Name: _____ Class: _____ Date: _____ ID: A

Chapter 17 Study Guide

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1) What happens to the energy produced by burning gasoline in a car engine?
   Ⓐ The energy is lost as heat in the exhaust.
   Ⓑ The energy is transformed into work to move the car.
   Ⓒ The energy heats the parts of the engine.
   Ⓓ all of the above

2) A piece of metal is heated, then submerged in cool water. Which statement below describes what happens?
   Ⓐ The temperature of the metal will increase.
   Ⓑ The temperature of the water will increase.
   Ⓒ The temperature of the water will decrease.
   Ⓓ The temperature of the water will increase and the temperature of the metal will decrease.

3) How does a calorie compare to a joule?
   Ⓐ A calorie is smaller than a joule.
   Ⓑ A calorie is larger than a joule.
   Ⓒ A calorie is equal to a joule.
   Ⓓ The relationship cannot be determined.

4) What would likely happen if you were to touch the flask in which an endothermic reaction were occurring?
   Ⓐ The flask would probably feel cooler than before the reaction started.
   Ⓑ The flask would probably feel warmer than before the reaction started.
   Ⓒ The flask would feel the same as before the reaction started.
   Ⓓ none of the above

5) Which of the following is NOT a form of energy?
   Ⓐ light
   Ⓑ pressure
   Ⓒ heat
   Ⓓ electricity

6) When energy is changed from one form to another, ____.
   Ⓐ some of the energy is lost entirely
   Ⓑ all of the energy can be accounted for
   Ⓒ a physical change occurs
   Ⓓ all of the energy is changed to a useful form

7) If heat is released by a chemical system, an equal amount of heat will be ____.
   Ⓐ absorbed by the surroundings
   Ⓑ absorbed by the universe
   Ⓒ released by the surroundings
   Ⓓ released by the universe

8) Which of the following is transferred due to a temperature difference?
   Ⓐ chemical energy
   Ⓑ mechanical energy
   Ⓒ electrical energy
   Ⓓ heat

9) In an exothermic reaction, the energy stored in the chemical bonds of the reactants is ____.
   Ⓐ equal to the energy stored in the bonds of the products
   Ⓑ greater than the energy stored in the bonds of the products
   Ⓒ less than the energy stored in the bonds of the products
   Ⓓ less than the heat released

10) When your body breaks down sugar completely, how much heat is released compared to burning the same amount of sugar in a flame?
   Ⓐ The body releases more heat.
   Ⓑ The body releases less heat.
   Ⓒ The body releases the same amount of heat.
   Ⓓ The body releases no heat.

11) A piece of candy has 5 Calories (or 5000 calories). If it could be burned, leaving nothing but carbon dioxide and water, how much heat would it give off?
Ⓐ 500 calories
Ⓑ 5 kilocalories
Ⓒ 5000 joules
Ⓓ Not enough information is given.

12) How many joules are in 148 calories? (1 cal = 4.18 J)
Ⓐ 6.61 J
Ⓑ 35.4 J
Ⓒ 148 J
Ⓓ 619 J

13) What is the amount of heat required to raise the temperature of 200.0 g of aluminum by 10°C? (specific heat of aluminum = 0.21 $\frac{\text{cal}}{\text{g°C}}$)
Ⓐ 420 cal
Ⓑ 4200 cal
Ⓒ 42,000 cal
Ⓓ 420,000 cal

14) What is the specific heat of a substance if 1560 cal are required to raise the temperature of a 312-g sample by 15°C?
Ⓐ 0.033 $\frac{\text{cal}}{\text{g°C}}$
Ⓑ 0.33 $\frac{\text{cal}}{\text{g°C}}$
Ⓒ 0.99 $\frac{\text{cal}}{\text{g°C}}$
Ⓓ 1.33 $\frac{\text{cal}}{\text{g°C}}$

15) How many kilocalories of heat are required to raise the temperature of 225 g of aluminum from 20°C to 100°C? (specific heat of aluminum = 0.21 $\frac{\text{cal}}{\text{g°C}}$)
Ⓐ 0.59 kcal
Ⓑ 3.8 kcal
Ⓒ 85 kcal
Ⓓ none of the above

