Study Guide Unit 10 – Thermochemistry Name: _____

Vocabulary to know:

- Vaporization
- Fusion
- Exothermic
- Condensation
- Solidification
- Joule (in notes)
- Chemical Potential energy
- Endothermic
- Specific Heat Capacity
- Chemical Energy

$C_{p\ (liquid)} = 4.18\ J/g\bullet^{\circ}C$

$C_{p\ (ice)} = 2.09\ J/g\bullet^{\circ}C$

$C_{p\ (steam)} = 1.84\ J/g\bullet^{\circ}C$

Things to study

- Difference between endothermic and exothermic processes
- Chemical Energy Stoich
- Concepts of specific heat. What is the difference between a high specific heat and a low specific heat?
- Can you draw a heat curve? Label liquid, solid, and gas.
- Label fusion, solidification, vaporization, and condensation on the heat curve
- Know the concepts and relationship between heat and temperature on the heat curve
- How to calculate using $q = mc\Delta T$

Sample Questions - $q = mc\Delta T$

1. If a 134.5 g piece of metal requires 1.07 kJ to raise its temperature from 45 °C to 79 °C, what is the specific heat of the metal?
2. Find the *initial temperature* of 5.00 moles of water as it cools to a temperature of 20.0 °C if the amount of heat released is 20.0 kJ
3. If a sample of water at 70 °C cools to a temperature of 35 °C, and the energy change of the system is -40.0 kJ, what is the mass of the water?
4. How much heat is given out when 100.0 g of solid lead cools from 200.0 °C to 0.0 °C (the specific heat of lead is 0.128 J/g°C).

Sample Questions - Thermochemical Stoichiometry

5. What mass of hydrogen must be reacted with excess nitrogen to produce 5.00 kJ of energy?

$$3\ H_2 + N_2 \rightarrow\ \ 2NH_3 + 2709\ kJ$$

6. Calcium oxide, CaO, reacts with carbon as graphite (pure carbon). Calcium carbide, CaC_2, and carbon monoxide are produced in an endothermic reaction.

$$462.3\ kJ + CaO\ (s) + 3C\ (s)\ \rightarrow\ CaC_2(s) + CO(g)$$

   a. 246.7 kJ of energy is available to react. What mass of carbon monoxide (CO) is produced, assuming sufficient reactants?

   b. What is the heat change for the reaction of 96.7 g of graphite (carbon) with excess calcium oxide?