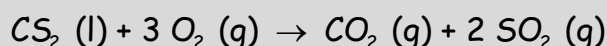


<b>LIZARDI BHI 2010-11</b>	<b>Topics:</b> Thermochemistry Kinetics Chemical Equilibrium	Marks
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1st term		
2010-11-12		

NAME	
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### EXERCISE #1

When 5.6 g of  $CS_2$  combine with oxygen (see the equation below) 79 kJ of heat are released:



The formation enthalpy changes of carbon dioxide and sulfur dioxide are:

$$\Delta H_f^0(CO_{2(g)}) = -395.5 \text{ kJ/mol}; \Delta H_f^0(SO_{2(g)}) = -296.4 \text{ kJ/mol}$$

- determine the enthalpy change of formation of  $CS_2(l)$
- determine the volume of  $SO_2(g)$  at  $25^\circ C$  and 1 atm formed when 6000 kJ have been released in the reaction above.
- Determine the efficiency of the process if 2110 kJ are released when 2.4 moles of  $CS_2$  react

Atomic weights: S=32; C=12; O=16

2.5 Points

### EXERCISE #2

In this reaction



determine

- enthalpy change of reaction
- entropy change of reaction
- the equation of  $\Delta G$  and the  $\Delta G-T$  graphic
- the interval of temperature in which the reaction is spontaneous

DATA

Formation enthalpy changes (kJ/mol)

$CH_3-CH_2OH$	$CH_3-COOH$	$H_2O$
-227.6	-487	-285.8

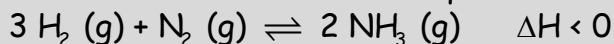
Entropy (J/mol.K)

$CH_3-CH_2OH$	$CH_3-COOH$	$H_2O$	$O_2$
160.7	159.9	70	205

2.5 Points

**EXERCISE #3**

A 25 L-container is charged with 2 moles of  $H_2$ , 1 mol of  $N_2$ , and 3.2 moles of  $NH_3$ . At 400 °C, when the equilibrium is reached, the number of moles of ammonia has decreased to 1.8 mol. Given this equation



determine:

- the number of moles of nitrogen and hydrogen at equilibrium
- the values of  $K_c$  and  $K_p$
- the total and partial pressures at equilibrium
- the shift of the reaction if the equilibrium is disturbed by increasing the pressure (by decreasing the volume)
- the shift of the reaction if the equilibrium is disturbed by lowering the temperature
- if the change in entropy is positive or negative. Give the reasons.

$R = 0.082 \text{ atm}\cdot\text{L}/\text{K}\cdot\text{mol}$

2.5 Points

**EXERCISE #4**

A 10 L-container is charged with 0.2 moles of  $N_2O_4$  and heated to 35 °C in order to react as follows:



At equilibrium, 57% of reactant is dissociated.

- Determine the composition at equilibrium (# of moles)
- The total pressure at equilibrium
- The values of  $K_c$  and  $K_p$
- Determine the shift of the reaction if the volume of the container is reduced.

$R = 0.082 \text{ atm}\cdot\text{L}/\text{K}\cdot\text{mol}$

2.5 Points