Physics 2145 Test 2 Preparation Homework

1. A 1m length of wire is made by welding the end of a 60cm silver wire to the end of a 40cm copper wire. Each piece of wire has a circular cross-section 0.5mm in diameter. A potential difference of 2V is maintained between the ends of the 1m composite wire. The wire is at room temperature; the resistivity for copper is 1.72×10⁻⁸Ωm and the resistivity for silver is 1.47×10⁻⁸Ωm.

Calculate the current in the silver section of the wire.

2. For the resistor circuit shown R₁ = R, R₂ = 2R, R₃ = 3R, and R₄ = 6R.
   (a) Find the equivalent resistance in terms of R.

   (b) The power supply provides a potential difference V₀ = 12 V. If the current I₁ passing through R₁ equals 6A, determine the currents I₂, I₃, and I₄ passing through each of the remaining resistors and the value of R.
3. A 4.0 mF capacitor is initially uncharged. It is connected in series with a switch of negligible resistance, a 500 Ω resistor, and an emf of 100 volts. The switch is closed at time t=0.
Find:
- the time constant of this circuit
- the current through the resistor at time t=0, at t= 1s, and after a long time
- the charge on the capacitor at t=0, at t=1s  and after a long time

4. A student measured the current flowing through a device as a function of the voltage drop across the device.

A) Does this device follow Ohm’s Law? Why or why not?
B) What is the resistance of this device?

5. A given 15 kΩ resistor has a power rating of 5.0 W.

A) What is the maximum current it can carry without damage?
B) What is the greatest allowable potential difference across the terminals of the resistor?