

Energy and Chemical Change

Section 15.1 Energy

pages 516–522

Practice Problems

pages 519–521

1. A fruit and oatmeal bar contains 142 nutritional Calories. Convert this energy to calories.

$$142 \text{ Calories} = 142 \text{ kcal}$$

$$142 \text{ kcal} \times \frac{1000 \text{ cal}}{1 \text{ kcal}} = 142,000 \text{ cal}$$

2. An exothermic reaction releases 86.5 kJ. How many kilocalories of energy are released?

$$86.5 \text{ kJ} \times \frac{1 \text{ kcal}}{4.184 \text{ kJ}} = 20.7 \text{ kcal}$$

3. **Challenge** Define a new energy unit, named after yourself, with a magnitude of one-tenth of a calorie. What conversion factors relate this new unit to joules? To Calories?

$$\text{Unit X} = 0.1 \text{ cal}$$

$$1 \text{ cal} = 4.184 \text{ J}$$

$$\text{X} = (0.1 \text{ cal})(4.184 \text{ J/cal}) = 0.4184 \text{ J}$$

$$1 \text{ cal} = 0.001 \text{ Calorie}$$

$$\text{X} = (0.1 \text{ cal})(1 \text{ Cal}/1000 \text{ cal}) = 0.0001 \text{ Calorie}$$

4. If the temperature of 34.4 g of ethanol increases from 25.0°C to 78.8°C, how much heat has been absorbed by the ethanol? Refer to Table 15.2.

$$q = c \times m \times \Delta T$$

$$q = 2.44 \text{ J/(g}\cdot\text{°C)} \times 34.4 \text{ g} \times 53.8\text{°C} = 4.52 \times 10^3 \text{ J}$$

5. A 155-g sample of an unknown substance was heated from 25.0°C to 40.0°C. In the process, the substance absorbed 5696 J of energy. What is the specific heat of the substance? Identify the substance among those listed in Table 15.2 on page 520.

$$q = c \times m \times \Delta T$$

$$c = \frac{q}{m\Delta T} = \frac{(5696 \text{ J})}{(155 \text{ g})(40.0 - 25.0\text{°C})} = 2.45 \text{ J/(g}\cdot\text{°C)}$$

The specific heat is very close to the value for ethanol.

6. **Challenge** A 4.50-g nugget of pure gold absorbed 276 J of heat. The initial temperature was 25.0°C. What was the final temperature?

$$q = c \times m \times \Delta T$$

$$\Delta T = \frac{q}{cm} = \frac{(276 \text{ J})}{(0.129 \text{ J/g}\cdot\text{°C})(4.50 \text{ g})} = 475\text{°C}$$

$$\Delta T = T_f - T_i = T_f - 25.0\text{°C} = 475\text{°C}$$

$$T_f = 5.00 \times 10^2\text{°C}$$

Section 15.1 Assessment

page 522

7. **Explain** how energy changes from one form to another in an exothermic reaction. In an endothermic reaction.

Chemical potential energy changes to heat in exothermic reactions and the heat is released. In endothermic reactions, heat is absorbed and changed to chemical potential energy.

8. **Distinguish** between kinetic and potential energy in the following examples: two separated magnets; an avalanche of snow; books on library shelves; a mountain stream; a stock-car race; separation of charge in a battery.

Two separated magnets illustrate potential energy. In a snow avalanche, positional potential energy is changing to kinetic energy. Books on a shelf illustrate positional potential energy. As water races down a mountain stream, positional potential energy is changing to kinetic energy. In a stock-car race, chemical potential energy is being changed to kinetic energy. The separation of charge in a battery illustrates electrical potential energy.

9. **Explain** how the light and heat of a burning candle are related to chemical potential energy.

Chemical potential energy, contained in the candle, is changed to energy in the form of light and heat and released as the chemical combustion reaction takes place.