16) The heat capacity of an object depends in part on its ____.
Ⓐ mass
Ⓑ enthalpy
Ⓒ shape
Ⓓ potential energy

17) Which of the following is a valid unit for specific heat?
Ⓐ $\frac{\text{cal}}{\text{g°C}}$
Ⓑ cal
Ⓒ $\frac{\text{cal}}{\text{g}}$
Ⓓ °C

18) When 45 g of an alloy, at 25°C, are dropped into 100.0 g of water, the alloy absorbs 956 J of heat. If the final temperature of the alloy is 37°C, what is its specific heat?
Ⓐ 0.423 $\frac{\text{cal}}{\text{g°C}}$
Ⓑ 1.77 $\frac{\text{cal}}{\text{g°C}}$
Ⓒ 9.88 $\frac{\text{cal}}{\text{g°C}}$
Ⓓ 48.8 $\frac{\text{cal}}{\text{g°C}}$

19) How can you describe the specific heat of olive oil if it takes approximately 420 J of heat to raise the temperature of 7 g of olive oil by 30°C?
Ⓐ greater than the specific heat of water
Ⓑ less than the specific heat of water
Ⓒ equal to the specific heat of water
Ⓓ Not enough information is given.

20) The specific heat of silver is 0.24 $\frac{\text{J}}{\text{g°C}}$. How many joules of energy are needed to warm 4.37 g of silver from 25.0°C to 27.5°C?
Ⓐ 2.62 J
Ⓑ 0.14 J
Ⓒ 45.5 J
Ⓓ 0.022 J

21) Which of the following has the greatest heat capacity?
Ⓐ 1000 g of water
Ⓑ 1000 g of steel
Ⓒ 1 g of water
Ⓓ 1 g of steel

22) Which of the following substances has the highest specific heat?
Ⓐ steel
Ⓑ water
Ⓒ alcohol
Ⓓ chloroform

23) By what quantity must the heat capacity of an object be divided to obtain the specific heat of that material?
Ⓐ its mass
Ⓑ its volume
Ⓒ its temperature
Ⓓ its energy

24) The amount of heat transferred from an object depends on which of the following?
Ⓐ the specific heat of the object
Ⓑ the initial temperature of the object
Ⓒ the mass of the object
Ⓓ all of the above

25) What does the symbol ΔH stand for?
Ⓐ the specific heat of a substance
Ⓑ the heat capacity of a substance
Ⓒ the heat of reaction for a chemical reaction
Ⓓ one Calorie given off by a reaction

26) Standard conditions of temperature and pressure for a thermochemical equation are ____.
Ⓐ 0°C and 101 kPa
Ⓑ 25°C and 101 kPa
Ⓒ 0°C and 0 kPa
Ⓓ 25°C and 22.4 kPa

27) On what principle does calorimetry depend?
Ⓐ Hess's law
Ⓑ law of conservation of energy
Ⓒ law of enthalpy
Ⓓ law of multiple proportions

28) How can the enthalpy change be determined for a reaction in an aqueous solution?
Ⓐ by knowing the specific heat of the reactants
Ⓑ by mixing the reactants in a calorimeter and measuring the temperature change
Ⓒ by knowing the mass of the reactants
Ⓓ The enthalpy change for this type of reaction cannot be determined.

29) A chunk of ice whose temperature is –20°C is added to an insulated cup filled with water at 0°C. What happens in the cup?
Ⓐ The ice melts until it reaches the temperature of the water.
Ⓑ The water cools until it reaches the temperature of the ice.
Ⓒ Some of the water freezes, so the chunk of ice gets larger.
Ⓓ none of the above

30) Calculate the energy required to produce 7.00 mol Cl_2O_7 on the basis of the following balanced equation.
$2Cl_2(g) + 7O_2(g) + 130 \text{ kcal} \rightarrow 2Cl_2O_7(g)$
Ⓐ 7.00 kcal
Ⓑ 65 kcal
Ⓒ 130 kcal
Ⓓ 455 kcal

