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

Chapter 10 Review

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

____ 1. A substance's temperature increases as a direct result of
a. energy being removed from the particles of the substance.
b. kinetic energy being added to the particles of the substance.
c. a change in the number of atoms and molecules in a substance.
d. a decrease in the volume of the substance.

____ 2. What happens to the internal energy of an ideal gas when it is heated from 0°C to 4°C?
a. It increases.
b. It decreases.
c. It remains constant.
d. It is impossible to determine.

____ 3. Which of the following is proportional to the kinetic energy of atoms and molecules?
a. elastic energy
b. temperature
c. potential energy
d. thermal equilibrium

____ 4. Which of the following best describes the relationship between two systems in thermal equilibrium?
a. No net energy is exchanged.
b. The volumes are equal.
c. The masses are equal.
d. The velocity is zero.

____ 5. What is the temperature of a system in thermal equilibrium with another system made up of water and steam at 1 atm of pressure?
a. 0°F
b. 273 K
c. 0 K
d. 100°C

____ 6. What is the temperature of a system in thermal equilibrium with another system made up of ice and water at 1 atm of pressure?
a. 0°F
b. 273 K
c. 0 K
d. 100°C

____ 7. Heat flow occurs between two bodies in thermal contact when they differ in which of the following properties?
a. mass
b. specific heat
c. density
d. temperature

____ 8. If two small beakers of water, one at 70°C and one at 80°C, are emptied into a large beaker, what is the final temperature of the water?
a. less than 70°C
b. greater than 80°C
c. between 70°C and 80°C
d. The water temperature will fluctuate.

____ 9. All of the following are widely used temperature scales EXCEPT
a. Kelvin.
b. Fahrenheit.
c. Celsius.
d. Joule.

____ 10. If 546 K equals 273°C, then 500 K equals
a. 227°C.
b. 250°C.
c. 773°C.
d. 1000°C.

____ 11. A substance registers a temperature change from 20°C to 40°C. This corresponds to an incremental change of
a. 20°F.
b. 40°F.
c. 36°F.
d. 313°F.

____ 12. A substance registers a temperature change from 20°C to 40°C. This corresponds to an incremental change of
a. 20 K.
b. 40 K.
c. 36 K.
d. 313 K.

____ 13. Which of the following is the equivalent of 88°F?
a. 31°C
b. 49°C
c. 56°C
d. 160°C

____ 14. What temperature has the same numerical value on both the Celsius and the Fahrenheit scales?
a. –40°
b. 0°
c. 40°
d. –72°

____ 15. The average normal body temperature for human beings is 98.6°F. This corresponds to which of the following in degrees Kelvin?
a. 296 K
b. 310 K
c. 393 K
d. 273 K

____ 16. If energy is transferred from a table to a block of ice moving across the table, which of the following statements is true?
a. The table and the ice are at thermal equilibrium.
b. The ice is cooler than the table.
c. The ice is no longer 0°C.
d. Energy is being transferred from the ice to the table.

____ 17. Why does sandpaper get hot when it is rubbed against rusty metal?
a. Energy is transferred from the sandpaper into the metal.
b. Energy is transferred from the metal to the sandpaper.
c. Friction is creating the heat.
d. Energy is transferred from a hand to the sandpaper.

____ 18. Energy transferred as heat always moves from an object
a. at high temperature to an object at low temperature.
b. at low temperature to an object at high temperature.
c. at low kinetic energy to an object at high kinetic energy.
d. of higher mass to an object of lower mass.

____ 19. Which of the following terms describes a transfer of energy?
a. heat
b. internal energy
c. temperature
d. kinetic energy

____ 20. If there is no temperature difference between a substance and its surroundings, what has occurred on the microscopic level?
a. Energy was transferred from higher-energy particles to lower-energy particles.
b. Energy was transferred from lower-energy particles to higher-energy particles.
c. Thermal equilibrium was not reached.
d. Heat has been flowing back and forth.

____ 21. High temperature is related to
a. low kinetic energy.
b. high kinetic energy.
c. no difference in kinetic energy.
d. zero net energy.

