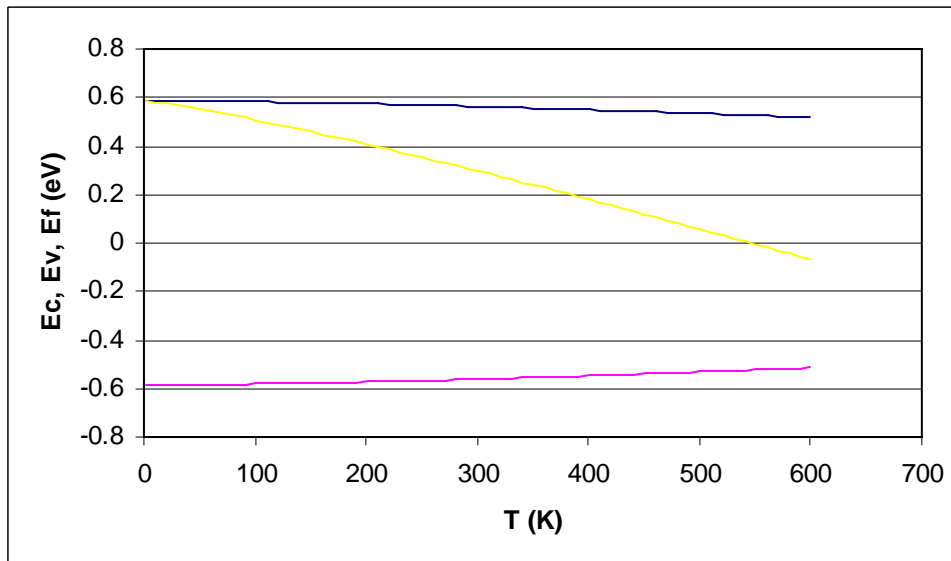
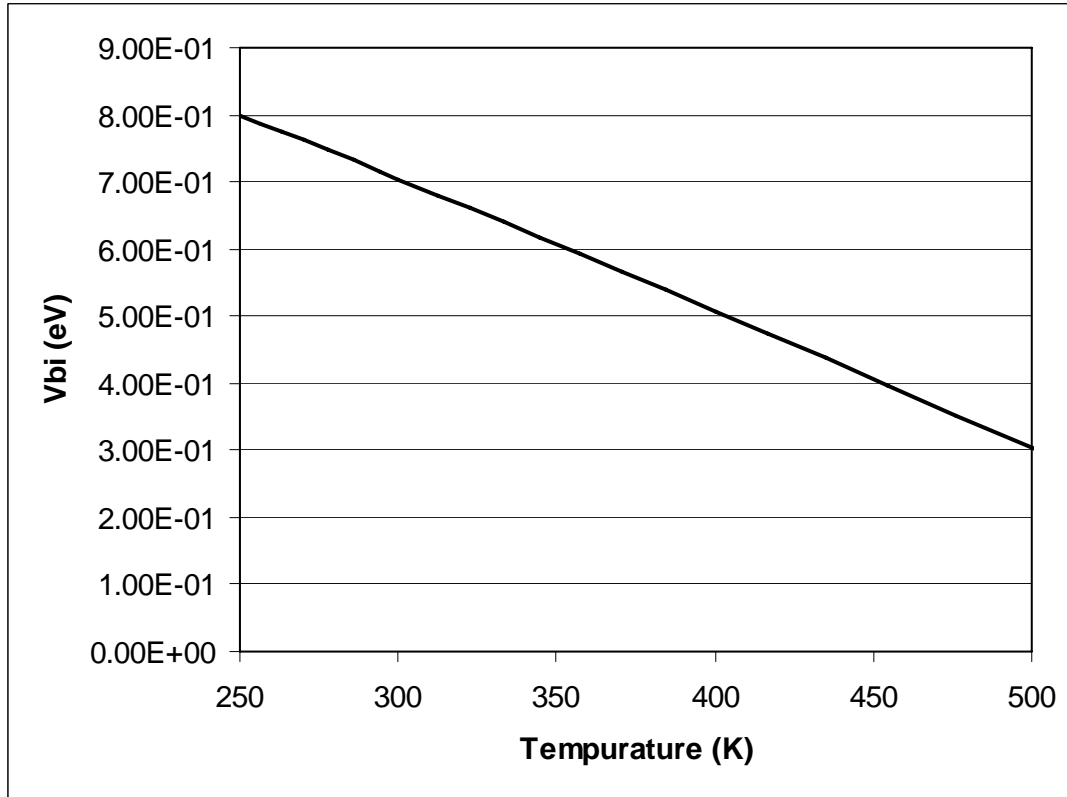


Problem 3:

I used my n_i vs temp plot from the hw 2. (I used the references equation that took into account the band gap's dependence on temperature.) I assume that all the impurities were ionized which is a good assumption, given the temperature and relatively low levels of doping.



If we look at the EGD we see that E_f crosses E_i around 550K. This is where the semiconductor becomes intrinsic again. This EGB is only done for $N_D=10^{15}\text{cm}^{-3}$ because this is the limiting factor. (See fig. 28 chapter 2.)

