Specific Heat & Calorimetry Virtual Lab – Accel.

Name/Pd.: _____

Objective: Comparison of the heat exchanged by metals.

Website: http://group.chem.iastate.edu/Greenbowe/sections/projectfolder/flashfiles/thermochem/heat_metal.html

Pre-lab: Read pages 523-524 in the chemistry textbook.

1. What is a calorimeter?

2. Describe how a calorimeter works.

3. What household object could be used as a calorimeter and why?

Procedure: Choose two metals to work with from the menu. They must be different metals than the group across from you. You will make a prediction of which metal will raise the temperature of water the highest when a piece of warm metal is placed in cool water in a calorimeter.

1. Choose your metals: Metal A: _____ Metal B: _____
2. Which metal do you predict will raise the temperature of the water the most? _____ Explain your prediction. (We already know that each metal has a different specific heat, so stating this fact is not an explanation.)

3. Use the computer simulation to do your experiment.
   - Use the mass and Ti listed for each of your metals.
   - Record your data in the table below.

	Mass (g)	**T_i (°C)**	**Specific Heat**	**T_f (°C)** *(same for the water & the metal in each trial)*	**ΔT (°C)** *(T_f-T_i)*
Metal A	30.00	100.00			
Water	30.00	20.00	4.18 J/g°C		
Metal B	30.00	100.00			
Water	30.00	20.00	4.18 J/g°C		

4. Which metal raised the temperature of water the most? _____
5. Did your prediction (from #2) match your experimental results? Explain.

6. In your experiment, heat was transferred from _____ to _____
7. Calculate the heat that was exchanged by the ***water*** using the experiment listed in #4. Use the formula $q=mc\Delta T$. Show all of your work and label your answer. Be sure to indicate the sign (positive or negative).

8. Calculate the heat that was exchanged by the ***metal*** listed in #4. Use the formula $q=mc\Delta T$. Show all of your work and label your answer. Be sure to indicate the sign (positive or negative).

9. Without doing any experiments, what do you expect to happen to the temperature of the water if you double the mass of metal A while keeping everything else the same?

10. Without doing any experiments, what do you expect to happen to the temperature of the water if you double the mass of water while keeping everything else the same?

11. Perform the two experiments listed in #9 and #10. Did your predictions match the results of the computer simulation? Explain.

12. Using your textbook as a resource, explain the Law of Conservation of Energy.

13. Compare the values of the heat exchanged by the water and the metal (# 7 & #8). Within experimental error, was the Law of Conservation of Energy obeyed?

Activity 2: Determination of the specific heat of an unknown metal.

Choose either Metal X or Metal Y (circle your choice). Design and carry out an experiment that will help you determine the specific heat of this metal. Record your procedure, observation (data), and calculations below.

1. Procedure:

2. Observations:

3. Calculations:

4. Claim: The specific heat of metal _____ is _____.

Energy & Specific Heat Practice

1. Explain what is meant by energy.
2. List two units used to measure energy. _____
3. What is the relationship between a calorie and a joule?

4. An exothermic reaction releases 86.5 kJ. How many kilocalories of energy are released?

5. A 4.50 g nugget of pure gold absorbed 276 J of heat. What was the final temperature of the gold if the initial temperature was 25.0 °C? The specific heat of gold is 0.129 J/(g * °C).

6. A 155 g sample of an unknown substance was heated from 25.0 °C to 40.0 °C. In the process, the substance absorbed 5696 J of energy. What is the specific heat of the substance?

7. Explain why you need to know the specific heat of a substance in order to calculate how much heat is gained or lost by the substance as a result of a temperature change.