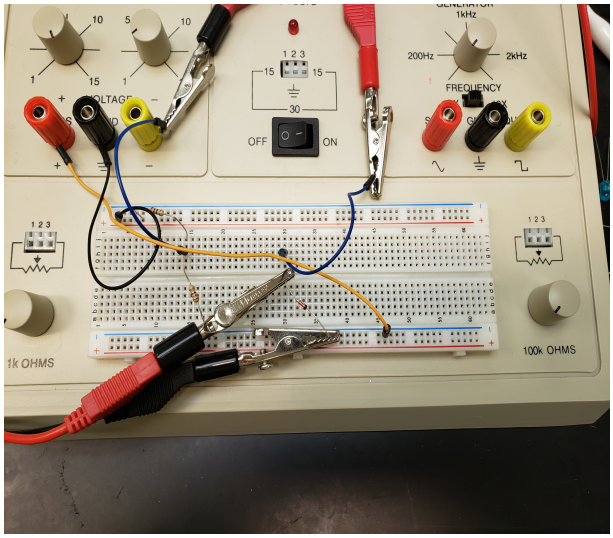

FIG. 1. The diode circuit

I. INTRODUCTION

The purpose of this laboratory is to study Kirchhoff's Laws. This will be done by constructing voltage dividers, and then a current divider, and seeing how the two circuits conform to Kirchhoff's Laws. Using these circuits, we carefully map the V-I curve of a silicon diode and a germanium diode.

II. THEORETICAL MODEL

As we know from lab one, we expect the diodes to be non-ohmic, rather we will fit them to the curve:

$$I = I_0(e^{eV/nk_BT} - 1) \tag{1}$$

Where n is a quality factor, and e, k_B, T, V are the charge of an electron, Boltzmann constant, temperature, and voltage respectively.

III. EXPERIMENT

For this experiment first we played around with understanding current and voltage dividers. Then, once we understood how to use and create these, we chose a circuit and took data for both diodes.

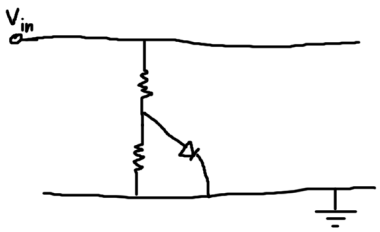

FIG. 2. An example of a simple voltage divider w/ diode

A. Procedure

First, we created the dividers, and understood how to create them. Next, we chose a circuit and took data backwards and forwards for each of the diodes. For the diodes, resistors of 270 ohms were used to divide.

B. Data

The graph, fit, and tables for each diode is included below.

IV. CONCLUSION

Both diodes followed the expected theoretical models closely, with an R^2 value of .9997 and .9282 for the silicon and germanium diodes respectively.

ACKNOWLEDGEMENTS

I acknowledge the support of the Wabash College Physics Department.

	Data Set	
	X	Y
1	0.488	0.13
2	0.525	0.3
3	0.566	0.74
4	0.6	1.8
5	0.645	3.83
6	0.664	5.63
7	0.686	9.07
8	0.702	13.05
9	0.712	16.35
10	0.718	18.4
11	0.72	19.26
12	0.723	20.7
13	0.727	22.06
14	-0.434	-0.00004
15	-0.629	0.000057
16	-0.932	0.000084
17	-1.186	0.000108
18	-1.377	0.000126
19	-1.634	0.000148
20	-1.734	0.000162
21	0.73	25.306
22	0.736	27.916
23	0.74	30.786
24	0.743	32.908
25	0.452	0.045

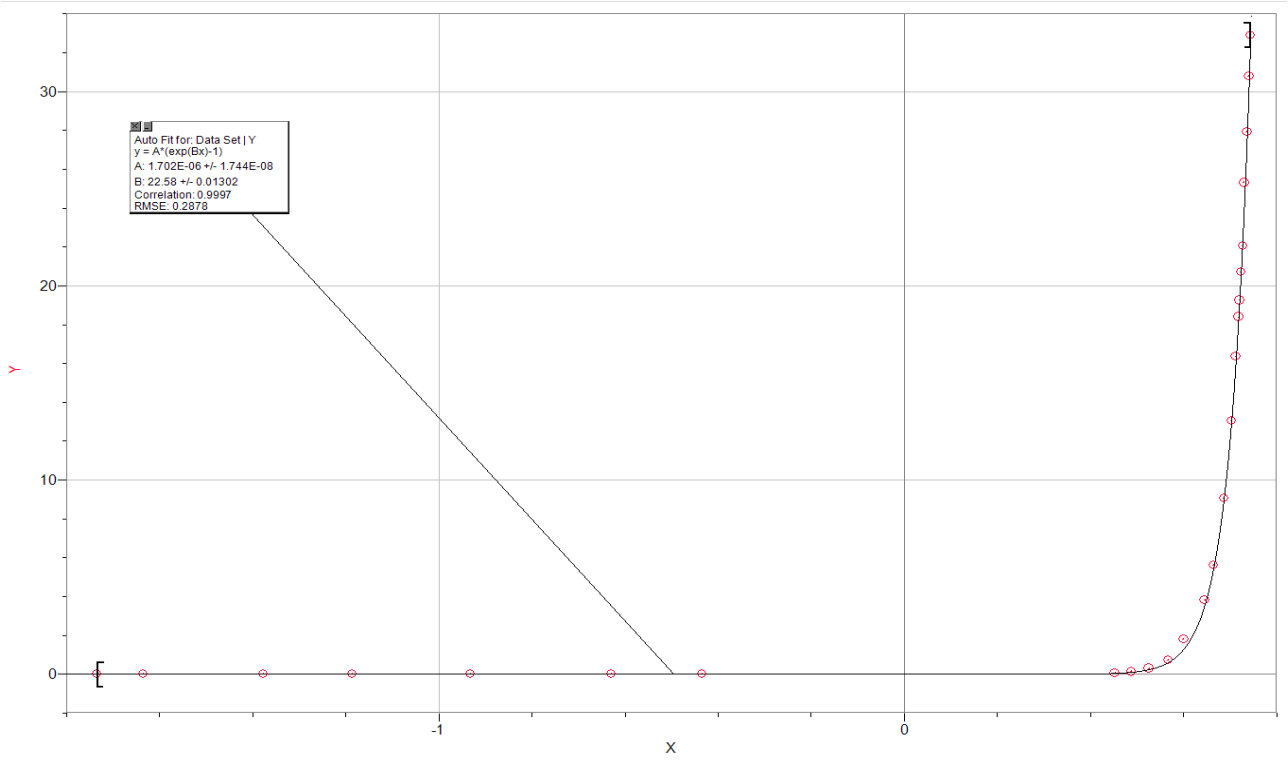

FIG. 3. The Silicon Diode Table and Graph

	Data Set	
	X	Y
1	0.313	1.098
2	0.371	2.912
3	0.431	5.443
4	0.477	7.718
5	0.512	9.477
6	0.554	11.675
7	0.619	15.342
8	0.677	20.258
9	0.708	25.357
10	0.698	23.506
11	0.719	27.622
12	0.733	31.588
13	0.736	32.666
14	-0.37	0.000052
15	-0.49	0.000063
16	-0.568	-0.00007
17	-0.071	0.000084
18	-0.88	-0.0001
19	-1.063	0.000117
20	-1.213	0.000131
21	-1.462	0.000155
22	-1.569	0.000164

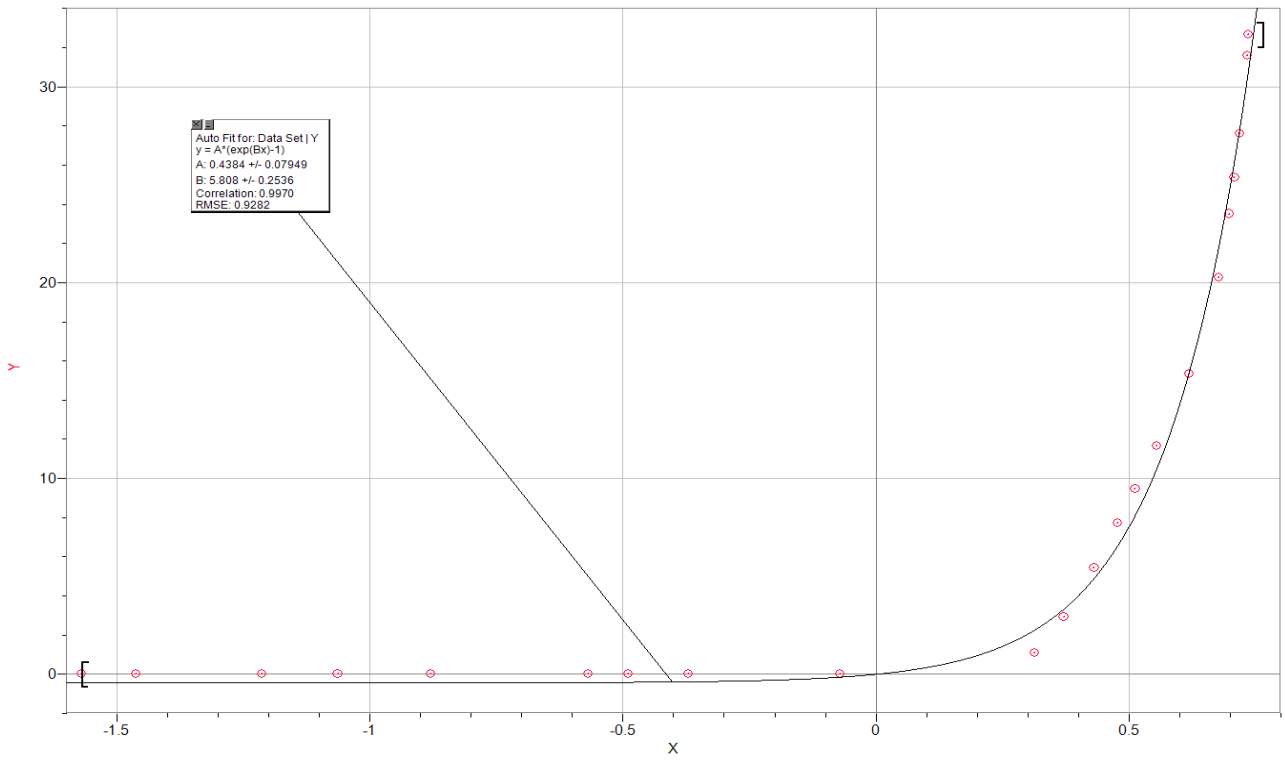

FIG. 4. The Germanium Diode Table and Graph

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