

Chemistry Unit 15: Chemical Equilibrium Worksheet**Practice 15.1 Writing Equilibrium Equations**

Write the equilibrium expressions (K_{eq}) for the following reactions

1. $2\text{CO(g)} \leftrightarrow \text{C(s)} + \text{CO}_2\text{(g)}$
2. $\text{N}_2\text{O}_4\text{(g)} \leftrightarrow 2\text{NO}_2\text{(g)}$
3. $2\text{HCl(g)} \leftrightarrow \text{I}_2\text{(g)} + \text{Cl}_2\text{(g)}$
4. $\text{Fe}_2\text{O}_3\text{(s)} + 3\text{H}_2\text{(g)} \leftrightarrow 2\text{Fe(s)} + 3\text{H}_2\text{O(g)}$
5. $2\text{CO(g)} + 4\text{H}_2\text{O(g)} \leftrightarrow 3\text{O}_2\text{(g)} + 2\text{CH}_4\text{(g)}$
6. $\text{P}_4\text{(s)} + 6\text{NO(g)} \leftrightarrow \text{P}_4\text{O}_6\text{(s)} + 3\text{N}_2\text{(g)}$

15.2 Calculating Equilibrium Constants

Be sure to write out the equilibrium (K_{eq}) expression for each problem before trying to solve it!

1. What is the equilibrium expression for the following reaction?
 $\text{SeO}_2\text{(s)} + 2\text{CO(g)} \leftrightarrow \text{Se(s)} + 2\text{CO}_2\text{(g)}$
2. At equilibrium the following concentrations are recorded: 20.0 M of H_2 , 18.0 M of CO_2 , 12.0 M H_2O , and 5.9 M of CO at 427°C. What is the value of K_{eq} at this temperature for the following reaction?
 $\text{CO}_2\text{(g)} + \text{H}_2\text{(g)} \leftrightarrow \text{CO(g)} + \text{H}_2\text{O(g)}$
3. At equilibrium a mixture of N_2 , H_2 , and NH_3 gas at 500°C is determined to consist of 0.602 M N_2 , 0.420 M H_2 , and 0.113 M of NH_3 . What is the equilibrium constant at this temperature? Does this equilibrium favor the reactants or the products?
 $\text{N}_2\text{(g)} + 3\text{H}_2\text{(g)} \leftrightarrow 2\text{NH}_3\text{(g)}$
4. Given the equilibrium concentrations of 0.15 M NO , 0.12 M H_2 and 1.6 M N_2 . Calculate the equilibrium constant for the following reaction. Does this reaction favor the reactants or the products?
 $2\text{NO(g)} + 2\text{H}_2\text{(g)} \leftrightarrow \text{N}_2\text{(g)} + 2\text{H}_2\text{O(l)}$
5. What is the equilibrium constant for the following reaction if the equilibrium concentrations for the gases are 0.3 M for C_2H_6 , 0.6 M for O_2 , 1.3 M for CO_2 and 1.8 M for H_2O ? Does the reaction favor the reactants or products?
 $2\text{C}_2\text{H}_6\text{(g)} + 7\text{O}_2\text{(g)} \leftrightarrow 4\text{CO}_2\text{(g)} + 6\text{H}_2\text{O(g)}$
6. Nitrogen dioxide reacts to form dinitrogen tetraoxide. What is the equilibrium concentration of N_2O_4 if the $K_{eq} = 4.70$ and the equilibrium concentration of NO_2 is 0.0310 M?
 $2\text{NO}_2\text{(g)} \leftrightarrow \text{N}_2\text{O}_4\text{(g)}$

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**Frank Schaffer Publications,Joan
DiStasio**



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has considerably extended the scope of problems of scientific computing which can now be solved successfully with the aid of computers. However, as the field of applications of computer algebra in scientific computing becomes broader and more complex, there is a danger of separation between theory systems and applications. For this reason, we felt the need to bring together the researchers who now apply the tools of computer algebra for the solution of problems in scientific computing in order to foster new and closer interactions. CASC 99 is the second conference devoted to applications of computer algebra in scientific computing. The first conference in this sequence, CASC 98, was held 20-24 April 1998 in St. Petersburg, Russia. This volume contains revised versions of the papers submitted by the participants and accepted by the program committee after a thorough reviewing process. The collection of papers included in the proceedings covers various topics of computer algebra: methods, algorithms, and software applied to scientific computing; symbolic, numeric, analysis, and solving differential equations; efficient computations with polynomials, groups, matrices, and other related objects; special purpose programming environments; application to physics, mechanics, optics, and to other areas. In particular, a significant group of papers deals with applications of computer algebra methods for the solution of current problems in group theory, which mostly arise in mathematical physics.

NMR Studies of Translational Motion William S. Price, 2009-07-30 Overview of NMR theory and applications in fluid systems, fully referenced for research use.

Gas Reservoir Engineering W. John Lee, Robert A.

Wattenbarger, 1996. Gas Reservoir Engineering provides the undergraduate as well as the graduate student with an introduction to fundamental problem solving in gas reservoir engineering through practical equations and methods. Although much oil well technology applies to gas wells, many differences exist. This book helps students understand and recognize these differences to enable appropriate handling of gas reservoir problems. Natural gas production has become increasingly important in the U.S., and the wellhead revenue generated from it is now greater than the wellhead revenue generated from oil production. Because this trend eventually will be followed worldwide, we feel that it is important to emphasize gas reservoir engineering courses at the undergraduate level and to have a textbook devoted to this purpose. This book also serves as an introduction to gas reservoir engineering for graduate students and practicing petroleum engineers. Although much of the technology for oil wells applies to gas wells, there are still many differences. It is important to learn these differences and to have a good fundamental background in how to recognize and handle them. We have tried to provide practical equations and methods while emphasizing the fundamentals on which they are based. We have not attempted to be complete in the sense of presenting the best known solutions to all problems in this area of technology. In many cases, we didn't even present the problem, much less a solution. Instead, we concentrated on fundamentals and hope to have made the literature in gas reservoir engineering more accessible both now and in the future. If you don't find your favorite topic in the table of contents or in the index, it simply didn't make our short list of fundamentals that we believed to be key parts of the literature.

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