Reaction Rate and Reaction Equilibrium Problems

1. Determine the rate law for the reaction of W+Xd Z from the data below.

Rate = 274 $[W]^2[X]^3$

[W] (M)	[X] (M)	Rate (M/min)
0.150	0.350	0.265
0.450	0.700	19.08
0.150	0.700	2.12

a) What is the order of the reaction? 2nd order in W, 3rd order in X and 5th order overall

b) What will be the rate at the same temperature if [W] is 0.62 M and [X] is 0.56 M? 18.5 M/min

2. What is the hydroxide ion concentration in a saturated solution of aluminum hydroxide if the K_{sp} is $1.26x10^{-33}$? Ans $7.84x10^{-9}$ M

3. What is the equilibrium concentration of sulfur trioxide in the equation (all gases) sulfur dioxide reacts with oxygen to form sulfur trioxide? The equilibrium constant is 85.0 and the equilibrium concentrations of sulfur dioxide and oxygen are each 0.0500 M. Ans. 0.103 M

4. What is the equilibrium constant for the reaction of nitrogen gas with oxygen gas to produce dinitrogen pentoxide gas? At equilibrium in a 3.65 liter container are 0.622 moles of nitrogen, 0.132 moles of oxygen and 1.562 moles of dinitrogen pentoxide. $1.01x10^8$

5. Ammonia combines with oxygen to produce water vapor and nitrogen gas. The reaction also produces energy. At a certain temperature the concetration of ammonia is 3.0 M, oxygen is 2.0 M, water is 4.0 M and nitrogen is 2.0 M. Calculate the equilibrium constant. Ans 25

6. Describe the effects of each change on the equilibrium in problem #5.

a) increase pressure Shift Left

b) increase ammonia Shift Right

c) decrease oxygen Shift Left

d) increase temperature Shift Left

e) add a catalyst None