Name _____ Date _____ Period _____

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Calorimetry

Chemistry

Heat lost = heat gained: $q_{rxn} = -q_{soln}$. Treat solutions like water: c = 4.18 J/g·°C and 1.00 g/mL, and use the total mass. $\Delta T = T_{final} - T_{initial}$. $c_{iron} = 0.449$, $c_{copper} = 0.385$, $c_{aluminum} = 0.897$ J/g·°C.

1. An instant cold pack gets cold when you squeeze it. (a) What is the system? What are the surroundings? (b) Is q for the system positive or negative? (c) Is the process exothermic or endothermic?

2. 50.0 g of water at 70.0 °C is mixed with 150. g of water at 10.0 °C. Find the final temperature.

3. 5.00 g of $CaCl_2$ (110.98 g/mol) dissolves in 95.0 g of water, and the temperature rises from 21.0 °C to 30.6 °C. Find q_{soln}, q_{rxn}, and ΔH in kJ/mol. Is dissolving $CaCl_2$ exothermic or endothermic?

4. 100.0 mL of 0.50 M HCl and 100.0 mL of 0.50 M NaOH are mixed, and the temperature rises from 22.0 °C to 25.4 °C. 0.050 mol of water forms. Find q_{rxn} and ΔH in kJ/mol.

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5. A 50.0 g piece of iron at 100.0 °C is dropped into 100. g of water at 20.0 °C. (a) Find the final temperature. (b) The iron changed by about 76 °C, but the water changed by only about 4 °C. Explain why.

6. NH_4NO_3 dissolves in water, and the temperature drops from 22.0 °C to 15.5 °C. A student says, "q_{soln} is negative, so the reaction released heat." Explain the mistake.

7. A 45.0 g metal sample is heated to 99.5 °C and dropped into a calorimeter holding 60.0 g of water at 22.0 °C. Both end at 32.7 °C. Identify the metal. The first row is done for you.

Step	**Work**	**Result**
Heat gained by the water	(60.0 g)(4.18 J/g·°C)(32.7 − 22.0 °C)	2.68×10^3 J
Heat lost by the metal		
ΔT of the metal		
c of the metal		
Which metal?		

8. A 150.0 g piece of copper at 98.0 °C is placed in water at 20.0 °C. Both end at 30.0 °C. (a) What mass of water was in the cup? (b) Which law lets you set the heat lost equal to the heat gained?

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