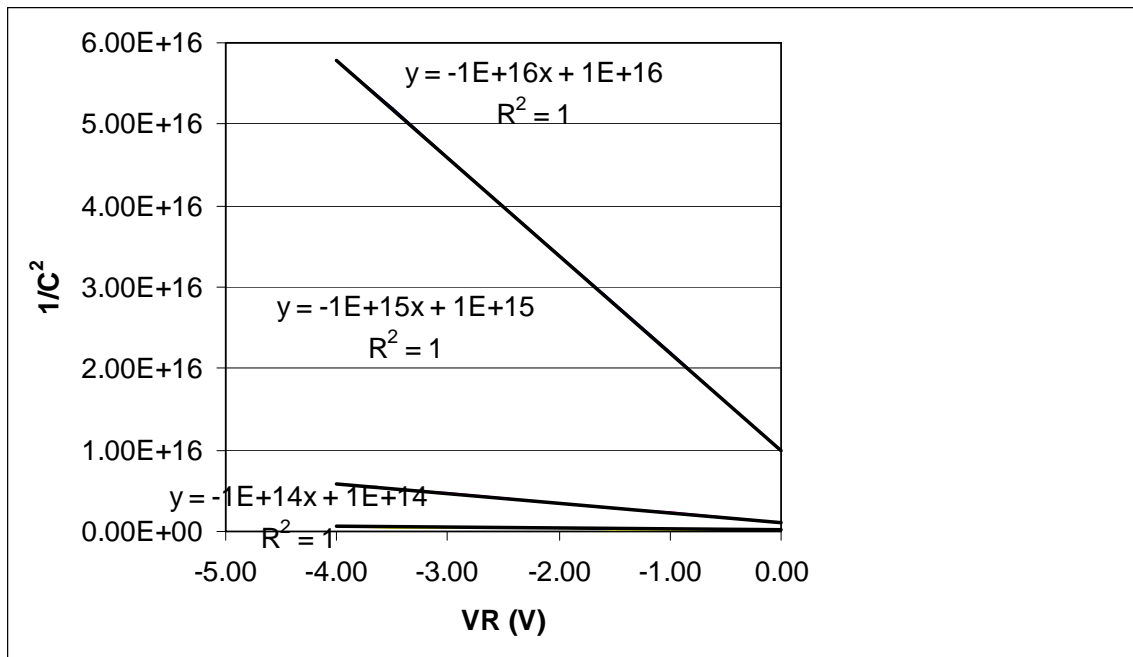
Use equation 27 from chapter 4 of the book because the heavily doped side of the junction is much more highly doped than the lowly doped side.

$$W@ 300\text{K} = .959 \times 10^{-4} \text{cm.}$$

Assume $X_n=W$ since the p-side is two orders of magnitude greater than the n-side (Example 2 page 96.)

$$E_{\text{max}} = 1.47 \times 10^4 \text{V/cm}$$

Problem 5:



