CHEM 130 **Name** _____
Quiz 7 – October 26, 2018

Complete the following problems. Write your final answers in the blanks provided. You must show your work to receive full credit. Show your answers to the correct number of significant figures with the correct units.

1. Determine the ΔH^o for this reaction from the data below. (9 pts)

$$N_2H_4 + 2H_2O_2 \rightarrow N_2 + 4H_2O$$

Reaction	ΔH^o
$N_2H_4 + O_2 \rightarrow N_2 + 2H_2O$	-622.2 kJ
$H_2 + ½O_2 \rightarrow H_2O$	-285.8 kJ
$H_2 + O_2 \rightarrow H_2O_2$	-187.8 kJ

$N_2H_4 + O_2 \rightarrow N_2 + 2H_2O$	-622.2 kJ
$2(H_2 + ½O_2 \rightarrow H_2O)$	2(-285.8 kJ)
$2(H_2O_2 \rightarrow H_2 + O_2)$	-2(-187.8 kJ)
$N_2H_4 + \cancel{O_2} + \cancel{2H_2} + \cancel{O_2} + 2H_2O_2 \rightarrow N_2 + 2H_2O + 2H_2O + \cancel{2H_2} + \cancel{2O_2}$	-818.2 kJ
$N_2H_4 + 2H_2O_2 \rightarrow N_2 + 4H_2O$	**-818.2 kJ**

Answer_____-818.2 kJ_____

2. If you combine 350.0 mL of water at 25.00 °C and 110.0 mL of water at 95.00 °C, what is the final temperature of the mixture? The specific heat of water is 4.184 J/gK and the density of water is 1.00 g/mL. (8 points)

The cold water is warming up and the warm water is cooling down, but both reach the same final temperature so

$$q_{warm} = -q_{cool}$$
$$m_{warm}c_{warm}\Delta T_{warm} = -m_{cool}c_{cool}\Delta T_{cool}$$
$$(110.0g)(4.184J/gK)\ \Delta T_{warm} = -(350.0g)(4.184J/gK)\ \Delta T_{cool}$$

So:

$$\Delta T_{warm} = \frac{-(350.0g)(4.184J/gK)\ \Delta T_{cool}}{(110.0g)(4.184J/gK)} = -3.182\ \Delta T_{cool}$$

And:

$$(T_f - T_{i,\,warm}) = -3.182(T_f - T_{i,\,cool})$$
$$T_f - 95.00^oC = -3.182(T_f - 25.00^oC)$$
$$T_f - 95.00\,^oC = -3.182T_f + 79.56\,^oC$$
$$4.182T_f = 174.56\,^oC$$
$$\mathbf{T_f = 41.74^oC}$$

Answer_____41.74°C_____

3. The overall reaction that occurs in the photosynthesis of plants is: (8 pts.)

$$6CO_2(g) + 6H_2O(g) \rightarrow C_6H_{12}O_6(s) + 6O_2 \quad \Delta H^o = +2803 \text{ kJ}$$

Use the information in the table below to determine the standard enthalpy of formation for glucose, $C_6H_{12}O_6(s)$. (8 pts)

Substance	ΔH^o_f (kJ/mol)	Substance	ΔH^o_f (kJ/mol)	Substance	ΔH^o_f (kJ/mol)
C(g)	**+716.7**	H(g)	**+218.0**	O(g)	**+249.2**
C(graphite)	**0**	$H_2(g)$	**0**	$O_2(g)$	**0**
CO(g)	**-110.5**	$H_2O(g)$	**-241.8**	$O_3(g)$	**+142.7**
$CO_2(g)$	**-393.5**	H_2O (l)	**-285.8**		

$$\Delta H^\circ_{rxn} = +2803 \text{ kJ} = \Sigma(n\Delta H^\circ_{f,products}) - \Sigma(n\Delta H^\circ_{f,reactants})$$

$$+2803 \text{ kJ} = [1 \text{ mol}(\Delta H^\circ_f[C_6H_{12}O_6(s)]) + 6 \text{ mol}(0 \text{ kJ/mol})] - [6 \text{ mol}(-393.5 \text{ kJ/mol}) + 6 \text{ mol } (-241.8 \text{ kJ/mol})]$$

$$+2803 \text{ kJ} = (\Delta H^\circ_f[C_6H_{12}O_6(s)] - [-3811.8 \text{ kJ}].$$

So, $(\Delta H^\circ_f[C_6H_{12}O_6(s)]$= **$-1008.8$ kJ/mol $C_6H_{12}O_6(s)$**

Answer____-1008.8 kJ/mol $C_6H_{12}O_6(s)$_____

Possibly Useful Information

$KE = \frac{1}{2}mv^2$	$K = {}^oC + 273.15$	$q_{lost} = -q_{gained}$
$q=mc\Delta T$	$q=n_{LR}\Delta H_{rxn}$	$q=m\Delta H$