31) What is the standard heat of reaction for the following reaction?
$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$
(ΔH_f^0 for Cu^{2+} = +64.4 kJ/mol; ΔH_f^0 for Zn^{2+} = –152.4 kJ/mol)
Ⓐ 216.8 kJ released per mole
Ⓑ 88.0 kJ released per mole
Ⓒ 88.0 kJ absorbed per mole
Ⓓ 216.8 kJ absorbed per mole

32) Calculate ΔH for the following reaction.
$C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g)$
(ΔH_f^0 for $C_2H_4(g)$ = 52.5 kJ/mol; ΔH_f^0 for $C_2H_6(g)$ = –84.7 kJ/mol)
Ⓐ –137.2 kJ
Ⓑ –32.2 kJ
Ⓒ 32.2 kJ
Ⓓ 137.2 kJ

33) Calculate the energy released when 24.8 g Na_2O reacts in the following reaction.
$Na_2O(s) + 2HI(g) \rightarrow 2NaI(s) + H_2O(l)$
$\Delta H = -120.00$ kcal
Ⓐ 0.207 kcal
Ⓑ 2.42 kcal
Ⓒ 48.0 kcal
Ⓓ 3.00×10^2 kcal

34) To calculate the amount of heat absorbed as a substance melts, which of the following information is NOT needed?
Ⓐ the mass of the substance
Ⓑ the specific heat of the substance
Ⓒ the change in temperature
Ⓓ the density of the sample

35) What is the heat of solution?
Ⓐ the amount of heat required to change a solid into a liquid
Ⓑ the amount of heat absorbed or released when a solid dissolves
Ⓒ the amount of heat required to change a vapor into a liquid
Ⓓ the amount of heat released when a vapor changes into a liquid

36) The ΔH_{soln} is ____.
Ⓐ always negative
Ⓑ always positive
Ⓒ sometimes positive, sometimes negative
Ⓓ always 0

37) When 1.0 g of solid NaOH ($\Delta H_{soln} = -445.1$ kJ/mol) dissolves in 10 L of water, how much heat is released?
Ⓐ 445.1 kJ
Ⓑ 405.1 kJ
Ⓒ 11.1 J
Ⓓ 11.1 kJ

38) When 10 g of diethyl ether is converted to vapor at its boiling point, about how much heat is absorbed? ($C_4H_{10}O$, ΔH_{vap} = 15.7 kJ/mol, boiling point: 34.6°C)
Ⓐ 2 kJ
Ⓑ 2 J
Ⓒ 0.2 kJ
Ⓓ Not enough information is given.

39) Hess's law ____.
Ⓐ makes it possible to calculate ΔH for complicated chemical reactions
Ⓑ states that when you reverse a chemical equation, you must change the sign of ΔH
Ⓒ determines the way a calorimeter works
Ⓓ describes the vaporization of solids

40) Using a table that lists standard heats of formation, you can calculate the change in enthalpy for a given chemical reaction. The change in enthalpy is equal to ____.
Ⓐ ΔH_f^0 of products minus ΔH_f^0 of reactants
Ⓑ ΔH_f^0 of products plus ΔH_f^0 of reactants
Ⓒ ΔH_f^0 of reactants minus ΔH_f^0 of products
Ⓓ ΔH_f^0 of products divided by ΔH_f^0 of reactants

41) ΔH_f^0 for the formation of rust (Fe_2O_3) is –826 kJ/mol. How much energy is involved in the formation of 5 grams of rust?
Ⓐ 25.9 kJ
Ⓑ 25.9 J
Ⓒ 66 kJ
Ⓓ 66 J

42) Calculate ΔH for the reaction of sulfur dioxide with oxygen.
$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$
($\Delta H_f^0 SO_2(g) = -296.8$ kJ/mol; $\Delta H_f^0 SO_3(g) = -395.7$ kJ/mol)
Ⓐ –98.9 kJ
Ⓑ –197.8 kJ
Ⓒ 197.8 kJ
Ⓓ Not enough information is given.