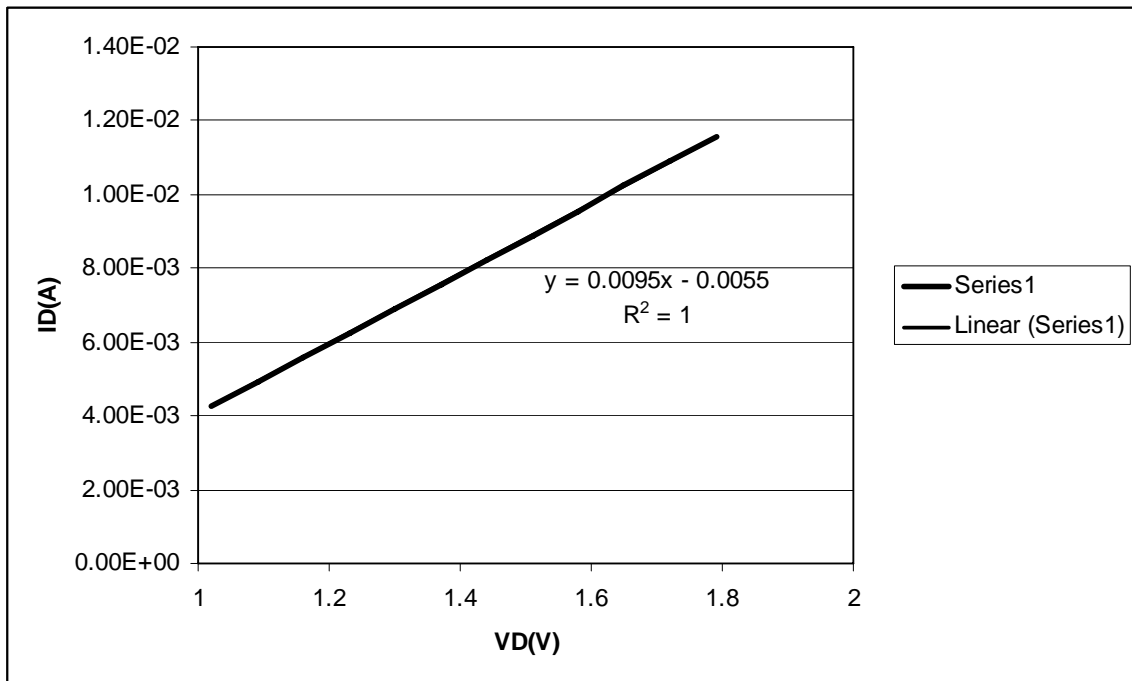
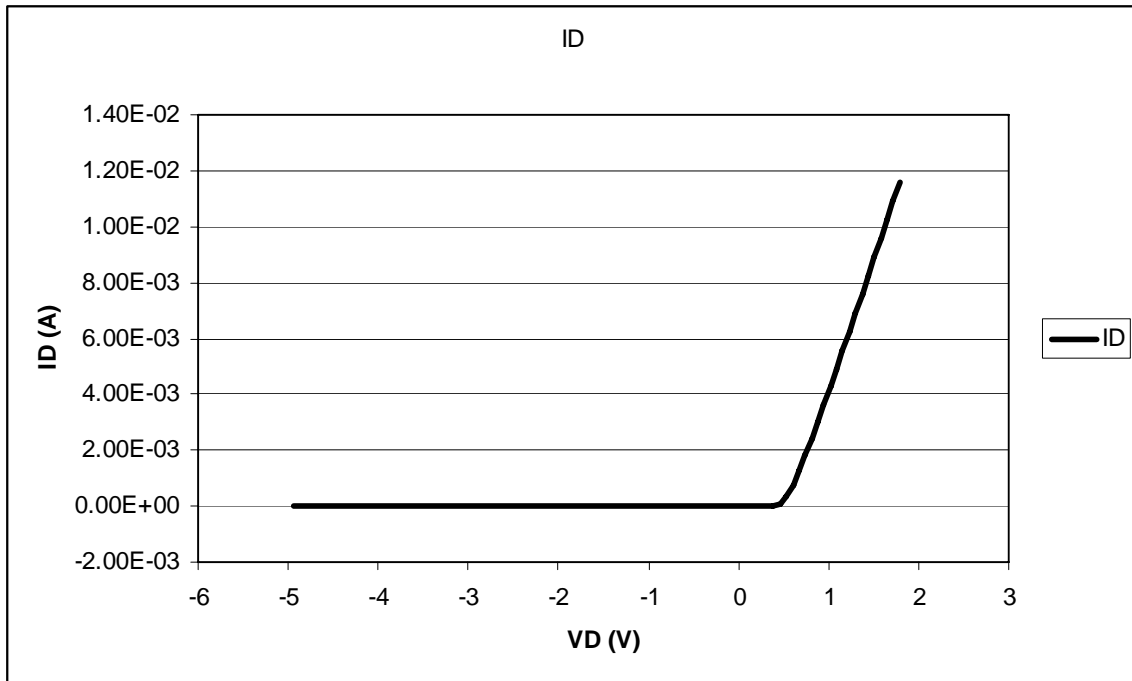
In this simple case $m = \text{abs}(b)$ which is a method to measure NB.

Problem 16:

