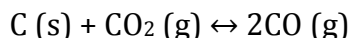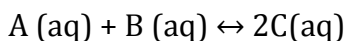## Solving Rice Tables and Equilibria Problems – Supplemental Worksheet

1. If the K_p for the following reaction is 2.4×10^{-9} and the initial concentration of CO_2 is 2 atm, what are the partial pressures of the substances at equilibrium? Hint: make necessary assumptions to solve.
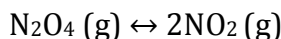
$$C\ (s) + CO_2\ (g) \leftrightarrow 2CO\ (g)$$

2. Here is a general reaction with a K value of 2.8×10^{-7}:

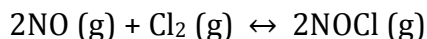$$A\ (aq) + B\ (aq) \leftrightarrow 2C(aq)$$

Initially you are given 4M of substance A and 4M of substance B. Set-up an equilibrium expression to solve for the equilibrium concentrations of each substance. Hint: you can solve this one all the way through!
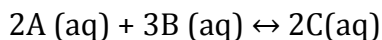
3. Given the K_C at 298K is 0.0059 for the following reaction and the initial concentration of N_2O_4 is 3.5M, set-up an equilibrium expression to solve for the equilibrium concentrations of the products and reactants. Hint: you will need a graphing calculator or program to solve fully, but you can make an assumption and still be approximately close. (Challenge: solve for K_p!)

$$N_2O_4\ (g) \leftrightarrow 2NO_2\ (g)$$

4. At some temperature, the K_p for the following reaction is 0.26. If you began with 0.1 atm of NO, 0.3 atm of Cl_2 and 0 atm of NOCl. What would the partial pressures be for each gas at equilibrium? Set-up the equilibrium expression in terms of "x" and describe how you could find the exact partial pressures. Hint: you will need a graphing calculator or program to solve fully.
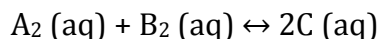
$$2NO\ (g) + Cl_2\ (g) \leftrightarrow 2NOCl\ (g)$$

5. Here is a general reaction with a K value of 1.6×10^{-6}:
$$2A\ (aq) + 3B\ (aq) \leftrightarrow 2C(aq)$$

Initially you are given 0.1M of substance A and 0.2M of substance B. Set-up an equilibrium expression to solve for the equilibrium concentrations of each substance in terms of x. Hint: do not actually solve!

6. Here is a general reaction with a K value of 144:

$$A_2 \text{ (aq)} + B_2 \text{ (aq)} \leftrightarrow 2C \text{ (aq)}$$

If the initial concentrations for A_2 and B_2 are 0.7 M, find the final concentration of C. Hint: make necessary assumptions to solve.

7. Given that the molar solubility of $PbSO_4$ is 1.59 x 10^{-4} M, what is the K_{sp} of $PbSO_4$?

8. In the previous problem, if we had placed the $PbSO_4$ solid into a solution containing 0.5M $(NH_4)_2SO_4$ what concentration of Pb^{2+} ion will be in solution at equilibrium? You will need a calculator to solve completely.

9. Given that the K_{sp} at 298 K is 9.8 x 10^{-11} for the dissociation of $CuCl_2$, set-up an equilibrium expression to solve for the molar solubility of the salt.

10. Here is a general reaction:

$$Ax \text{ (aq)} \leftrightarrow By \text{ (aq)} + Cz \text{ (aq)}$$
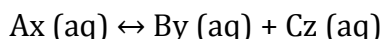
a. In this general form of an aqueous reaction, how would one set up the equilibrium expression, K?

b. Say we have 0.5 M of Ax and 0.2 M of Cz at initial conditions. How would you set up the RICE table and K expression? Set these up and do not solve yet.

c. Let's say we had found our K to be 3.9x10^{-4}. Then we increased the concentration of A_x to 0.7 M. Would the reaction shift left or right?

d. What will the new equilibrium concentrations be for this situation? Hint: make necessary assumptions and/or use technology to aid your solving.