Chemistry Matter And Change Chapter 12 Solutions

**Hans-Dieter Barke, Günther
Harsch, Siegbert Schmid**



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Student's Guide to Fundamentals of Chemistry Jo A. Beran, 2013-10-22 *Student's Guide to Fundamentals of Chemistry* Fourth Edition provides an introduction to the basic chemical principles. This book deals with various approaches to chemical principles and problem solving in chemistry. Organized into 25 chapters, this edition begins with an overview of how to define and recognize the more common names and symbols in chemistry. This text then discusses the historical development of the concept of atom as well as the historical determination of atomic weights for the elements. Other chapters consider how to calculate the molecular weight of a compound from its formula. This book discusses as well the characteristics of a photon in terms of its particle-like properties and defines the wavelength, frequency, and speed of light. The final chapter deals with the fundamental components of air and the classification of materials formed in natural waters. This book is a valuable resource for chemistry students, lecturers, and instructors.

Living by Chemistry Angelica M. Stacy, 2016-01-23 *Living by Chemistry* Fourth Edition is a high school chemistry program built around hands-on learning, real-world connections, and NGSS-aligned content. Students develop scientific thinking through inquiry-based lessons, labs, and problem solving.

Living by Chemistry (2018 Update) Angelica M. Stacy, 2019-03-07 Designed to help all students to learn chemistry, *Living by Chemistry* is a full-year high school curriculum that incorporates science practices with a guided inquiry approach. Students of all levels will gain a deep understanding of chemistry with this program. With *Living by Chemistry*, students learn chemistry in the same way that chemists work: by asking questions, collecting evidence, and thinking like scientists. *Living by Chemistry* is the product of a decade of research and development in high school classrooms, focusing on optimizing student understanding of chemical principles. Author Angelica Stacy assisted in the development of the NGSS standards and served on the AP Chemistry redesign committee. She designed *Living by Chemistry* as an introduction for students who will take AP Chemistry or additional college classes. The curriculum was developed with the belief that science is best learned through first-hand experience and discussion with peers. Guided inquiry allows students to actively participate in and become adept at scientific processes and communication. These skills are vital to a student's further success in science as well as beneficial to other pursuits. Formal definitions and formulas are frequently introduced after students have explored, scrutinized, and developed a concept, providing more effective instruction. LBC's innovative curriculum offers much more than traditional programs. To help engage students of all levels, the curriculum provides a variety of learning experiences through activities, discussions, games, demos, lectures, labs, and individual work.

AP Chemistry For Dummies Peter J. Mikulecky, Michelle Rose Gilman, Kate Brutlag, 2008-11-13 A practical and hands-on guide for learning the practical science of AP chemistry and preparing for the AP chem exam. Gearing up for the AP Chemistry exam, *AP Chemistry For Dummies* is packed with all the resources and help you need to do your very best. Focused on the chemistry concepts and problems the College Board wants you to know, this AP Chemistry study guide gives you winning test-taking tips, multiple-choice strategies, and topic guidelines, as well as great

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Joseph Topich,2000-10 *Chemistry, Student Solutions Manual* James E. Brady,Joel W. Russell,John R. Holum,2000-01-26 The images on the cover call attention to the relationship between macro observations and the intimate structure of chemical substances and the changes both chemical and physical that they undergo Fireworks One of the ingredients is phosphorus a molecular form of which is believed to consist of linked tetrahedra of phosphorus atoms The chemical reaction of phosphorus with oxygen is partly responsible for the spectacular show of light Carbon The element is found in several forms including the familiar diamond and another recently discovered sooty substance that consists of soccer ball shaped molecules often referred to as buckeyballs Diamond is not the most stable form of carbon and is created from other forms of carbon at high temperatures and pressures deep within the earth Acetylene torch Cutting steel is possible because of the intense heat generated by the chemical reaction of acetylene with oxygen a reaction between molecules of C_2H_2 and O_2 to give CO_2 and H_2O Hot air balloon The air that helps it rise is heated by the combustion of molecules of propane each composed of three carbon and eight hydrogen atoms Stormy weather The evaporation of water serves to store energy provided by the sun Subsequent condensation of the water vapor releases this energy and is the basis of all the weather systems on our planet