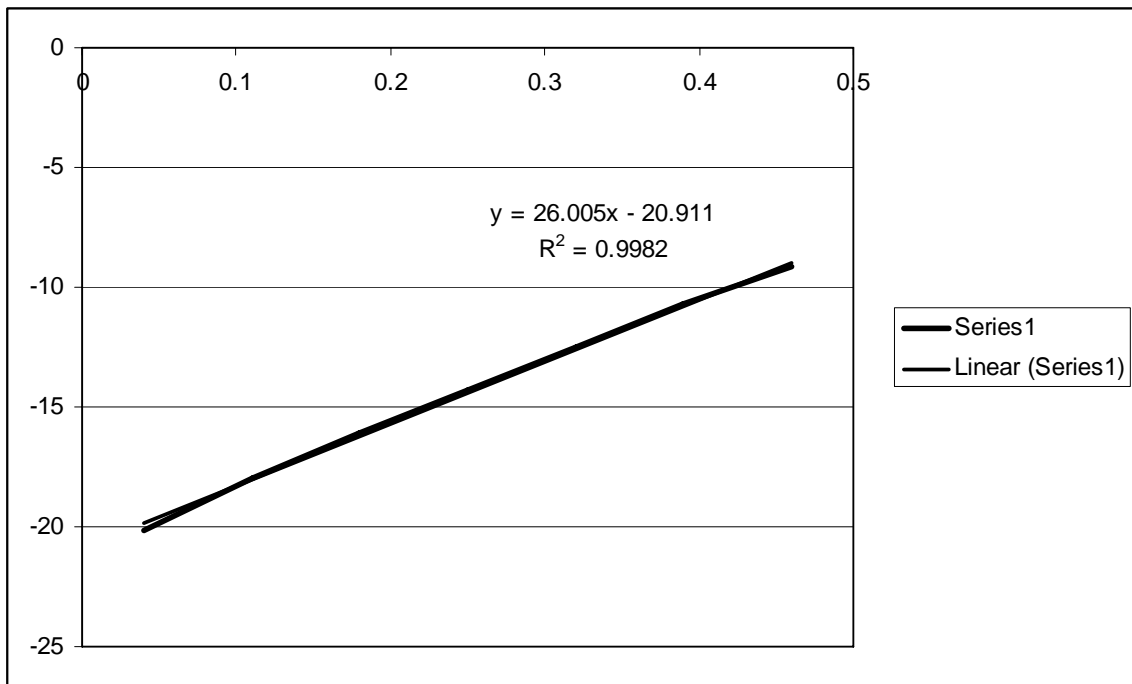
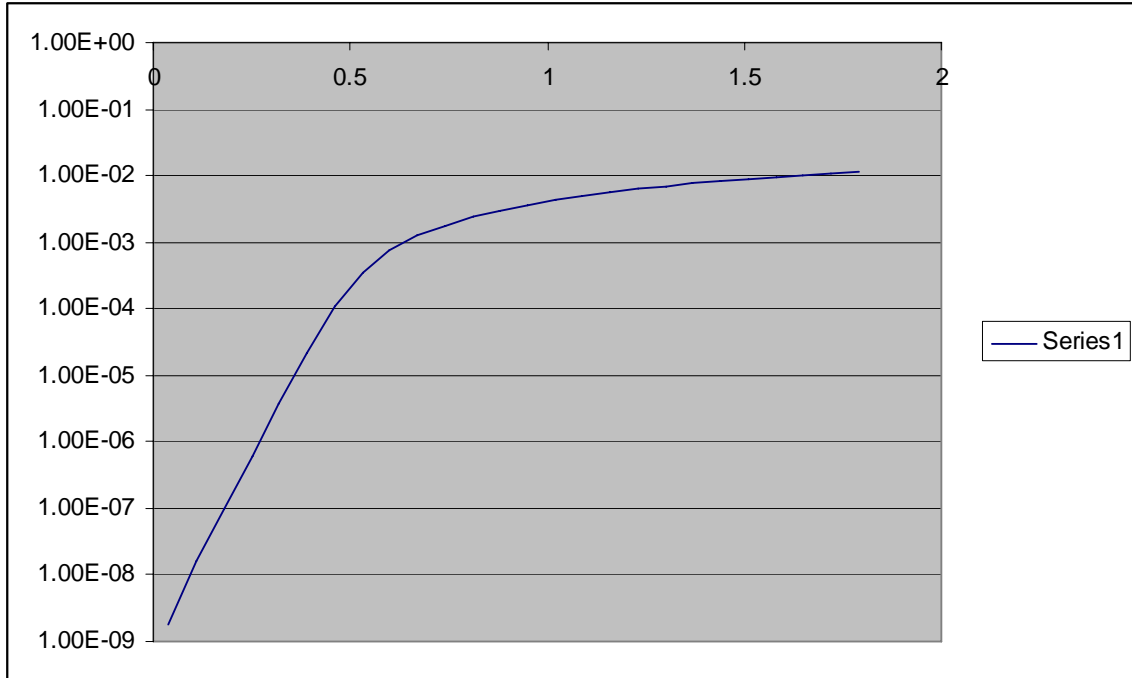
From the chart the breakdown voltage is 300V. If the n side is reduced to $5\mu\text{m}$, then the depletion width is reduced and the breakdown voltage is reduced between 100 and 200 V. It does not matter what N_A is as long as it is two orders of magnitude larger than N_D . We see that N_D for from 10^{17} to 10^{19}cm^{-3} and the width at breakdown is $2\mu\text{m}$.

-300	1.00E+15	1.00E+19	8.37E-01	0.001981678
-300	1.00E+15	1.00E+17	7.17E-01	0.001981285
BETWEEN 100 AND 200 v				

Diode 1:



