Chemistry 30 Chapter 11 Quiz 27 Name KEY 2010 - 2011 Blk ____

Use complete sentences to answer questions that require an explanation.

1. Determine the final temperature of 6.50 L of water at 15.0 °C if it absorbs 800 kJ of heat. [2]

$Q = 800\,kJ = 800{,}000\,J$
$m = 6.50\,kg = 6{,}500\,g$
$t_i = 15.0°C$
$t_f = ?$
$c = 4.19\ J/g°C$

$Q = mc\Delta t$
$\Delta t = \frac{Q}{mc}$
$\Delta t = \frac{800{,}000\,J}{(6{,}500\,g \cdot 4.19\ J/g°C)} = 29.4°$

$\Delta t = t_f - t_i$
$t_f = \Delta t + t_i$
$\boxed{t_f = 44.4°C}$

2. An 80.4 g piece of metal alloy is heated from 20.0 °C to 42.0 °C while it absorbs 834 J of heat. Determine the specific heat capacity of the alloy. [2]

$Q = 834\,J$
$m = 80.4\,g$
$t_i = 20.0°C$
$t_f = 42.0°C$
$c = ?$

$Q = mc\Delta t$
$c = \frac{Q}{m\Delta t}$
$c = \frac{834\,J}{(80.4\,g(42.0°C - 20.0°C))}$

$\boxed{c = 0.472\ J/g°C}$

3. Explain what is meant by the term *enthalpy*. Explain how enthalpy changes are measured and why they cannot be measured directly. [3]

- Enthalpy is the total energy of a chemical system which includes both kinetic and potential energies.
- Enthalpy changes are measured using a calorimeter where the energy of a chemical system is either absorbed from or released into water of known mass and temperature.
- Enthalpy can't be measured directly because it occurs in a non-isolated system.

4. When 8.60 g of ammonium nitrate is dissolved in 150 mL of water which had an initial temperature of 22.3 °C, the water cools down to 17.7 °C. Use this information to determine the experimental molar enthalpy of solution of ammonium nitrate. [3]

NH_4NO_3

M: N: 2 · 14.01 g/mol
+H: 4 · 1.01 g/mol
+O: 3 · 16.00 g/mol
80.06 g/mol

$\Delta_R H = Q$
$\Delta_R H = mc\Delta t$
$= 150\,g \cdot 4.19\ J/g°C \cdot (17.7°C - 22.3°C)$
$\Delta_R H = +2891.1\,J$

$n = \frac{m}{M} = \frac{8.60\,g}{80.06\,g/mol}$
$n = 0.107\,mol$

$\Delta_R H = n \cdot \Delta_R H_m$
$\Delta_R H_m = \frac{\Delta_R H}{n}$
$\Delta_R H_m = \frac{+2891.1\,J}{0.107\,mol}$
$\boxed{\Delta_R H_m = +26.9\ kJ/mol}$ /10