Chemistry James E. Brady,John R. Holum,1993-01-21 Offers accurate lucid and interesting explanations of basic concepts and facts of chemistry while helping students develop skills in analytical thinking and problem solving Students are taught in a variety of ways to think of skills as tools that can be used to solve complex problems Several aids are included to help focus and inspire student interest frequent reference to common chemicals in commercial products numerous

photographs of reactions in chapter practice exercises following worked examples

Chemistry For Dummies John T. Moore, 2016-05-26 Chemistry For Dummies 2nd Edition 9781119293460 was previously published as Chemistry For Dummies 2nd Edition 9781118007303 While this version features a new Dummies cover and design the content is the same as the prior release and should not be considered a new or updated product See how chemistry works in everything from soaps to medicines to petroleum We re all natural born chemists Every time we cook clean take a shower drive a car use a solvent such as nail polish remover or perform any of the countless everyday activities that involve complex chemical reactions we re doing chemistry So why do so many of us desperately resist learning chemistry when we re young Now there s a fun easy way to learn basic chemistry Whether you re studying chemistry in school and you re looking for a little help making sense of what s being taught in class or you re just into learning new things Chemistry For Dummies gets you rolling with all the basics of matter and energy atoms and molecules acids and bases and much more Tracks a typical chemistry course giving you step by step lessons you can easily grasp Packed with basic chemistry principles and time saving tips from chemistry professors Real world examples provide everyday context for complicated topics Full of modern relevant examples and updated to mirror current teaching methods and classroom protocols Chemistry For Dummies puts you on the fast track to mastering the basics of chemistry

Chemistry Martin Stuart Silberberg, 1996 This general chemistry text centres on the theme that observable change in chemical systems is the result of molecular change The aims of this edition are to enable students to perceive matter and change at the molecular level and to help build student confidence in their ability to solve chemical problems as they discover the relevance of chemistry to their lives

Chemistry Didactics Compact Hans-Dieter Barke, Günther Harsch, Simone Kröger, Annette Marohn, 2025-04-24 Chemiedidaktik kompakt offers students and trainee chemists practical overview knowledge with many examples from current teaching with experiments and models with exercises and school relevant results of teaching and learning research on each topic With their proven concept the authors not only address the classic problems of chemistry didactics but also devote extensive attention to modern topics such as chemistry in everyday life student ideas media and motivation

Essentials of Chemical Education Hans-Dieter Barke, Günther Harsch, Siegbert Schmid, 2011-10-28 For everybody teaching chemistry or becoming a chemistry teacher the authors provide a practice oriented overview with numerous examples from current chemical education including experiments models and exercises as well as relevant results from research on learning and teaching With their proven concept the authors cover classical topics of chemical education as well as modern topics such as every day life chemistry student s misconceptions the use of media or the challenges of motivation This is the completely revised and updated English edition of a highly successful German title

The Principles of Chemistry Dmitry Ivanovich Mendeleev, 1905 *Library of Universal Literature: The principles of chemistry*, 1901

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 *Chemical*

Control of Gas Manufacture ,1916 **Chemistry** McGraw-Hill Staff,2001-03 **Principles of Electroplating and Electroforming (electrotyping)** William Blum,George Byron Hogaboom,1930 **CHEMISTRY SILBERBERG**,2003

The Oxford Handbook of Thinking and Reasoning Keith J. Holyoak, Ph.D.,Robert G. Morrison, Ph.D.,2012-04-19 The Oxford Handbook of Thinking and Reasoning brings together the contributions of many of the leading researchers in thinking and reasoning to create the most comprehensive overview of research on thinking and reasoning that has ever been available Each chapter includes a bit of historical perspective on the topic and concludes with some thoughts about where the field seems to be heading *College Chemistry* J. Nelson Shaw,1966

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