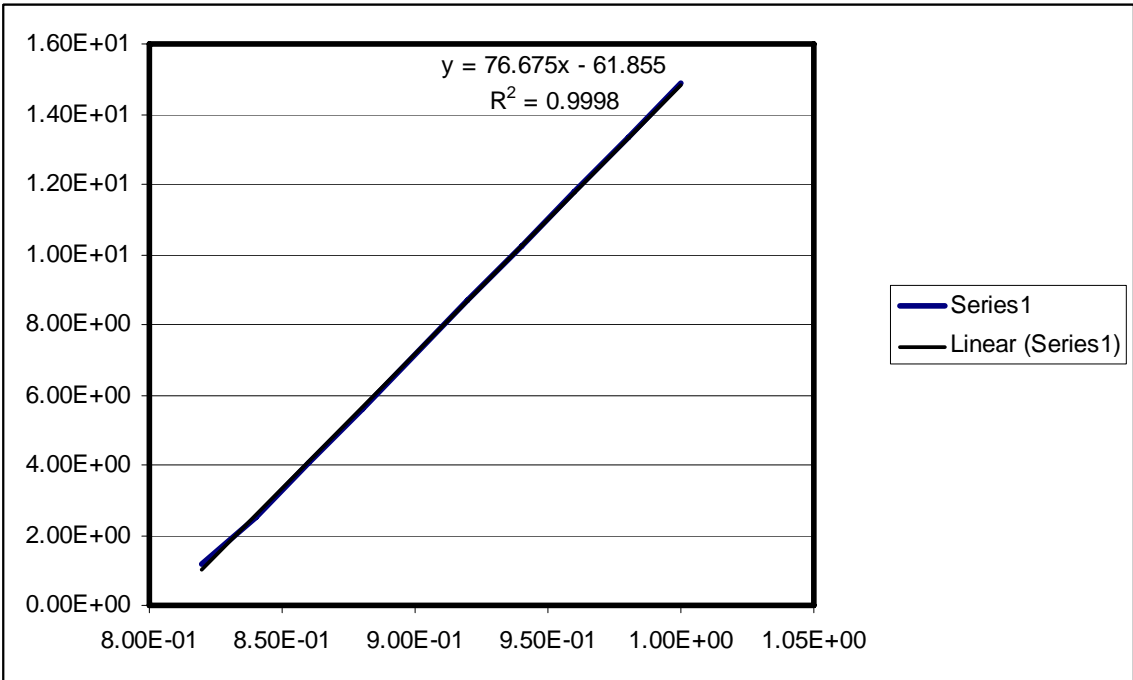
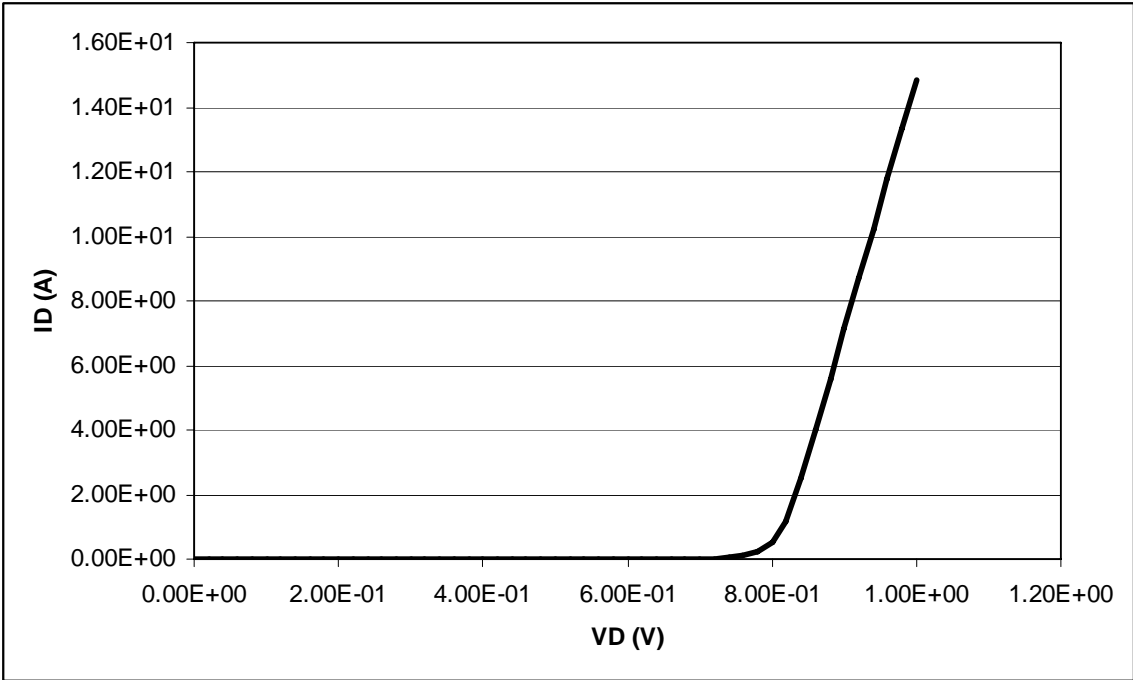
RS=105 Ohms



