

CHEMISTRY FOR ENGINEERS

ASSIGNMENT 5

Date:

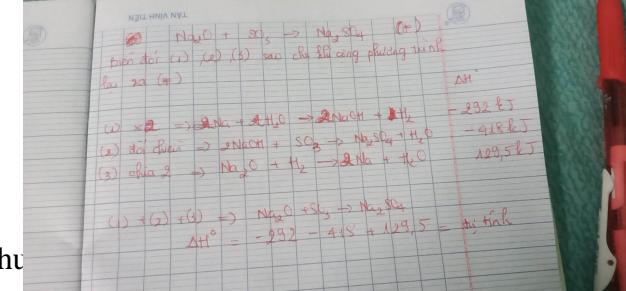
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PART I: IDENTIFICATION INCORRECT STATEMENTS (50pts)

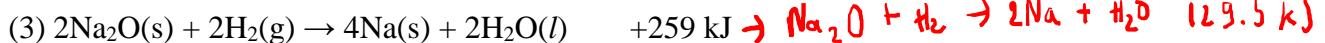
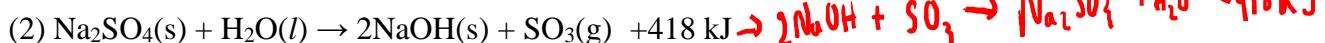
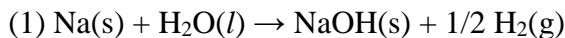
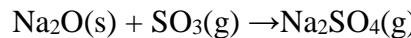
- >1* a) A reaction with a $\Delta G^\circ = -30 \text{ kJ/mol}$ has a positive K and <1  $\Delta G^\circ = -RT \ln(K)$
or $\Delta G^\circ \rightarrow \text{spontaneous}$
- b) When ΔG for a reaction is negative, the reaction is spontaneous. 
- c) If ΔS is negative then ΔH must be negative for a spontaneous process. $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$
- d) At 25°C $\Delta H = 128.9 \text{ kJ}$ and $\Delta G = 33.5 \text{ kJ}$ for a reaction. This reaction become spontaneous at above the minimum temperature 440K
- e) The second law of thermodynamics states the entropy of the universe always increases in spontaneous processes.
- f) An endothermic process which is spontaneous must have a positive ΔS .
- g) The Gibb's free energy of the system always increases in a spontaneous process.  Decrease $\Delta G < 0$
- h) A process which causes the system entropy to decrease can still be spontaneous if an even larger entropy increase takes place in the surroundings.
- i) The Law of Conservation of Energy is another statement of the First Law of Thermodynamics.
- j) The symbol H refers to the enthalpy, or "heat content" of the system.
- k) The second law states that ΔS of a system increases in any spontaneous process. 
- l) The Gibbs free energy of a system is increasing in any spontaneous process going  at constant T and P .  decrease
- m) The expansion of a gas into a vacuum is an example of an increase in entropy.
- n) Enthalpy change and entropy change are two properties of a reacting system that determine whether a process at constant pressure and temperature can occur spontaneously
- o) A process which causes the system entropy to decrease can still be spontaneous if an even larger entropy increase takes place in the surroundings.
- p) In an exothermic reaction the value of H of the species is increasing in going from reactants to products.  decrease
- q) ΔH for a reaction is equal in magnitude but opposite in sign to ΔH for the reverse reaction.
- r) Enthalpy change is dependent upon the number of steps in a reaction.  it depends only on the initial and final states of the system.
- s) For the reaction, $A + B \rightarrow C$, $\Delta H^\circ = +30 \text{ kJ}$; $\Delta S^\circ = +50 \text{ J/K}$. Therefore the reaction is spontaneous at all temperatures.
- t) Gibbs free energy is a state function.
- u) The entropy will usually increase when a molecule is broken into two or more smaller molecules.

