

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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3 Key

R Sandford



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Chemistry Homework Frank Schaffer Publications, Joan DiStasio, 1996-03 Includes the periodic table writing formulas balancing equations stoichiometry problems and more

Chemical Equilibrium William Guenther, 1975-12 The present work is designed to provide a practical introduction to aqueous equilibrium phenomena for both students and research workers in chemistry biochemistry geochemistry and interdisciplinary environmental fields The pedagogical strategy I have adopted makes heavy use of detailed examples of problem solving from real cases arising both in laboratory research and in the study of systems occurring in nature The procedure starts with mathematically complete equations that will provide valid solutions of equilibrium problems instead of the traditional approach through approximate concentrations and idealized infinite dilution assumptions There is repeated emphasis on the use of corrected conditional equilibrium constants and on the checking of numerical results by substitution in complete equations and or against graphs of species distributions Graphical methods of calculation and display are used extensively because of their value in clarifying equilibria and in leading one quickly to valid numerical approximations The coverage of solution equilibrium phenomena is not however exhaustively comprehensive Rather I have chosen to offer fundamental and rigorous examinations of homogeneous step equilibria and their interactions with solubility and redox equilibria Many examples are worked out in detail to demonstrate the use of equilibrium calculations and diagrams in various fields of investigation

Chemical Equilibrium In a Nutshell Brian Coleman, 2018-06-25 Understanding the math and minutiae of

chemical equilibrium can be a tall task for anyone so why not enlist the help of a scientific squirrel to guide you on your journey Join Dr Wash as we dabble in equilibrium constants and other tools needed to predict chemical processes This book focuses on introductory concepts at the high school and early university level focusing on identifying equilibrium calculating K and Q discussing Le Chatelier s principle and tying equilibrium with the field of Thermodynamics Full of step by step instructions and practice questions this book aims to simplify one of the more complex topics found within the field of chemistry

Equilibrium Calculations John T. Donoghue,1971 *Solution Equilibria* F. R. Hartley,Christopher Burgess,R. M. Alcock,1980 *Unified Equilibrium Calculations* William Benton Guenther,1991-08-19 A new approach to the academic treatment of solution equilibria is presented The author unifies homonuclear equilibrium calculations in one concept The alpha species fraction and bound proton and bound ligand ratio as a function of a single master variable the unbound H or L yield complete balances A single logic is maintained for all cases by equating the chemical binding expressed as an equilibrium condition and as a material balance condition

The Determination of Stability Constants Francis J. C. Rossotti,Hazel Rossotti,1961 *Equilibrium Constants of Liquid-liquid Distribution Reactions* International union of pure and applied chemistry. Commission on equilibrium data, **An Analytical Investigation of Three General Methods of Calculating Chemical-equilibrium Compositions** Frank J. Zeleznik,Sanford Gordon,1960 *Study Guide for Chemical Principles [by] Steven S. Zumdahl* Steven S. Zumdahl,Paul B. Kelter,1995 The Study Guide reflects the unique problem solving approach taken by the Chemical Principles text The new edition of the Study Guide includes many new worked out examples

Principles of Chemical Equilibrium Kelso B. Morris,1965 *Determining an Equilibrium Constant Using Spectrophotometry* Norman J. Hudak,1988-01-01 **Ion Exchange Equilibrium Constants** Y. Marcus,Darryl G. Howery,International Union of Pure and Applied Chemistry. Commission on Equilibrium Data,1975 Ion Exchange Equilibrium Constants focuses on the test compilation of equilibrium constants for ion exchange reactions The book first underscores the scope of the compilation equilibrium constants symbols used and arrangement of the table The manuscript then presents the table of equilibrium constants including polystyrene sulfonate cation exchanger polyacrylate cation exchanger polymethacrylate cation exchanger polysterene phosphate cation exchanger and zirconium phosphate cation exchanger The text highlights zirconium oxide anion exchanger zeolite type 13Y cation exchanger and

Study Guide for Chemical Principles Thomas Elliott Taylor,1979 **Critical Evaluation of Equilibrium Constants in Solution** J. Sary,G. Anderegg,1977 *Study Guide for Chemical Principles, Fourth Edition, by Dickerson, Gray, Darensbourg, and Darensbourg* Patricia L. Samuel,1984 **Critical Evaluation of Equilibrium Constants in Solution** International Union of Pure and Applied Chemistry. Commission on Toxicology,1978 **Critical Evaluation of Equilibrium Constants in Solution** Giorgio Anderegg,International Union of Pure and Applied Chemistry. Commission on Toxicology,1977

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Table of Contents Calculating Equilibrium Constants Chem Worksheet 18 3 Key

1. Understanding the eBook Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - The Rise of Digital Reading Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - Advantages of eBooks Over Traditional Books
2. Identifying Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - User-Friendly Interface
4. Exploring eBook Recommendations from Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - Personalized Recommendations
 - Calculating Equilibrium Constants Chem Worksheet 18 3 Key User Reviews and Ratings

- Calculating Equilibrium Constants Chem Worksheet 18 3 Key and Bestseller Lists
- 5. Accessing Calculating Equilibrium Constants Chem Worksheet 18 3 Key Free and Paid eBooks
 - Calculating Equilibrium Constants Chem Worksheet 18 3 Key Public Domain eBooks
 - Calculating Equilibrium Constants Chem Worksheet 18 3 Key eBook Subscription Services
 - Calculating Equilibrium Constants Chem Worksheet 18 3 Key Budget-Friendly Options
- 6. Navigating Calculating Equilibrium Constants Chem Worksheet 18 3 Key eBook Formats
 - ePub, PDF, MOBI, and More
 - Calculating Equilibrium Constants Chem Worksheet 18 3 Key Compatibility with Devices
 - Calculating Equilibrium Constants Chem Worksheet 18 3 Key Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - Highlighting and Note-Taking Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - Interactive Elements Calculating Equilibrium Constants Chem Worksheet 18 3 Key
- 8. Staying Engaged with Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Calculating Equilibrium Constants Chem Worksheet 18 3 Key
- 9. Balancing eBooks and Physical Books Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Calculating Equilibrium Constants Chem Worksheet 18 3 Key
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - Setting Reading Goals Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - Fact-Checking eBook Content of Calculating Equilibrium Constants Chem Worksheet 18 3 Key
 - Distinguishing Credible Sources

13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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