

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.

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

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

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.

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

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

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?

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

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

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

$$T_f = 5.00 \times 10^2^\circ\text{C}$$

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.

Assessment Energy And Chemical Change Solutions Manual

Thomas Griffiths



Assessment Energy And Chemical Change Solutions Manual:

Basic Concepts of Chemistry, 9e Study Guide and Solutions Manual Leo J. Malone, Theodore O. Dolter, 2012-01-03

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Laboratory Manual of Inorganic Chemistry for Colleges Lyman Churchill Newell, 1916

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Instructor's Manual and Test Bank to Accompany Basic Concepts of Chemistry Malone, 2000-04-18

A Laboratory Manual of General Chemistry William Crowell Bray, Ludwig Rosenstein, 1916

A Laboratory

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Table of Contents Assessment Energy And Chemical Change Solutions Manual

1. Understanding the eBook Assessment Energy And Chemical Change Solutions Manual
 - The Rise of Digital Reading Assessment Energy And Chemical Change Solutions Manual
 - Advantages of eBooks Over Traditional Books
2. Identifying Assessment Energy And Chemical Change Solutions Manual
 - 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 Assessment Energy And Chemical Change Solutions Manual
 - User-Friendly Interface
4. Exploring eBook Recommendations from Assessment Energy And Chemical Change Solutions Manual
 - Personalized Recommendations
 - Assessment Energy And Chemical Change Solutions Manual User Reviews and Ratings
 - Assessment Energy And Chemical Change Solutions Manual and Bestseller Lists
5. Accessing Assessment Energy And Chemical Change Solutions Manual Free and Paid eBooks
 - Assessment Energy And Chemical Change Solutions Manual Public Domain eBooks
 - Assessment Energy And Chemical Change Solutions Manual eBook Subscription Services
 - Assessment Energy And Chemical Change Solutions Manual Budget-Friendly Options
6. Navigating Assessment Energy And Chemical Change Solutions Manual eBook Formats
 - ePub, PDF, MOBI, and More
 - Assessment Energy And Chemical Change Solutions Manual Compatibility with Devices
 - Assessment Energy And Chemical Change Solutions Manual Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Assessment Energy And Chemical Change Solutions Manual
 - Highlighting and Note-Taking Assessment Energy And Chemical Change Solutions Manual
 - Interactive Elements Assessment Energy And Chemical Change Solutions Manual
8. Staying Engaged with Assessment Energy And Chemical Change Solutions Manual

- Joining Online Reading Communities
- Participating in Virtual Book Clubs
- Following Authors and Publishers Assessment Energy And Chemical Change Solutions Manual
- 9. Balancing eBooks and Physical Books Assessment Energy And Chemical Change Solutions Manual
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Assessment Energy And Chemical Change Solutions Manual
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Assessment Energy And Chemical Change Solutions Manual
 - Setting Reading Goals Assessment Energy And Chemical Change Solutions Manual
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Assessment Energy And Chemical Change Solutions Manual
 - Fact-Checking eBook Content of Assessment Energy And Chemical Change Solutions Manual
 - 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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