____ 22. A 5.00×10^2 kg object is attached by a rope through a pulley to a paddle-wheel shaft that is placed in a well-insulated tank holding 25.0 kg of water. The object is allowed to fall, causing the paddle wheel to rotate, churning the water. If the object falls a vertical distance of 1.00×10^2 m at constant speed, what is the temperature change of the water? (c_p = 4186 J/kg•°C and g = 9.81 m/s^2)

a. 1.96×10^4°C
c. 4.69°C
b. 4.69×10^3°C
d. 0.800°C

____ 23. A 3.00×10^{-3} kg lead bullet travels at a speed of 2.40×10^2 m/s and hits a wooden post. If half the heat energy generated remains with the bullet, what is the increase in temperature of the embedded bullet? ($c_l = 1.28 \times 10^2$ J/kg•°C)

a. 112°C
c. 225°C
b. 137°C
d. 259°C

____ 24. What is the temperature increase of water per kilogram at the bottom of a 145 m waterfall if all of the initial potential energy is transferred as heat to the water? (g = 9.81 m/s^2 and c_p = 4186 J/kg•°C)

a. 0.170°C
c. 0.680°C
b. 0.340°C
d. 1.04°C

____ 25. What is the temperature increase of 4.0 kg of water when it is heated by an 8.0×10^2 W immersion heater for exactly 10.0 min? (c_p = 4186 J/kg•°C)

a. 57°C
c. 29°C
b. 51°C
d. 14°C

____ 26. A 0.2 kg mass of metal with a specific heat capacity of 1.26×10^3 J/kg•°C and an initial temperature of 90°C is placed in a 500 g calorimeter at an initial temperature of 20°C with a specific heat capacity of 4.19×10^2 J/kg•°C. The calorimeter is filled with 0.1 kg of water with an initial temperature of 20°C. When the combination of the metal, the calorimeter, and the water reaches equilibrium, what is the final temperature?

a. 70°C
c. 50°C
b. 60°C
d. 40°C

____ 27. Which of two rods has the greatest thermal conductivity?

a. a rod with electrons that are freer to move from atom to atom than are the electrons another rod
b. a rod with greater specific heat than another rod
c. a rod with greater cross-sectional area than another rod
d. a rod with greater length than another rod

____ 28. A 1.00×10^2 g piece of copper at an initial temperature of 95°C is dropped into 2.00×10^2 g of water contained in a 0.28 kg aluminum calorimeter. The water and calorimeter are initially at 15°C. What is the final temperature of the system when it reaches equilibrium? ($c_c = 3.9 \times 10^2$ J/kg•°C and $c_a = 9.00 \times 10^2$ J/kg•°C.)

a. 16°C
c. 24°C
b. 18°C
d. 25°C

____ 29. A machine gear consists of 0.10 kg of iron and 0.16 kg of copper. How much total energy transfer as heat is generated in the gear if its temperature increases by 35°C? ($c_i = 4.6 \times 10^2$ J/kg•°C and c_c == 3.9×10^2 J/kg•°C)

a. 910 J
c. 5100 J
b. 3800 J
d. 4400 J

____ 30. An electric drill bores through a 0.100 kg piece of copper in 30.0 s. Find the increase in the temperature of the copper if the drill operates at 40.0 W. Assume that the drill does not increase in temperature. (c_c = 387 J/kg•°C)

a. 40.6°C
c. 31.0°C
b. 34.7°C
d. 27.3°C

____ 31. Find the final equilibrium temperature when 10.0 g of milk at 10.0°C is added to 1.60×10^2 g of coffee with a temperature of 90.0°C. Assume the specific heats of coffee and milk are the same as for water (c_w = 4.19 J/g•°C), and disregard the heat capacity of the container.

a. 85.3°C
c. 71.4°C
b. 77.7°C
d. 66.7°C

____ 32. A slice of bread contains about 4.19×10^5 J of energy. If the specific heat of a person is 4.19×10^3 J/kg•°C, by how many degrees Celsius would the temperature of a 70.0 kg person increase if all the energy in the bread were converted to heat?

