

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?
 $2\text{NO}_2\text{(g)} \leftrightarrow \text{N}_2\text{O}_4\text{(g)}$

Calculating Equilibrium Constants 18 3

Frank R. Foulkes



Calculating Equilibrium Constants 18 3:

Calculation of Thermodynamic Functions from Molecular Data Ivan Nikolaevich Godnev, 1956 **Cellular Energy Metabolism and its Regulation** Bozzano G Luisa, 2012-12-02 Cellular Energy Metabolism and Its Regulation examines the metabolic and molecular aspects of living organisms Beginning with a discussion of evolutionary design and its close analogy with human design it emphasizes the notion that evolution is a process of functional design and that the characteristics of an organism whether morphological or molecular were selected because of functional advantage to the organism s ancestors Thus the study of an enzyme a reaction or a sequence can be biologically relevant only if its position in the hierarchy of function is kept in mind This book deals with some aspects of metabolism from that point of view The key concepts discussed include the conservation of solvent capacity and energy functional stoichiometric coupling and metabolic prices adenylate control and the adenylate energy charge aspects of enzyme behavior that appear to be related to metabolic control interactions between metabolic sequences and the adenylate energy charge in intact cells This book was designed for graduate students in biochemistry physiology microbiology and related fields However it may also be useful to senior undergraduate students and more advanced workers who have a direct or peripheral interest in energy metabolism It assumes a general familiarity with the material covered in a standard biochemistry textbook as well as some knowledge of such related areas as genetics **General Chemistry** Donald A. McQuarrie, Stanley Gill, 2011-06-15 This Fourth Edition of McQuarrie s classic text offers a thorough revision and a quantum leap forward from the previous edition Taking an atoms first approach it promises to be another ground breaking text in the tradition of McQuarrie s many previous works This outstanding new text available in a soft cover edition offers professors a fresh choice and outstanding value **Physical Chemistry for Engineering and Applied Sciences** Frank R. Foulkes, 2012-09-12 Physical Chemistry for Engineering and Applied Sciences is the product of over 30 years of teaching first year Physical Chemistry as part of the Faculty of Applied Science and Engineering at the University of Toronto Designed to be as rigorous as compatible with a first year student s ability to understand the text presents detailed step by step derivations of the equations that permit the student to follow the underlying logic and of equal importance to appreciate any simplifying assumptions made or mathematical tricks employed In addition to the 600 exercises and end of chapter problems the text is rich in worked non trivial examples many of which are designed to be inspiring and thought provoking Step by step derivation of all equations enables the student to smoothly follow the derivation by sight and can be understood relatively easily by students with moderate skills and backgrounds in mathematics Clear and accessible Physical Chemistry for Engineering and Applied Sciences includes The answers to all of the 112 worked examples 99 exercises following many of the worked examples and 496 end of chapter problems Topics not normally seen in introductory physical chemistry textbooks ionic reaction rates activities and activity coefficients or not regularly explained in much detail electrochemistry chemical kinetics with an eye on industrial applications Special

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British Abstracts ,1926 *The Journal of Industrial and Engineering Chemistry* ,1921 *Journal of the Society of Chemical Industry* Society of Chemical Industry (Great Britain),1906 **From Source to Seep** M. Lawson,M.J. Formolo,J.M. Eiler,2018-03-28 Hydrocarbon systems by nature are a complex interplay of elements that must be spatially and temporally aligned to result in the generation and preservation of subsurface hydrocarbon accumulations To meet the increasing challenges of discovering hydrocarbon resources it is essential that we advance our understanding of these systems through new geochemical approaches and analytical developments Such development requires that academic and industry led research efforts converge in ways that are unique to the geosciences The aim of this volume is to bring together a multidisciplinary geochemical community from industry and academia working in hydrocarbon systems to publish recent advances and state of the art approaches to resolve the many remaining questions in hydrocarbon systems analysis From Source to Seep presents geochemical and isotopic studies that are grouped into three themes 1 source rock identification and the temperature timing of hydrocarbon generation 2 mechanisms and time scales associated with hydrocarbon migration trapping storage and alteration and 3 the impact of fluid flow on reservoir properties *International Catalogue of Scientific Literature* ,1904 *Calculations in Physical Chemistry* James Riddick Partington,Sidney Keenlyside Tweedy,1928

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