CHM 1046 - JOENS WORKSHEET #3 Due date: M,W,F Wednesday, September 14
T,R Thursday, September 15

* While I prefer you turn in a hard copy of the worksheet, I will accept scanned copies sent to my email address, joensj@fiu.edu

Section: (circle one) M,W,F Tu,Tr

For problems involving calculations you must show your work for credit.

1) For a particular process a system expands by an amount ΔV = 600.0 mL against a constant external pressure p_{ex} = 2.50 atm. During the process, 2200. J of heat is added to the system. Find q, w, and ΔU for the process. (NOTE:1 L•atm = 101.3 J).

2) Give the correctly balanced formation reaction for the following substances. Be sure to indicate the state (s, ℓ, g, aq) for all reactants and products.

a) $HNO_3(aq)$

b) $CaSiO_3(\ell)$

3) For the chart below, fill in the missing information.

	ΔS_{syst} (J/K)	ΔS_{surr} (J/K)	ΔS_{univ} (J/K)	spontaneous (yes or no)
process 1	18.6	– 27.8	_____	_____
process 2	– 3.6	_____	18.7	_____
process 3	_____	58.4	– 3.2	_____

4) Using the table of thermochemical data below (for T = 298. K) find the following for the chemical reaction

$$PbS(s) + 4\ H_2O(\ell) + 4\ Cl_2(g) \rightarrow PbSO_4(s) + 8\ HCl(g) \qquad (4.1)$$

Substance	$\Delta H°_f$(kJ/mole)	$\Delta G°_f$(kJ/mole)	$S°$(J/mole·K)
$Cl_2(g)$	0.0	0.0	223.0
HCl(g)	– 92.3	– 95.3	187.0
$H_2O(\ell)$	– 285.8	– 237.2	69.9
PbS(s)	– 94.3	– 92.7	91.2
$PbSO_4(s)$	– 918.4	– 811.2	147.3

a) $\Delta H°_{rxn}$ and $\Delta S°_{rxn}$

b) ΔS_{syst}, ΔS_{surr}, and ΔS_{univ}

c) Is the reaction spontaneous for standard conditions and at T = 298 K (yes/no) and a brief justification for your answer)?