NSM 12C PAL Worksheet Thermochemistry Name: _____

Constants & Equations:

$\Delta E = q + w$ $w = -P \times \Delta V$ $q = m \times C \times \Delta T$ $C_{H_2O} = \frac{4.181\ J}{g \cdot {}^{o}C}$ $101.3\ J = 1L \times atm$

1. Which of the following signs on q and w represent a system that is doing work on the surroundings, as well as losing heat to the surroundings?
   A) q = +, w = –
   B) q = – , w = –
   C) q = –, w = +
   D) q = +, w = +
   E) None of these represent the system referenced above.

2. Which of the following is TRUE if ΔEsys = – 95 J?
   A) Both the system and the surroundings are gaining 95 J.
   B) The system is gaining 95 J, while the surroundings are losing 95 J.
   C) The system is losing 95 J, while the surroundings are gaining 95 J
   D) Both the system and the surroundings are losing 95 J
   E) None of the above are true.

3. For ΔEsys to always be –, what must be true?
   A) –w > q B) q = w C) +w > -q D) +q > -w

4. Calculate the change in internal energy (ΔE) for a system that is giving off 25.0 kJ of heat and is changing from 12.00 L to 6.00 L in volume at 1.50 atm pressure.

5. Calculate the amount of heat (in kJ) required to raise the temperature of a 79.0 g sample of ethanol from 298.0 K to 385.0 K. The specific heat capacity of ethanol is 2.42 J/g°C.

6. Determine the final temperature of a gold nugget (mass = 376 g) that starts at 398 K and loses 4.86 kJ of heat to a snow bank when it is lost. The specific heat capacity of gold is 0.128 J/g°C.

7. A 50.0-g sample of liquid water at 25.0°C is mixed with 29.0 g of lead at 45.0°C in a coffee cup calorimeter. The final temperature of the water is _____°C.

8. How much energy is <u>evolved</u> during the reaction of 48.7 g of Al, according to the reaction below? Assume that there is excess Fe_2O_3.

$$Fe_2O_3(s) + 2\ Al(s) \rightarrow Al_2O_3(s) + 2\ Fe(s) \qquad \Delta H°_{rxn} = -852\ kJ$$