

REF ID

Unit 9 Outline- Thermodynamics, Reaction Rates, & Chemical Equilibrium

Chapters 17 & 18

### Essential 2010/2011 State Standards:

- 9-1. Describe how temperature and heat flow in terms of the motion of molecules (or atoms). (CSS: 7a)
  - 9-2. Know that chemical processes & phase changes can either release energy (exothermic) or absorb energy (endothermic). (CSS: 7b, 7c)
  - 9-3. Solve problems involving heat flow and temperature changes, using known values of specific heat ( $q = m \cdot c \cdot \Delta T$ ) & latent heat of phase change ( $q = m \cdot \Delta H$ ). (CSS: 7d)
  - 9-4. Know the rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time & depends on such factors as: concentration, temperature, and pressure. (CSS: 8a, 8b)
  - 9-5. Know the definition and role of activation energy & catalyst in a chemical reaction. (CSS: 8d\*, 8c)
  - 9-6. Know how to use Le Chatelier's principle to predict the effect of changes in concentration, temperature, and pressure. (CSS: 8c)
  - 9-7. Know that equilibrium is established when the forward and reverse reaction rates are equal. (CSS: 9b)

## Wesleyan

- Condensation
  - Freezing
  - Vaporization
  - Melting
  - Boiling
  - Sublimation
  - Deposition
  - Heat
  - Temperature
  - Thermochemistry
  - Exothermic
  - Endothermic
  - Calorimeter
  - Joule
  - Specific heat
  - $q = m \cdot c \cdot \Delta T$
  - $q = m \cdot \Delta H_{\text{exothermic}}$
  - $q = m \cdot \Delta H_{\text{endothermic}}$
  - Heat of reaction
  - Le Chatelier's principle
  - Equilibrium
  - Activation Energy
  - Catalyst

**Study Guide** (use notes, worksheets, and labs in addition to this study guide)

1. According to the collision theory, what 3 things must happen in order for two molecules to react?  
Must collide with each other. Must collide with enough energy. & in the correct orientation

2. What is the importance of the activation energy in a chemical reaction?

Amount of energy needed for a reaction to occur

3. Using the collision theory, explain if the following would increase/ decrease the rate of reaction.



- a. Increase temp: Increase, molecules collide more.
  - b. Increase HCl: Increase, more collisions because more reactants to collide.
  - c. Increase pressure: Hard to say, wouldn't affect the reactants directly because none of them are gases. One of the products is a gas, so it might cause the gas particles to collide more with the reactants and could slow down. Tough call.. (this one won't be on the test).
  - d. Remove  $MgCl_2$ : Increase, less products means less chance for them to interfere with reactant collisions.
  - e. Add  $H_2$ : Decrease, more products mean they interfere more with reactants and the reactants would

One of the products is a gas, so it might cause the gas particles to collide more with the reactants and could slow it down. Tough call.. (this one won't be on the test).

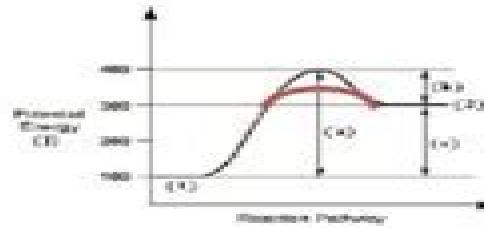
- d. Remove  $MgCl_2$  : Increase, less products means less chance for them to interfere with reactant collisions  
e. Add  $H_2$  : Decrease, more products mean they interfere more with reactants and the reactants would collide less.

4. Identify the following terms with their correct letter from the options:

- Reactants- 3
  - Activation energy- A
  - Is this reaction exothermic or endothermic?
  - Products- 2

Environ Biol Fish (2007) 79:111–120

5. Explain how a catalyst affects the activation energy in a chemical reaction. (Also, show on the above graph what a catalyst might do). It lowers the activation energy (see on graph)



# 18 Reaction Rates And Equilibrium Answers

**M Woodhall**

## 18 Reaction Rates And Equilibrium Answers:

**Study Guide and Solutions Manual for Seager/Slabaugh's Chemistry for Today** Seager/Slabaugh,2004 The fifth edition of the Study Guide and Student Solutions Manual has been updated to reflect all of the changes to the text This ancillary tests the student on the learning objectives in each chapter and provides answers to all of the even numbered end of chapter exercises New additional activities have been added to include a review of each section of the chapter and a section entitled Tying It All Together with a Laboratory Application

**MCAT General Chemistry Review** Alexander Stone Macnow,2016-07-05 The most efficient learning for the MCAT results you want Kaplan's MCAT General Chemistry Review has all the information and strategies you need to score higher on the MCAT This book features more practice than any other guide plus targeted subject review questions opportunities for self analysis a complete online center and thorough instruction on all of the general chemistry concepts necessary for MCAT success from the creators of the 1 MCAT prep course page 4 of cover

