

Mole Ratios

How can the coefficients in a chemical equation be interpreted?

NATALIA
LACAYO
P. 2

Why?

A balanced chemical equation can tell us the number of reactant and product particles (ions, atoms, molecules or formula units) that are necessary to conserve mass during a chemical reaction. Typically when we balance the chemical equation we think in terms of individual particles. However, in real life the reaction represented by an equation occurs an unimaginable number of times. Short of writing very large numbers (10^{23} or larger) in front of each chemical in the equation, how can we interpret chemical equations so that they more realistically represent what is happening in real life? In this activity you will explore the different ways a chemical reaction can be interpreted.

Model 1 – A Chemical Reaction



- Consider the reaction in Model 1.

a. What are the coefficients for each of the following substances in the reaction?

1 N_2

3 H_2

2 NH_3

b. Draw particle models below to illustrate the reaction in Model 1.



- Consider each situation below as it relates to the reaction in Model 1.

a. Calculate the amount of reactants consumed and products made.

b. Record the ratio of N_2 to H_2 to NH_3 . Reduce the ratio to the lowest whole numbers possible.

	N_2 Consumed	H_2 Consumed	NH_3 Produced	Ratio $\text{N}_2:\text{H}_2:\text{NH}_3$ (reduced)
For a single reaction, how many molecules of each substance would be consumed or produced?	1	3	2	1:3:2
If the reaction occurred one hundred times, how many molecules would be consumed or produced?	100	300	200	1:3:2
If the reaction occurred 538 times, how many molecules would be consumed or produced?	538	1614	1076	1:3:2

Mole Ratios Worksheet Model 1 A

Y. A. Liu, Ai-Fu Chang, Kiran Pashikanti

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Science Spectrum Holt Rinehart & Winston, Holt, Rinehart and Winston Staff, 2003-03 **Chemical, Biochemical, and Engineering Thermodynamics** Stanley I. Sandler, 2017-04-24 In this newly revised 5th Edition of Chemical and Engineering Thermodynamics Sandler presents a modern applied approach to chemical thermodynamics and provides sufficient detail to develop a solid understanding of the key principles in the field The text confronts current information on environmental and safety issues and how chemical engineering principles apply in biochemical engineering bio technology polymers and solid state processing This book is appropriate for the undergraduate and graduate level courses **Chemical Engineering Process Simulation** Nishanth G. Chemmangattuvalappil, Chien Hwa Chon, Denny Ng Kok Sum, Rafil Elyas, Cheng-Liang Chen, I Lung Chien, Hao-Yeh Lee, Rene D Elms, 2017-07-13 Chemical Engineering Process Simulation is ideal for students early career researchers and practitioners as it guides you through chemical processes and unit operations using the main simulation softwares that are used in the industrial sector This book will help you predict the characteristics of a process using mathematical models and computer aided process simulation tools as well as model and simulate process performance before detailed process design takes place Content coverage includes steady and dynamic simulations the similarities and differences between process simulators an introduction to operating units and convergence tips and tricks You will also learn about the use of simulation for risk studies to enhance process resilience fault finding in abnormal situations and for training operators to control the process in difficult situations This experienced author team combines industry knowledge with effective teaching methods to make an accessible and clear comprehensive guide to process simulation Ideal for students early career researchers and practitioners as it guides you through chemical processes and unit operations using the main simulation softwares that are used in the industrial sector Covers the fundamentals of process simulation theory and advanced applications Includes case studies of various difficulty levels to practice and apply the developed skills Features step by step guides to using UniSim Design PRO II ProMax Aspen HYSYS for process simulation novices Helps readers predict the characteristics of a process using mathematical models and computer aided process simulation tools Chemical Process Design and Simulation: Aspen Plus and Aspen Hysys Applications Juma Haydary, 2019-01-16 A comprehensive and example oriented text for the study of chemical process design and simulation Chemical Process Design and Simulation is an accessible guide that offers information on the most important principles of chemical engineering design and includes illustrative examples of their application that uses simulation software A comprehensive and practical resource the text uses both Aspen Plus and Aspen Hysys simulation software The author describes the basic methodologies for computer aided design and offers a description of the basic steps of process simulation in Aspen Plus and Aspen Hysys The text reviews the design and simulation of individual simple unit operations that includes a mathematical model of each unit operation such as reactors separators and heat exchangers The author also explores the