a. 2.25°C
c. 1.43°C
b. 1.86°C
d. 1.00°C

____ 33. A 3.0×10^{-3} kg lead bullet is traveling at a speed of 240 m/s when it becomes embedded in a block of ice with a temperature of 0.0°C. If all the heat generated goes into melting the ice, what quantity of ice is melted? ($L_f = 3.4 \times 10^5$ J/kg and $c_l = 1.3 \times 10^2$ J/kg•°C)

a. 1.5×10^{-2} kg
c. 3.2×10^{-3} kg
b. 5.8×10^{-4} kg
d. 2.5×10^{-4} kg

____ 34. A flat container holds 200 g of water. Over a 10 min period, 1.5 g of water evaporates from the surface. What is the approximate temperature change of the remaining water? ($L_v = 2.26 \times 10^3$ J/g)

a. 4°C
c. 0.4°C
b. –4°C
d. –0.4°C

____ 35. A pitcher of iced tea is made by adding ice to 1.8 kg of hot tea with an initial temperature of 80.0°C. How many kilograms of ice, which has an initial temperature of 0.0°C, are required to bring the mixture to 10.0°C? ($L_f = 3.3 \times 10^5$ J/kg)

a. 1.8 kg
c. 1.4 kg
b. 1.6 kg
d. 1.2 kg

____ 36. A 1.0 kg cube of ice is dropped into 1.0 kg of water, and, when equilibrium is reached, there are 2.0 kg of ice at 0.0°C. The initial temperature of the water was 0°C. What was the original temperature of the ice? (c_w = 4186 J/kg•°C, c_i = 2093 J/kg•°C, and $L_f = 3.3 \times 10^5$ J/kg•°C)

a. one or two degrees below 0.0°C
c. –160°C
b. –80°C
d. –240°C

____ 37. How much heat energy must be removed from 0.10 kg of oxygen with a temperature of 22.0°C in order for the oxygen to liquefy at –183°C? ($c_0 = 9.13 \times 10^{-1}$ J/g•°C and L_v = 213 J/g.)

a. 5.71×10^4 J
c. 1.81×10^4 J
b. 4.00×10^4 J
d. 9.56×10^3 J

____ 38. The figure above shows how the temperature of 10.0 g of ice changes as energy is added. Which of the following statements is correct?

a. The water absorbed energy continuously, but the temperature increased only when all of the water was in one phase.
b. The water absorbed energy sporadically, and the temperature increased only when all of the water was in one phase.
c. The water absorbed energy continuously, and the temperature increased continuously.
d. The water did not absorb energy.

____ 39. At what point on the figure above is the amount of energy transferred as heat approximately 4.19×10^3 J?
a. A
b. B
c. C
d. D

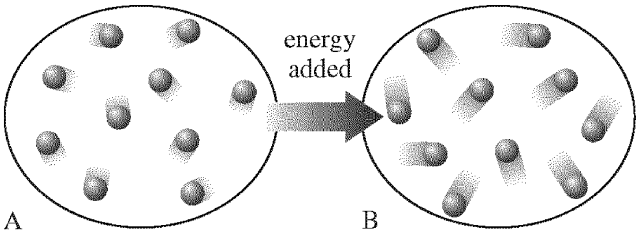
____ 40. At what point on the figure above does the substance undergo a phase change?
a. A
b. B
c. C
d. E

____ 41. Which of the following is a substance in which the temperature and pressure remain constant while the substance experiences an inward transfer of energy?
a. gas
b. liquid
c. solid
d. substance undergoing a change of state

____ 42. The use of fiberglass insulation in the outer walls of a building is intended to minimize heat transfer through what process?
a. conduction
b. radiation
c. convection
d. vaporization

____ 43. On a sunny day at the beach, the reason the sand gets hot and the water stays relatively cool is attributed to the difference in which property between water and sand?
a. mass density
b. specific heat
c. temperature
d. thermal conductivity

Short Answer



44. Describe how temperature is related to the kinetic energy of the molecules of the gas in the figure above.

45. Do "heat" and "cold" flow between objects? Explain.

46. Describe on the microscopic level why energy transfer as heat moves from an object at high temperature to an object at low temperature.

47. In the figure above, what happens to the ice at 0°C?

48. What is a phase change?

49. What is thermal conduction? What happens to atoms during thermal conduction?

50. What is hypothermia?

51. Why is air an effective thermal insulator for the body?

52. Why would covering most of the body keep a person cool in the desert?