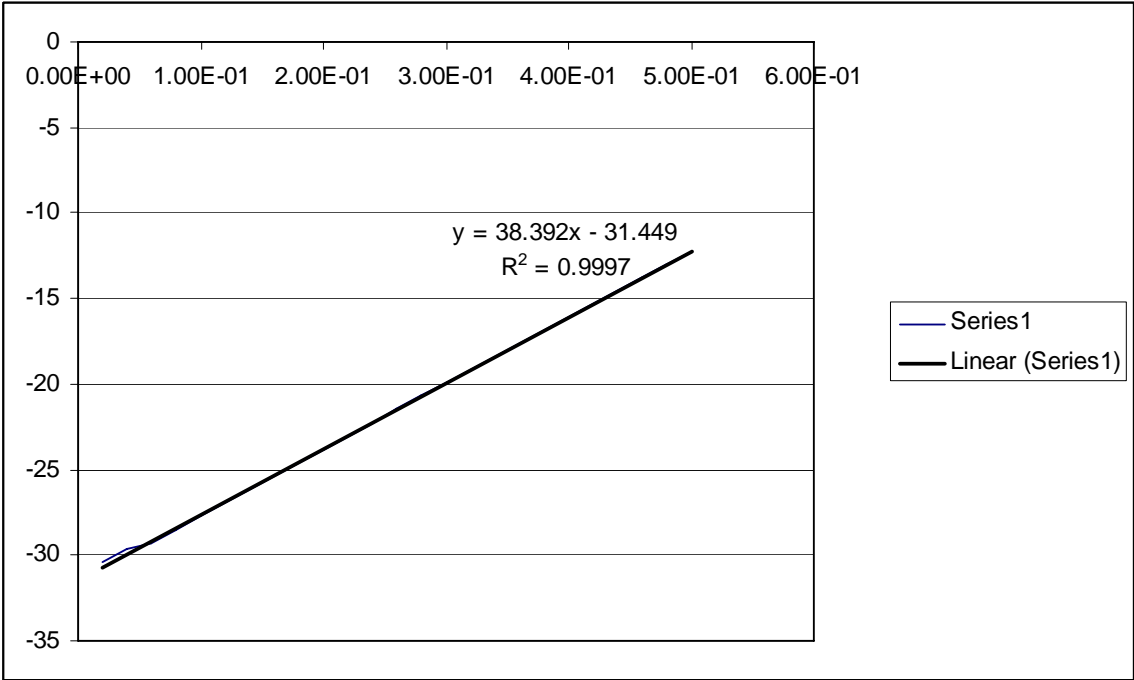
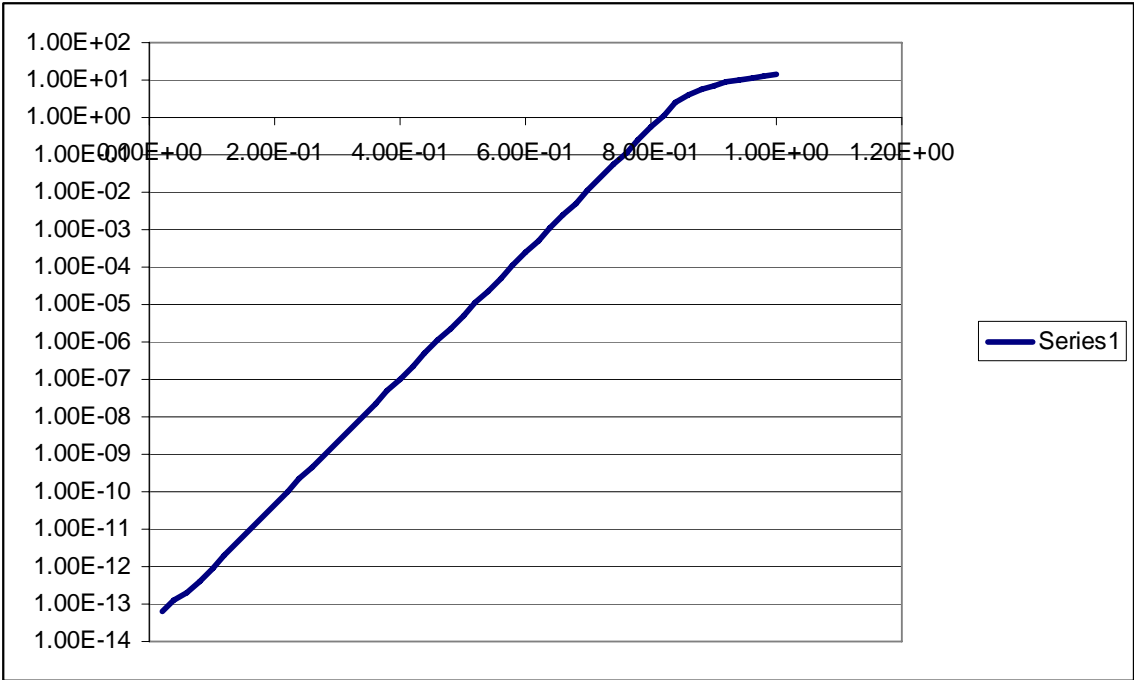
$$IS = \exp(-20.911) = 7.65e-10A$$