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The Pressured Child Michael Thompson, PhD,2011-08-17 The push for students to excel at school and get into the best colleges has never been more intense In this invaluable new book the bestselling co author of Raising Cain addresses America s performance driven obsession with the accomplishments of its kids and provides a deeply humane response How was school These three words contain a world of desire on the part of parents to know what their children are learning and experiencing in school each day Children may not divulge much but psychologist Michael Thompson suggests that the answers are there if we know how to read the clues and equally important if we remember our own school days School Thompson reminds us occupies more waking hours than kids spend at home and school is full not just of studies but of human emotion excitement fear envy love anger sexuality boredom competitiveness Through richly detailed interviews case histories and student e mail journals including those of his own children Thompson illuminates the deeper psychological journey that school demands a journey that all children must take in order to grow and develop whether they are academic aces or borderline dropouts Most of us remember this journey if we are honest with ourselves but our children must experience it in their own way for better or worse In stories that are by turns poignant shocking uplifting and inspiring we see students grapple with the textured reality of their lives devising their own unique strategies to survive and thrive in school For parents this book reveals the hidden emotional landscape of the school day and points toward the answers we both desire and dread as we seek to help our children find success in school and beyond Bridging the worlds of the growing and the grown up and told in Thompson s compassionate voice as both psychologist and father The Pressured Child shows us how to listen for the truth of our children s experience and how to trust love and ultimately let go of a child It is a crucial book for our stressful age and an ideal resource for families struggling to survive it Petroleum Refinery Process Modeling Y. A. Liu,Ai-Fu Chang,Kiran Pashikanti,2018-06-05 A comprehensive review of the theory and practice of the simulation and optimization of the petroleum refining processes Petroleum Refinery Process Modeling offers a thorough review of how to quantitatively model key refinery reaction and fractionation processes The text introduces the basics of dealing with the

thermodynamics and physical property predictions of hydrocarbon components in the context of process modeling The authors three experts on the topic outline the procedures and include the key data required for building reaction and fractionation models with commercial software The text shows how to filter through the extensive data available at the refinery and using plant data to begin calibrating available models and extend the models to include key fractionation sub models It provides a sound and informed basis to understand and exploit plant phenomena to improve yield consistency and performance In addition the authors offer information on applying models in an overall refinery context through refinery planning based on linear programming This important resource Offers the basic information of thermodynamics and physical property predictions of hydrocarbon components in the context of process modeling Uses the key concepts of fractionation lumps and physical properties to develop detailed models and workflows for atmospheric CDU and vacuum VDU distillation units Discusses modeling FCC catalytic reforming and hydroprocessing units Written for chemical engineers process engineers and engineers for measurement and control this resource explores the advanced simulation tools and techniques that are available to support experienced and aid new operators and engineers

Introduction to Software for Chemical Engineers Mariano Martín Martín, 2025-03-24 The field of chemical engineering and its link to computer science is in constant evolution and engineers have an ever growing variety of tools at their disposal to tackle everyday problems Introduction to Software for Chemical Engineers Third Edition provides a quick guide to the use of various computer packages for chemical engineering applications It covers a range of software applications including Excel and general mathematical packages such as MATLAB MathCAD R and Python Coverage also extends to process simulators such as CHEMCAD HYSYS and Aspen equation based modeling languages such as gPROMS optimization software such as GAMS AIMS and Julia and specialized software like CFD or DEM codes The different packages are introduced and applied to solve typical problems in fluid mechanics heat and mass transfer mass and energy balances unit operations reactor engineering and process and equipment design and control This new edition is updated throughout to reflect software updates and new packages It emphasizes the addition of SimaPro due to the importance of life cycle assessment as well as general statistics software SPSS and Minitab that readers can use to analyze lab data The book also includes new chapters on flowsheeting drawing process control and LOOP Pro as well as updates to include Pyomo as an optimization platform reflecting current trends The text offers a global idea of the capabilities of the software used in the chemical engineering field and provides examples for solving real world problems Written by leading experts this handbook is a must have reference for chemical engineers looking to grow in their careers through the use of new and improving computer software Its user friendly approach to simulation and optimization as well as its example based presentation of the software makes it a perfect teaching tool for both undergraduate and graduate level readers

AIChE Symposium Series American Institute of Chemical Engineers, 1972 *Thermophysical Properties for Industrial Process Design* Theodore B. Selover, 1994 his volume presents

papers from the 1992 Symposium on Thermophysical Properties for Industrial Process Design Papers in Part I deal with new experimental techniques to provide data that are either difficult to measure by a conventional method or new data sets leading to the development of estimation or correlation of data new property estimation methods software for chemical equilibrium calculation and use of data in process design Papers in Part II cover novel experiences in industrial applications of existing models and methods for property estimation and phase equilibrium calculations Also included are discussions of software for database management and for molecule design by property The industrial processes covered in these papers involve a range of chemical systems including non electrolytes surfactants etc A detailed key word index is also provided

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