CHAPTER 15 SOLUTIONS MANUAL

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 Calories = 142 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?

Unit X = 0.1 cal

1 cal = 4.184 J

X = (0.1 cal)(4.184 J/cal) = 0.4184 J

1 cal = 0.001 Calorie

X = (0.1 cal)(1 Cal/1000 cal) = 0.0001 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.**

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

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

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.

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

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

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?

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

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

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

$T_f = 5.00 \times 10^2\ \text{°C}$

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.

Chapter 15 Study Energy And Chemical Change Answers

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516 Chapter 15 • Energy and Chemical Change Section 115.15.1 Objectives Define energy. Distinguish between potential and kinetic energy. Relate chemical potential energy to the heat lost or gained in chemical reactions. Calculate the amount of heat absorbed or released by a substance as its temperature changes. Review Vocabulary

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Energy Chapter 15 Quiz 1 Study Guide KEY
Energy Chapter 15 Quiz 1 Study Guide 1. Define kinetic energy. 2. Give an example of kinetic energy. 3. Define potential energy. 4. Give an example of potential energy. 5. A 70 kg man walks at a speed of 2.5 m/s. What is his KE? 6. A 1.7 kg brick is dropped 2 m and hits the ground. What was the PE before it is dropped? 7. Identify the forms of energy and give an example of each. 8. ME = 9 ...

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Chapter 15 Energy Section 15.2 Energy Conversion and Conservation (pages 453–459) This section describes how energy is converted from one form to another. The law of conservation of energy also is presented. Reading Strategy (page 453) Relating Cause and Effect As you read, complete the flowchart to explain an energy conversion used by some gulls to obtain food. For

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