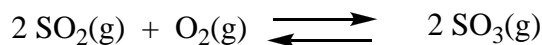


**Problem of the Day 22      CHEM 1252**

**Suggested Book Problems for Chapter 15: 2, 13, 17, 27, 33, 41, 43, 47, 51**

1. Sulfuric acid is the most widely produced chemical in the United States. An important step in this manufacturing process is shown below.



(a) Write the expression for the equilibrium constant.

$K_c =$	4
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(b) At a temperature of 900 K, 0.0216 mol of  $\text{SO}_2$  and 0.0148 mol of  $\text{O}_2$  were placed in a 1.00 L container and allowed to react. At equilibrium, 0.0175 mol  $\text{SO}_3$  were present. Fill in the table below with appropriate concentrations.

	$2 \text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2 \text{SO}_3(\text{g})$		
initial	1	1	1
change	1	1	1
equilibrium	1	1	1

(c) Using your answers from part (b), calculate  $K_c$ .

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2. A gaseous mixture containing 0.50 M each  $\text{CO}$  and  $\text{H}_2\text{O}$ , and 2.0 M each  $\text{CO}_2$  and  $\text{H}_2$  is allowed to undergo the following reaction at 1000 °C.



What direction does the reaction need to proceed to reach equilibrium? You must justify your answer.

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3. The following reaction was studied at 500 K.



(a) A reaction vessel initially contained  $9.84 \times 10^{-4} \text{ M H}_2$  and  $1.38 \times 10^{-3} \text{ M I}_2$ . The reaction was allowed to come to equilibrium. Using this information, fill in the table below with concentrations and/or variables.

	$\text{H}_2(\text{g})$	+	$\text{I}_2(\text{g})$	$\longrightarrow$	$2\text{HI}(\text{g})$
initial	2		2		2
change	2		2		2
equilibrium	2		2		2

(b) At equilibrium, the concentration of  $\text{I}_2$  was measured to be  $[\text{I}_2] = 4.73 \times 10^{-4} \text{ M}$ . Calculate the equilibrium concentrations of  $\text{H}_2$  and  $\text{HI}$ . You must show your work.

$[\text{H}_2] =$ 
 $[\text{HI}] =$

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(c) What is the value of the equilibrium constant for the reaction at 500 K? You must show your work.

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