Current and Resistance

Name_____

Concepts:

1) What causes a flow of charges?

2) Name the two voltage sources?

3) Give another name for voltage and why is this name sometimes used?

4) What is current?

5) What is the equation for current?

6) What is the SI unit for current and who is it named after?

7) What are the two types of current and how are they different?

8) Which way does current flow in relation to the flow of the electrons? Why?

9) What is drift speed?

10) Explain electrical resistance?

11) What is Ohm's law?

12) What is resistivity?

13) What three ways can you change the resistance of a wire?

14) Explain fully how to read the color code on a resistor and what each color means in each band.

Exercises and problems:

15) $\Delta Q = 4$ C and $\Delta t = 3$ seconds, find the current.

16)   How long will it take for 75 amps to flow if it has a charge of 8 coulombs?

17)   What is the drift speed if the charge is -1.6 x 10^{-19} C and the number of charge carriers are 9 x 10^{23} electrons with a cross sectional area of 3 x 10^{-6} m^2 and 10 amps? $V_{drift} = I / nqA$

18)   What is the drift speed in gold if the charge is –51.2 x 10^{-19} C and the number of charge carriers are 6.4 x 10^{23} electrons with a cross sectional area of 7 x 10^{-6} m^2 and 20 amps?

Use the following table for resistivity exercises and problems:

Material	Resistivity ($\Omega \cdot$ m)
Silver	1.59×10^{-8}
Copper	1.7×10^{-8}
Gold	2.44×10^{-8}
Aluminum	2.82×10^{-8}
Tungsten	5.6×10^{-8}
Iron	10.0×10^{-8}
Platinum	11×10^{-8}
Lead	22×10^{-8}
Nichrome*	150×10^{-8}
Carbon	3.5×10^{5}
Germanium	0.46
Silicon	640
Glass	$10^{10} - 10^{14}$
Hard rubber	$\approx 10^{13}$
Sulfur	10^{15}
Quartz (fused)	75×10^{16}

19)   What is the resistance of a copper wire that has a length of 4 meters and a cross-sectional area of 4 x 10^{-6} m^2?

20)   What is the resistance of a silver wire that has a length of 2.5 meters and a cross-sectional area of 8 x 10^{-6} m^2?

21)   What is the resistance of a platinum wire that has a length of .08 meters and a cross-sectional area of 3 x 10^{-7} m^2?

22)   What is the resistance of a aluminum wire that has a length of 100 meters and a cross-sectional area of 3 x 10^{-4} m^2?

Ohms law exercises and problems:

23) $\Delta V = 10$ volts, I = 5 amps, find the resistance.

24)   I = 2 amps, R = 100 ohms, find the voltage.

25) $\Delta V = 60$ volts, R = 1000 ohms, find the current.

26) $\Delta V = 160$ volts, I = 30 amps, find the resistance.

27)   I = 45 amps, R = 100000 ohms, find the voltage.

28) $\Delta V = 9$ volts, R = 150 ohms, find the current.

29)   A 9 meter long piece of copper wire with cross sectional area of 3×10^{-6} m^2 has a voltage across it of 120 volts. How much current will flow through it? (This combines resistivity and Ohm's law)

30)   In your computer the longest individual wire is about 8 cm long. In general the computer companies use copper wire with gold contacts. In an effort to reduce the size of the computer they use very thin wire (2×10^{-7} m^2). An electrical engineer is trying to decide what resistor he needs to put in the circuit such that the wire carries a current though it of .015 Amps. What would you suggest?