Heat Exchange Between Metal and Water

Purpose: To collect data on several calorimetry experiments; to find the specific heat of two unknown metal samples based on collected data.

Procedure: Click on the following link to access the virtual lab.
Chemistry Department IA State - Heat Exchange Between Metal and Water

1. Click on the metal "SILVER" in the top left of the screen.
2. Set the parameters to the following:
mass of metal = 120 g
temp of metal = 220°C
mass of water = 100 g
temp of water = 20°C
3. Record the specific heat of the metal and the water.
4. Click START.
5. Record the final temperature of the water and the metal.
6. Repeat the experiment for the remaining five metals, two of which are unknowns.
7. Complete the following table.

	Mass of metal (g)	T_i metal (°C)	C of metal (J/g°C)	Mass of water (g)	T_i water (°C)	C of water (J/g°C)	T_f water/ metal (°C)
silver							
gold							
copper							
iron							
metal x			unknown				
metal y			unknown				

Analysis:
1. For each metal, calculate the heat lost by the metal using $Q = mC\Delta t$. Remember that $\Delta t = (T_f - T_i)$. This answer will be in Joules and will be negative because the heat is lost by the metal.
2. For each metal, calculate the heat gained by the water using $Q = mC\Delta t$. Remember that $\Delta t = (T_f - T_i)$. This answer will be in Joules and will be positive because the heat is gained by the water.

3. Compare the answers for the heat lost and heat gained for each metal/water combination. Do they agree? Should they? Justify your answer.If they do not agree, what are some sources of error for this experiment in the real laboratory?
4. For the two unknowns, calculate the heat gained by the water as above in #2. Show this work below.
Metal x:

Metal y:

Divide this answer by the product of the metal mass and the change in temperature of the unknown metal. This answer will be in J/g°C and will be the specific heat of the unknown. Show this work below.
Metal x:

Metal y:

Using a table of specific heat values, find a likely answer to the question of the identity of the unknowns.
Try one of these sites: http://www.standnes.no/chemix/periodictable/specific-heat-capacity.htm
http://www2.ucdsb.on.ca/tiss/stretton/database/Specific_Heat_Capacity_Table.html
http://web.mit.edu/course/3/3.091/www3/pt/pert13.html
[Jeff- I do want to have a few links here. The previous link went dead (in the old course). Or, if you could embed one of these tables in the course, that would work too!]

Notice that specific heat capacity units vary. Be sure that you are using a value that is in units of J/g°C or J/gK. Other variations that are not acceptable are kJ or kg. Note that °C and K ARE interchangeable because the reference to temperature in this value is a reference to the change in temperature. When referring to a change in temperature, one degree Celsius is equal to one Kelvin.

Metal x:
Metal y: