**Physics 112**

**Exp.#1: Linear and Nonlinear Elements**

**Preliminary Laboratory Questions**

1. Find the value of the electric resistance of a carbon resistor from the four colors ordered on it as: yellow, black, red and silver.
2.  How an ammeter is connected in an electric circuit and why?
3. How an voltmeter is connected in an electric circuit and why?
4. Consider the circuit shown: Find the value of R2

 If R1=100 Ω , the reading of the voltmeter 10 V and the reading of the ammeter 20 mA.

1. If the resistance of the tungsten wire in the light bulb is 2 Ω at 20 ˚C what would be its resistance at a temperature of 1320 ˚C, if the thermal coefficient of o resistance of tungsten is 4.5 x 10-3 ˚C-1 .
2. Explain how you can measure the temperature of glow of the tungsten filament in the light bulb.
3. Explain how a current flows in a semiconducting diode in the two states of biasing (forward and reverse) .
4. Find the current in a silicon diode with a reverse saturation current of IS= 12 pA when it is biased;

 a-Forward at 0.26 V, and 0.52 V

 b-Reverse at 0.26 V, and 0.52 V

(Note that the current for ideal diode is given by:

$I=I\_{S}(e^{\frac{V}{V\_{T}}}-1)$ (1)

Where V is the applied voltage IS the saturation current and VT=kBT/q ≈26 mV the so called thermal voltage.

Here we take Boltzmann constant kB =1.38x10-23J/K, T=300 K , and q=1.6x10-19C)

1. Find the voltage on the diode at very high current ( take I=1A).

(Note that from (1) the voltage could be given by: $=V\_{T}ln⁡(\frac{I}{I\_{S}})$ )