**Essential Cell Biology** Bruce Alberts,Dennis Bray,Karen Hopkin,Alexander D Johnson,Julian Lewis,Martin Raff,Keith Roberts,Peter Walter,2015-01-01 Essential Cell Biology provides a readily accessible introduction to the central concepts of cell biology and its lively clear writing and exceptional illustrations make it the ideal textbook for a first course in both cell and molecular biology The text and figures are easy to follow accurate clear and engaging for the introductory student Molecular detail has been kept to a minimum in order to provide the reader with a cohesive conceptual framework for the basic science that underlies our current understanding of all of biology including the biomedical sciences The Fourth Edition has been thoroughly revised and covers the latest developments in this fast moving field yet retains the academic level and length of the previous edition The book is accompanied by a rich package of online student and instructor resources including over 130 narrated movies an expanded and updated Question Bank Essential Cell Biology Fourth Edition is additionally supported by the Garland Science Learning System This homework platform is designed to evaluate and improve student performance and allows instructors to select assignments on specific topics and review the performance of the entire class as well as individual students via the instructor dashboard Students receive immediate feedback on their mastery of the topics and will be better prepared for lectures and classroom discussions The user friendly system provides a convenient way to engage students while assessing progress Performance data can be used to tailor classroom discussion activities and lectures to address students needs precisely and efficiently For more information and sample material visit <http://garlandscience.rocketmix.com>

**Im/Tb Chemistry F/Today** Slabaugh,Seager,2004

**Numerical Solution of Nonlinear Boundary Value Problems with Applications** Milan Kubicek,Vladimir Hlavacek,2008-01-01 A survey of the development analysis and application of numerical techniques in solving nonlinear boundary value problems this text presents numerical analysis as a working tool for physicists and engineers Starting with a survey of accomplishments in the field it explores initial and boundary value problems for ordinary differential equations linear boundary value problems and the numerical

realization of parametric studies in nonlinear boundary value problems The authors Milan Kubicek Professor at the Prague Institute of Chemical Technology and Vladimir Hlavacek Professor at the University of Buffalo emphasize the description and straightforward application of numerical techniques rather than underlying theory This approach reflects their extensive experience with the application of diverse numerical algorithms *Physical Chemistry* Gordon M. Barrow,1988 Includes glossary and index *Introduction to General, Organic, and Biochemistry* Morris Hein,1997 The authors recognize that both science and mathematics may be daunting subjects for many students taking this course With this in mind they have anticipated where students might stumble and have paced and organized this text to help them through Their goal is to make the material interesting and relevant so students understand the basic chemical principles related to their career The authors emphasize problem solving and provide a range of practice exercises As in previous editions the text first presents the basic concepts of general chemistry and then moves into organic and biochemistry In this edition the first two sections have been revised primarily to improve explanations and include new pedagogical features The biochemistry portion has been thoroughly updated to include coverage of many recent developments and emerging technologies in the field

**Foundations of Chemistry** Morris Hein,Susan Arena,1996 A textbook introducing matter atomic theory ionization and other aspects of chemistry to the high school student *Thermodynamic and Kinetic Constraints on Reaction Rates Among Minerals and Aqueous Solutions* William Marshall Murphy,1985 *Student Study Guide and Solutions Manual to accompany General Organic and Biological Chemistry, 1e* Kenneth W. Raymond,2005-10-07 Finally readers have a shorter less intimidating introduction to general organic and biological chemistry Not only is Raymond s text concise it also takes an integrated approach to presenting important topics in a way that makes the material easier to understand In this approach similarities can be exploited and concepts reinforced The result is that readers see the strong connections that exist between these three branches of chemistry **Chemical & Process Engineering** ,1954 *Molecular Dynamics* Alexander Vakhrushev,2018-08-01 This book is devoted to a description of the modeling of nanosystems and a detailed exposition of the application of molecular dynamics methods to problems from various fields of technology material science the formation of composite molecular complexes and transport of nanosystems The research results of the modeling of various nanosystems are presented soft supramolecular nanostructures nanosized beams of single crystal Cu metallic nanosized crystals drug delivery systems and systems stabilized by hydrogen bonds The information from this book will be useful for engineers technologists researchers and postgraduate students interested in the study of the whole complex of computer simulation based on the concept of molecular dynamics methods for the task of designing and producing nanomaterials with controlled properties *Soviet Physics, Crystallography* ,1973 **Transactions of the Iron & Steel Society of AIME** ,1988

**Chemistry of Soil Solutions** Adel M. Elprince,1990 *Journal of Applied Chemistry of the USSR* ,1988 *Physical Chemistry* Walter John Moore,1972 **Chemistry** John Christian Bilar,1989 *Military Medicine* ,1920 **The Military**

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