

Name: \_\_\_\_\_

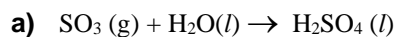
Period: \_\_\_\_\_

Seat#: \_\_\_\_\_

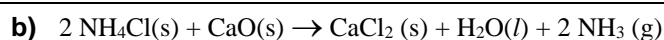
**Directions:** Show all work in a way that would earn you credit on the AP Test! This is always the rule! Some answers are provided at the end in italics and underlined. If you need more space, use binder paper and staple to your worksheet.

$$\Delta G^\circ = \Sigma \Delta G_f^\circ \text{ products} - \Sigma \Delta G_f^\circ \text{ reactants}$$

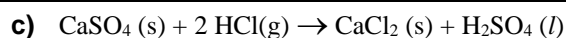
1) Calculate  $G^\circ$  in kJ for the following reactions, using thermodynamic data from an appendix or your reference sheet.



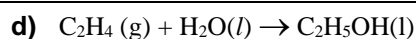
*-81.99*



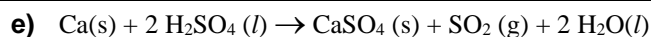
*-10.68*



*72.2*



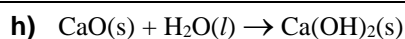
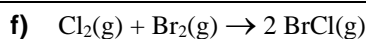
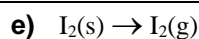
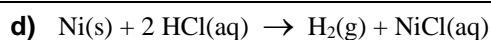
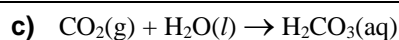
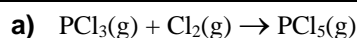
*-5.42*



*-715.9*

2) When solid KI is dissolved in water, a cooling of the mixture occurs because the solution process is endothermic. Explain, in terms of what happens to the molecules and ions, why this mixing occurs spontaneously?

3) Predict the algebraic sign of the entropy change for the following reactions?



**Dougherty Valley HS Chemistry - AP  
Thermodynamics – Entropy and Gibbs 1**

4) Show that  $\Delta S$  for the melting of ice is positive

<i>Conceptually</i>	<i>Quantitatively</i>

5) Calculate the entropy change in J/mol·K for each of the following reactions.  $\Delta S^\circ = \Sigma \Delta S^\circ_{products} - \Sigma \Delta S^\circ_{reactants}$

<p>a) <math>\text{CaO}(s) + 2 \text{HCl}(g) \rightarrow \text{CaCl}_2(s) + \text{H}_2\text{O}(l)</math></p> <p style="text-align: right;"><u>-228.34</u></p>	<p>b) <math>\text{C}_2\text{H}_4(g) + \text{H}_2(g) \rightarrow \text{C}_2\text{H}_6(g)</math></p> <p style="text-align: right;"><u>-120.78</u></p>
--------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------

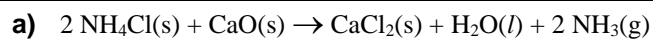
6) Predict the probability of the following reactions by calculating the sign of  $\Delta G$ . Then classify each reaction as exothermic or endothermic, and if there is increase or decrease to entropy. Then, if spontaneous, identify if it is entropy driven, enthalpy driven, both, or neither.

$\Delta G$ Calculation	Endo or Exo?	Spont. or Non-spont.
<p>a) <math>\text{H}_2\text{O}(l) \rightarrow \text{H}_2(g) + \frac{1}{2} \text{O}_2(g)</math>  <math>\Delta H = +285 \text{ kJ}</math>  <math>T\Delta S = +245 \text{ kJ}</math></p>		
	Increase or Decrease Entropy?	What drives the Rxn (if spont)
<p>b) <math>\text{C}_6\text{H}_{14}(g) \rightarrow 6 \text{C}(s) + 7 \text{H}_2(g)</math>  <math>\Delta H = +167 \text{ kJ}</math>  <math>T\Delta S = +168 \text{ kJ}</math></p>	Endo or Exo?	Spont. or Non-spont.
	Increase or Decrease Entropy?	What drives the Rxn (if spont)
<p>c) <math>2 \text{Fe}(s) + \frac{1}{2} \text{N}_2(g) \rightarrow \text{Fe}_2\text{N}(s)</math>  <math>\Delta H = -3.8 \text{ kJ}</math>  <math>T\Delta S = -14.6 \text{ kJ}</math></p>	Endo or Exo?	Spont. or Non-spont.
	Increase or Decrease Entropy?	What drives the Rxn (if spont)
<p>d) <math>\text{HCl}(g) + \text{H}_2\text{O}(l) \rightarrow \text{H}_3\text{O}^+(aq) + \text{Cl}^-(aq)</math>  <math>\Delta H = -75.3 \text{ kJ}</math>  <math>T\Delta S = -39.3 \text{ kJ}</math></p>	Endo or Exo?	Spont. or Non-spont.
	Increase or Decrease Entropy?	What drives the Rxn (if spont)

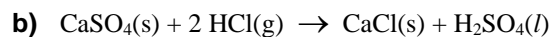
**Dougherty Valley HS Chemistry - AP**  
**Thermodynamics – Entropy and Gibbs 1**

---

7) Calculate  $\Delta G^\circ$  in kJ/mole for the following reactions, using the appropriate data tables from your textbook appendix.

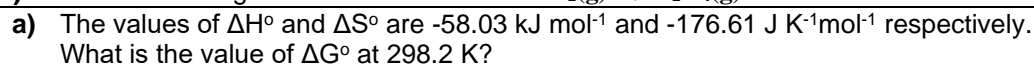


-10.68



72.2

8) Use the following reaction at 298.2 K  $2 \text{NO}_2(g) \rightarrow \text{N}_2\text{O}_4(g)$



-5.40

b) At what temperature is  $\Delta G^\circ = 0$ ?

328.6

c) Is  $\Delta G$  negative above, or below, this temperature?