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AP Chemistry – Are we at equilibrium yet? – 46

Name _____Per ___

1. A mixture of H_2, S and H_2S is held in a 1.0 L vessel at 90°C until the following equilibrium is achieved: $H_{2(g)} + S_{(s)} \leftrightarrow H_2S_{(g)}$. At equilibrium the mixture contains 0.46 g of H_2S and 0.40 g of H_2. (a) Write the equilibrium constant expression for this reaction.

(b) What is the value of K_p for the reaction at this temperature?

2. A sample of nitrosyl bromide decomposes according to the following equation: $2NOBr_{(g)} \leftrightarrow 2NO_{(g)} + Br_{2(g)}$. An equilibrium mixture is a 5.00 L vessel at 100°C contains 3.22 g of NOBr, 3.08 g of NO and 4.19 g of Br_2. (a) Calculate K_p.

(b) What is the total pressure exerted by the mixture of gases?

3. Solid NH_4HS is introduced into an evacuated flask at 24°C. The following reaction takes place: $NH_4HS_{(s)} \leftrightarrow NH_{3(g)} + H_2S_{(g)}$. At equilibrium the total pressure for NH_3 and H_2S taken together is 0.614 atm. What is the K_p for this equilibrium at 24°C.

4. Nicotine is composed of carbon, hydrogen and nitrogen. A 5.250 mg sample of nicotine was combusted, producing 14.242 mg of CO_2 and 4.083 mg of H_2O. (a) What is the empirical formula for nicotine?

(b) If the substance has a molar mass of 162 g/mole, what is its molecular formula?

5. Indicate the concentration of each ion present in the solution formed by mixing (assume that the volumes are additive): (a) 20 mL of 0.100 M HCl and 10.0 mL of 0.500 M HCl

(b) 15.0 mL of 0.300 M Na_2SO_4 and 10.0 mL of 0.200 M KCl

(c) 3.50 g of NaCl in 50.0 mL of 0.500 M $CaCl_2$ solution