Metals vs. Non metals

**Background**

What materials make the best plumbing supplies? Or the best electrical wiring? Material scientists research questions like these to try to find the best materials for different products. Knowledge of the periodic table can help them predict what type of material they should research. In today’s lab, you will identify various properties of various items. You will then apply this knowledge to predict relationships among groups in the periodic table**.**

**Electric current** is the flow of charge. **Brass** is an alloy consisting of copper and zinc. **Steel** is a modified form of iron with some carbon in it All transition elements have 1 or 2 valence electrons. Use Chp 13, sec 1 to help interpret your results.

**Materials**

Light bulb, D cell, wire, paper clip, eraser, chalk, lead, paper, glass, hot water, cold water

**Procedure**

*Physical properties*

1. Compare the shininess and color of your samples. Record in notebook.
2. Try to bend each sample (**do not use all of the graphite samples to perform this task)** Record in notebook.

*Electrical conductivity*

1. Construct a complete electric circuit using the cell, the wire, and the light bulb. Be sure that the light will light up before conducting electrical conductivity tests on the rest of the items.
2. To test for flow of charge, wrap the two free ends of the wires together. Make sure all parts of wires are touching and that your circuit is closed (no open areas). If you have done this correctly you should be able to see the light! Note how bright the light is and continue testing other samples by attaching the sample to be tested to the free ends of the wire. Record your observations about each sample in your data table.

*Heat Conductivity*

1. Hold one end of the graphite sample between the fingertips of one hand. Hold one end of the copper wire between the fingertips of the other hand.
2. Dip both the graphite and copper wire into the hot water at the same time. Allow only about 3 cm of each sample to be under the water. From your fingertips to the water, the lengths of both the graphite sample and the copper wire should be about equal.
3. Time how long it takes to feel the heat in the fingertips of each hand. Record you observations.
4. Now use the same technique to time how long it takes your fingertips to feel the heat from each of the various wire samples. Record your observations. Repeat with the cold water.

**Questions/ Analysis**

1. Why was it important to use equal lengths of wire and graphite in step 2 of Heat Conductivity test?
2. Compare the physical characteristics of the various samples you observed.
3. Which samples conduct electricity? What type of material are these samples most likely composed of?
4. What should the heat conductivity test tell you about the material from which the sample is made?
5. Look at the periodic table of elements. Notice the zigzag line that is on the middle right hand side of the table. Notice what groups your samples came from and their placement in the periodic table relative to the zigzag line. What properties would you predict groups of elements would have to the left of the zigzag line? To the right of the zigzag line?