CHEM 1100 Quiz 15 Summer 2015 Dr. Stone Name_____**ANSWERS**_____

$w = -P\Delta V$ $\Delta E = q + w$ $\Delta H = \Delta E + P\Delta V$ q = heat capacity x mass x ΔT
heat transferred at constant volume: $q_v = \Delta E$
heat transferred at constant pressure: $q_p = \Delta H$
101 J/L*atm

1. (1 point) Which of the following is not a type of energy or energy flow?
   a. Temperature b. Work c. $P\Delta V$ d. Heat e. Chemical energy

2. (1 point) Positive work is done **on** the system when:
a. $\Delta V = 0$ **b. $\Delta V < 0$** c. $\Delta E > 0$ d. $\Delta V > 0$ e. none of these

3. (2 points) What is the first law of thermodynamics?

Energy can not be created nor destroyed. It can change forms.

4. (1 point) Which of the following can be interpreted as a measure of randomness?
a. enthalpy **b. entropy** c. free energy d. temperature e. none of these

5. (1 point) The enthalpy of fusion of water is positive and corresponds to which physical change
   a. $H_2O(g) \rightarrow H_2O(l)$
   b. $H_2O(l) \rightarrow H_2O(g)$
   c. $H_2O(s) \rightarrow H_2O(l)$
   d. $H_2O(l) \rightarrow H_2O(s)$
   e. $H_2O(s) \rightarrow H_2O(g)$
   f. none of these

6. (3 points) Calculate the work that is done (in kJ) on the surroundings when a gas expands from 2.5 L to 15.0 L against a constant external pressure (1.2 atm).

15-2.5 = 12.5 L
12.5 L x 1.2 atm = 15 Lx atm
15 Lxatm x 101J/(L x atm) = 1.51 x 10^3 J or 1.51 kJ

7. (5 points) Aluminum metal reacts with chlorine with a spectacular display of sparks. How much heat is released from the reaction of of 10.00 grams of Al with an excess amount of chlorine gas.

   $2\ Al(s) + 3\ Cl_2(g) \rightarrow 2\ AlCl_3(s)$ $\Delta H = -1408.4$ kJ

-1408 kJ per 2 moles of Aluminum

10.00 g Al x 1 mole Al/26.98 g x -1408kJ/2 moles Al = -260.9 kJ or -2.609 x 10^2 kJ

8. (4 points) The specific heat of copper is0.385 (J/g °C). A piece of copper weighs 20.2 grams and starts out at 24°C. It then absorbs 1.234 kJ of energy. What is the new temperature?

1.234×10^3 J = 0.385 J/g °C x 20.2 g x (T_f - 24 °C)

T = 182.6 °C

9. (2 points) Is the following reaction always spontaneous, always non spontaneous or temperature dependent? Explain your answer.

$2C_{(graphite)} + 2H_2(g) \rightarrow C_2H_4(g)$ $\Delta H = 52.26$ kJ

ΔS is negative. The products are less random (less moles of gas) than the reactants.

$+\Delta H - T(-\Delta S) = +\Delta G$, non spontaneous

10. (1 point) Which combination always results in a reaction being spontaneous?

a. ΔH is negative and ΔS is negative. **b. ΔH is negative and ΔS is positive.**
c. ΔH is positive and ΔS is negative. d. ΔH is positive and ΔS is positive.