$$N = 1/26.005/0.0259 = 1.49$$

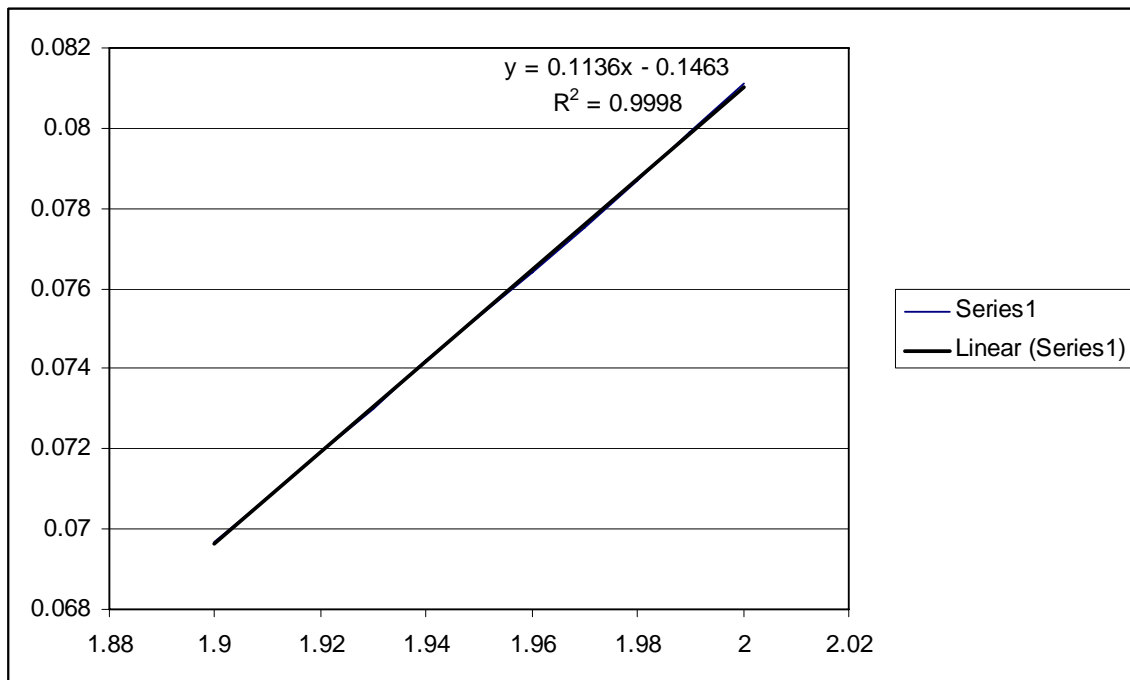
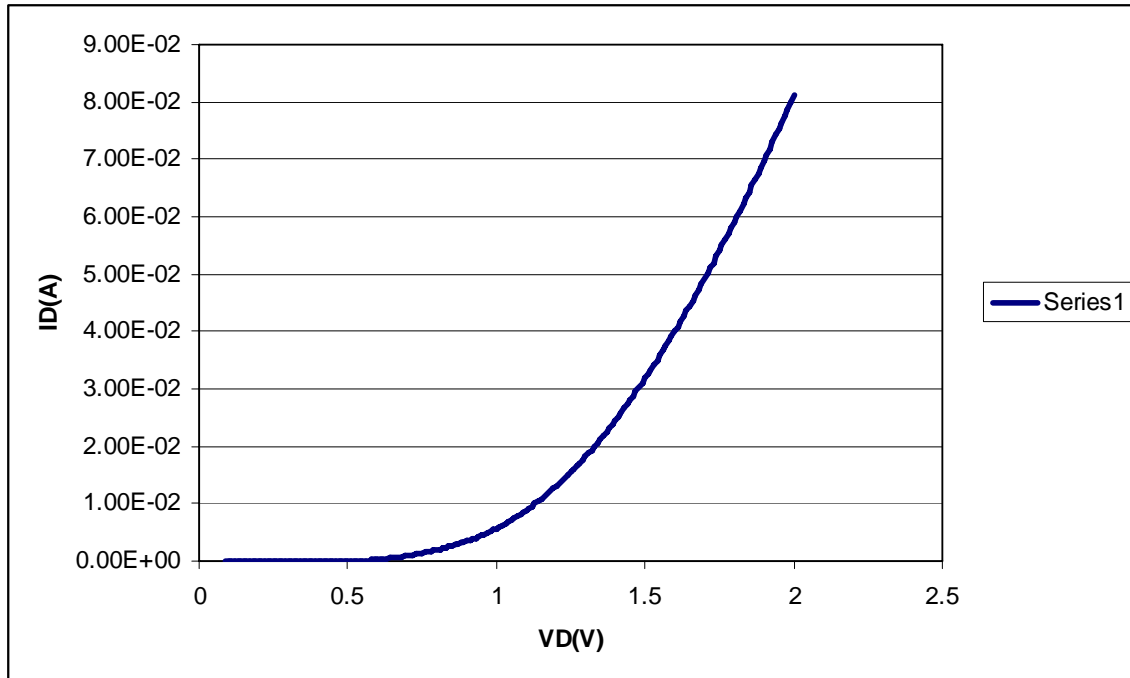
Diode 2:



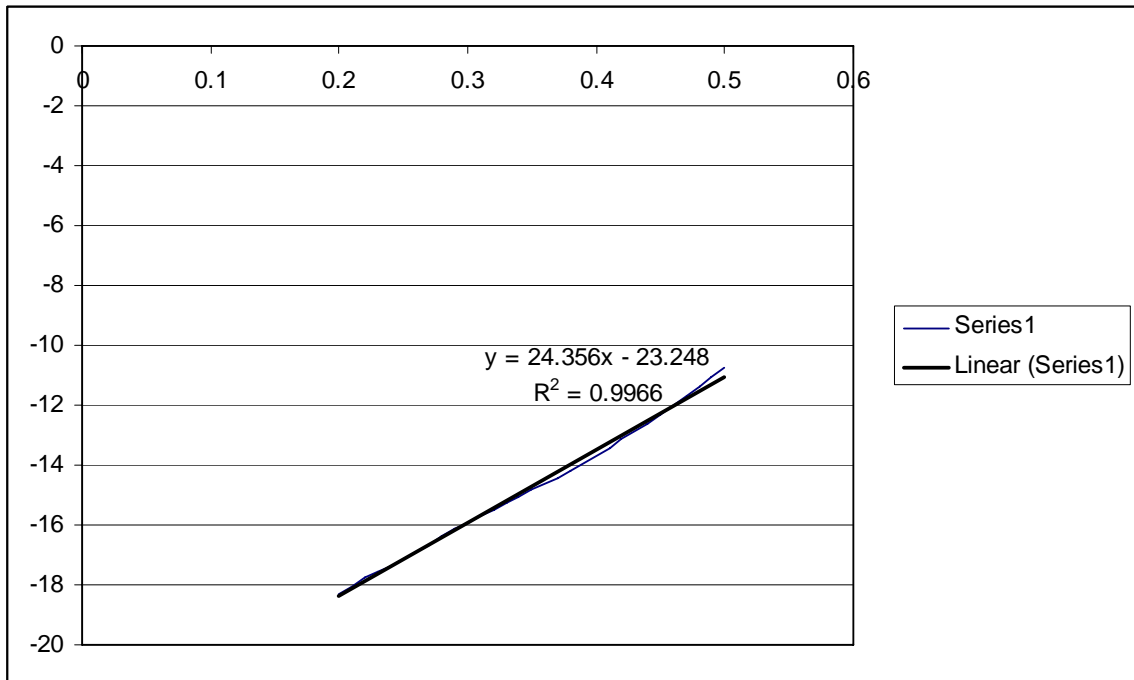
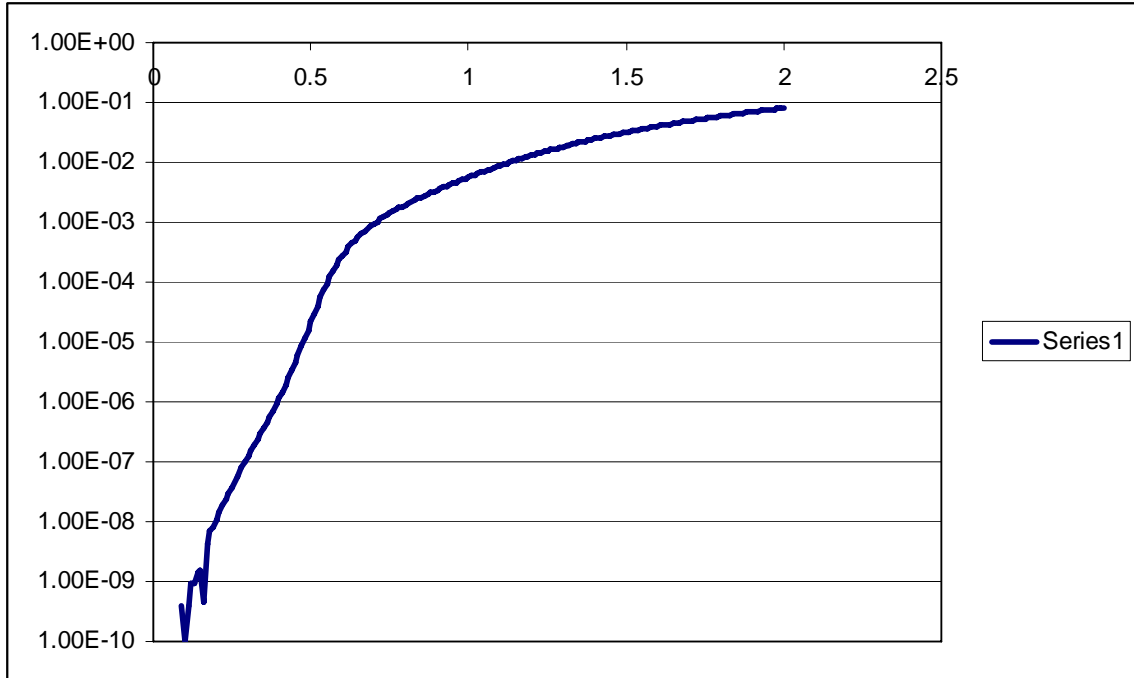
$RS = 1/76.675 = .013 \text{ ohms}$



IS=2.2e-14A
 N=1.005
 Diode 3



RS=8.8ohms



IS=8e-11A
 N=1.58