Chemistry Name: _____

Section _____ Heat Calculations WS Date: _____

Solve the following problems. Write the formula, show all substitutions, show answers to the correct number of significant digits, and include all units and cancellations.

1. How many joules are needed to melt 500. g of ice at its freezing point?

   q = ? J
   m = 500. g
   H_f = 334 J/g

   $q = mH_f$
   = 500. g × 334 J/g
   = 167,000 J

2. How many kilojoules are needed in Problem #1?

   $$167{,}000\ \text{J} \times \frac{1\ \text{kJ}}{1000\ \text{J}} = 167\ \text{kJ}$$

3. How much heat is needed to vaporize 500. g of water at its boiling point?

   q = ? J
   m = 500. g
   H_v = 2260 J/g

   $q = mH_v$
   = 500. g × 2260 J/g
   = 1,130,000 J or 1,130 kJ

4. If 5,100 J are given off when a sample of water freezes, what is the mass of the water?

   q = 5,100 J
   m = ? g
   H_f = 334 J/g

   $q = mH_f$

   $m = q \div H_f$
   = 5,100 J ÷ 334 J/g
   = 15 g

5. If 57,000 J are given off when a sample of steam condenses, what is the mass of the steam?

   q = 57,000 J
   m = ? g
   H_v = 2260 J/g

   $q = mH_v$

   $m = q \div H_v$
   = 57,000 J ÷ 2260 J/g
   = 25 g

6. How many J are needed to raise the temperature of 500. g of water from 20°C to 30°C?

   q = ? J
   m = 500. g
   C = 4.18 J/g·K
   ΔT = (30–20) K

   $q = mC\Delta T$
   = 500.g × 4.18 J/g·K × 10 K
   = 20,900 J or 20.9 kJ

7. How many J would be absorbed if 500. g of water has it temperature raised by 55 °C?

   q = ? J
   m = 500. g
   C = 4.18 J/g·K
   ΔT = 55 K

   $q = mC\Delta T$
   = 500.g × 4.18 J/g·K × 55 K
   = 114,950 J or 115 kJ