PART II: CONSTRUCTED QUESTIONS (40pts)

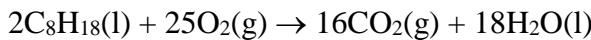
1. (15pts) Let help meeeee to calculate ΔH° for the reaction $\text{Na}_2\text{O}(s) + \text{SO}_3(\text{g}) \rightarrow \text{Na}_2\text{SO}_4(\text{g})$



Given the following information:



2. (15pts) Use data in the following table to calculate the standard enthalpy of combustion of octane, C_8H_{18} .



$$\Delta H^\circ = ? \quad 18(-285.8) + 16(-393.5) - 2(-249.9) = -10940.6$$

Substance	$\Delta H_f^\circ, \text{ kJ/mol}$
CO(g)	-110.5
$\text{CO}_2(\text{g})$	-393.5
$\text{CH}_4(\text{g})$	-74.81
$\text{C}_2\text{H}_2(\text{g})$	+226.7
$\text{C}_2\text{H}_4(\text{g})$	+52.26
$\text{C}_2\text{H}_6(\text{g})$	-84.68
$\text{C}_3\text{H}_8(\text{g})$	-103.8
$\text{C}_4\text{H}_{10}(\text{g})$	-125.7
$\text{C}_6\text{H}_6(\text{l})$	+48.99
$\text{C}_8\text{H}_{18}(\text{l})$	-249.9
$\text{CH}_3\text{OH}(\text{l})$	-238.7
$\text{CH}_3\text{CH}_2\text{OH}(\text{l})$	-277.7
$\text{H}_2\text{O(g)}$	-241.8
$\text{H}_2\text{O(l)}$	-285.8

KJ/mol

3. (5pts) For each of the following note what you would expect for the **entropy of the system, surroundings, and total**. Choose the correct answer.

- a. A container of liquid honey (the system) sitting in your kitchen (the surroundings) crystallizes.

ΔS_{SYS}	Increase	Decrease	Stay the Same	No Way to Know
ΔS_{SURR}	Increase	Decrease	Stay the Same	No Way to Know
ΔS_{TOTAL}	Increase	Decrease	Stay the Same	No Way to Know

For example: The correct answer for ΔS_{TOTAL} is increase.

Spontaneous so it is increasing

- b. 1 mole of an ideal gas initially at a pressure of 10 bar, expanding isothermally against a constant external pressure of 1 bar until mechanical equilibrium is reached.

ΔS_{SYS}	Increase	Decrease	Stay the Same	No Way to Know
ΔS_{SURR}	Increase	Decrease	Stay the Same	No Way to Know
ΔS_{TOTAL}	Increase	Decrease	Stay the Same	No Way to Know

Spontaneous

It must be if the total is increasing

This must be endothermic.
 Work out and heat in. ΔS_{SURR}
 no change internal energy ΔS_{TOTAL}

1 mol khí lý tưởng ban đầu ở áp suất 10 bar, giãn nở đẳng nhiệt với áp suất bên ngoài không đổi 1 bar cho đến khi đạt đến trạng thái cân bằng cơ học.

$\Delta G^\circ = -11,000 \text{ J} - T (-17.4 \text{ J/K})$ [-11.0 kJ were converted to J]

$$0 = -11,000 \text{ J} + 17.4 \text{ T J/K}$$

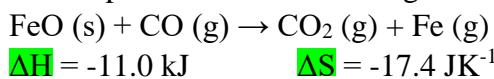
$$11,000 \text{ J} = 17.4 \text{ T J/K}$$

Ở nhiệt độ nào thì phản ứng sau xảy ra tự phát?

$$T = 11,000 \text{ kJ} / (17.4 \text{ J/K}) = 632 \text{ K} \leftarrow \text{answer}$$

4. (15pts) At what temperature is the following reaction become **spontaneous** ?

Gibbs Free Energy



For a constant temperature and constant pressure process:

Gibbs free energy (G)

$$\Delta G = \Delta H_{\text{sys}} - T \Delta S_{\text{sys}}$$

PART III: THE CONFESSION (10pts)

1. Do you have any feedback for Dr. Phong? who is that??

$\Delta G < 0$ The reaction is spontaneous in the forward direction.

2. Do you have any feedback for the homework and assignments?

$\Delta G > 0$ The reaction is nonspontaneous as written. The reaction is spontaneous in the reverse direction.

(Too easy, too hard, not relevant, to name but a few) it's hard now, i have to watch youtube and TA have not

3. Do you have any feedback for your TA?

replied me so i have to do by myself

i have been waiting you for 3 weeks, please reply my message :(

BONUS QUESTION FOR TRUTH:

“DO YOU WANT TO DO MY ASSIGNMENTS?”

YESSSSSSSSSSSSSSSSSSSS, but i need solution immediately

GOOD LUCK FOR FINAL <3