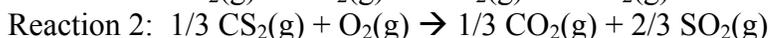
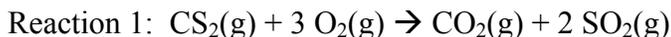


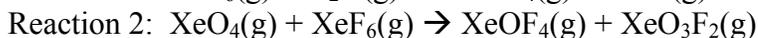
CH302H – Principles of Chemistry II: Honors
Fall 2014, Unique 51880

Homework, Week 7

1. How do the equilibrium constants for the following two reactions compare at 25°C:



2. Determine the equilibrium constant for reaction 3 (K_3) in terms of the equilibrium constants for reactions 1 and 2 (K_1 and K_2):



3. Phosphorous pentachloride (PCl_5) decomposes into phosphorous trichloride (PCl_3) and chlorine gas. 1.5 g of PCl_5 is placed into a 10 mL sealed vessel and heated to 250°C, (which is above its sublimation temperature). Determine the partial pressure of all species at equilibrium.

4. Dimethyl ether can be made from the dimerization of methanol:



Describe, both quantitatively and qualitatively, the optimum conditions of pressure and temperature to make as much of this chemical as possible.

5. Determine which of the following molecules is a Bronsted-Lowry acid, and draw its conjugate base.



6. Niacin ($\text{C}_5\text{H}_4\text{NCOOH}$, also called vitamin B_3) is an essential nutrient whose deficiency in the diet leads to a nasty disease called pellagra.

a) Write a balanced equation for the equilibrium reaction of niacin with water. This will require determining if the molecule is an acid or a base.

b) Niacin is structurally very similar to pyridine: $\text{C}_5\text{H}_5\text{N}$. Would you predict the K_a of niacin to be greater than or less than the K_a of pyridine? Justify your answer.

7. The K_a of HIO_3 is 0.016 at 25°C. Determine the pH of an aqueous solution of 0.10 M HIO_3 .