

- ____ 11. Which of the following statements is true according to the law of conservation of energy?
- Energy cannot be created.
 - Energy cannot be destroyed.
 - Energy can be converted from one form to another.
 - all of the above
- ____ 12. If no friction acts on a diver during a dive, then which of the following statements is true?
- The total mechanical energy of the system increases.
 - Potential energy can be converted into kinetic energy but not vice versa.
 - $(KE + PE)_{\text{beginning}} = (KE + PE)_{\text{end}}$
 - all of the above
- ____ 13. The mechanical energy of an object equals its
- chemical energy plus its nuclear energy.
 - kinetic energy plus its potential energy.
 - nuclear energy.
 - thermal energy.
- ____ 14. In which of the following does Einstein's famous equation apply?
- a driver brings a car to a halt
 - collisions between objects
 - water falling in a waterfall
 - nuclear fission and fusion reactions
- ____ 15. What is biomass energy?
- the chemical energy stored in living things
 - the electromagnetic energy stored in living things
 - the nuclear energy stored in living things
 - the thermal energy stored in living things
- ____ 16. Nonrenewable energy resources do not include which of the following?
- coal
 - hydrogen fuel cells
 - oil
 - uranium
- ____ 17. Fossil fuels currently account for the majority of the world's energy use because they are
- distributed evenly throughout the world.
 - nonpolluting.
 - relatively inexpensive and readily available.
 - renewable energy resources.
- ____ 18. A drawback of solar energy is that it
- cannot be converted directly into electrical energy.
 - depends on the climate.
 - produces water pollution.
 - is not a renewable resource.
- ____ 19. A benefit of a hydrogen fuel cell is that its byproduct is
- carbon dioxide.
 - oxygen.
 - water.
 - uranium.
- ____ 20. Heat is the transfer of thermal energy from one object to another because of a difference in
- specific heat.
 - phase.
 - temperature.
 - waste heat.
- ____ 21. What property of an object is related to the average kinetic energy of the particles in that object?
- specific heat
 - mass
 - conductivity
 - temperature

- ___ 22. As the temperature of an object rises, so does the
- kinetic energy of the object.
 - mass of the object.
 - thermal energy of the object.
 - potential energy of the object.

- ___ 23. Thermal energy depends on an object's
- mass.
 - phase (solid, liquid, or gas).
 - temperature.
 - all of the above

- ___ 24. Energy from the sun reaches Earth mostly by
- conduction.
 - convection.
 - radiation.
 - thermal expansion.

- ___ 25. Matter is needed to transfer thermal energy by
- conduction.
 - convection.
 - radiation.
 - both a and b

- ___ 26. Which of the following materials conducts heat well?
- glass
 - plastic
 - metal
 - wood

- ___ 27. The second law of thermodynamics states that thermal energy can flow from colder objects to hotter objects
- by convection.
 - only if work is done on the system.
 - spontaneously.
 - when thermal expansion takes place.

- ___ 28. In forced-air heating systems, where are warm-air vents usually located?
- above windows
 - near the floor
 - next to cold-air ducts
 - under radiators

- ___ 29. A fluid that vaporizes and condenses inside the tubing of a heat pump is called the
- compressor.
 - fuel.
 - refrigerant.
 - condenser.

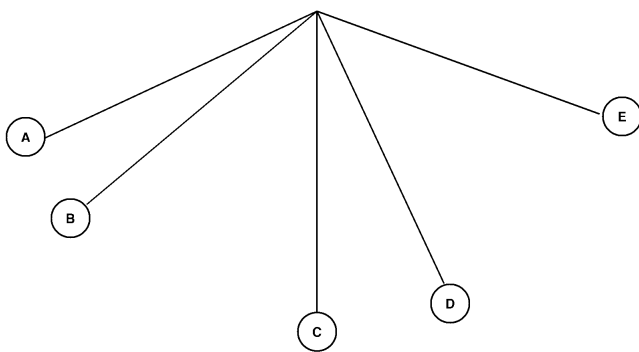


Figure 15-1

- ___ 30. The kinetic energy of the pendulum bob in Figure 15-1 increases the most between locations
- A and B.
 - A and C.
 - B and D.
 - C and D.

Completion

Complete each sentence or statement.

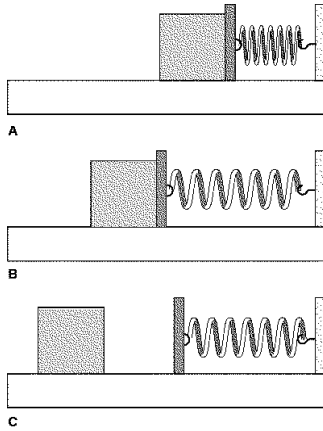
31. In Figure 15-1, the kinetic energy of the pendulum bob decreases between locations B and _____.
32. Energy and work are measured in the SI unit called the _____.
33. If the _____ of an object doubles, its kinetic energy doubles.
34. The kinetic energy of an object is proportional to the square of its _____.
35. Energy that is stored due to position or shape is called _____ energy.
36. You can calculate an object's gravitational potential energy by using the equation _____.
37. The sum of the kinetic energy and potential energy of an object is called its _____ energy.
38. Wind turbines convert _____ energy into electrical energy.
39. Turning off unused lights or appliances is an example of energy _____.
40. Heat is the transfer of thermal energy because of a(an) _____ difference.
41. The increase in volume of a material due to a temperature increase is called _____.
42. If the temperature change of an aluminum nail is positive, thermal energy is transferred _____ the nail _____ the surroundings.
43. In a calorimeter, the increase in the thermal energy of the water and the decrease in the thermal energy of the sample are _____.
44. The transfer of thermal energy in matter with no overall transfer of matter is called _____.
45. The transfer of energy as waves moving through space is called _____.
46. The type of thermal energy transfer that takes place in fluids is mostly _____.
47. The statement that absolute _____ cannot be reached is known as the _____ law of thermodynamics.
48. A steam-heating system is most similar to a(an) _____ heating system.
49. In a hot-water heating system, room temperature is controlled by a device called a(an) _____.

Short Answer

50. What evidence is there that energy is transferred as a golf club does work on a golf ball?
51. What are the two general types of energy that can be used to classify many forms of energy?
52. Sled A (with its riders) has twice the mass of Sled B (with its riders). If both sleds have the same kinetic energy, which sled is moving faster? Explain your answer.
53. What is the most familiar form of electromagnetic energy?
54. What are two examples of renewable energy resources?
55. Explain how biomass energy depends on the sun.
56. How does placing the lid of a jar under hot water help loosen it?
57. Show that the joule is the unit for the quantity equal to $m \times c \times \Delta T$.
58. What role do free electrons have in conduction in metals?
59. Which type of central heating system involves fans and ducts to circulate warm air?

Problem

60. What is the kinetic energy of a 72.0-kg sky diver falling at a terminal velocity of 79.0 m/s? Show your work.
61. A 0.47-kg squirrel jumps from a tree branch that is 3.5 m high to the top of a bird feeder that is 1.2 m high. What is the change in gravitational potential energy of the squirrel? (The acceleration due to gravity is 9.8 m/s^2 .) Show your work.
62. A small dog is trained to jump straight up a distance of 1.2 m. How much kinetic energy does the 7.2-kg dog need to jump this high? (The acceleration due to gravity is 9.8 m/s^2 .) Show your work.
63. How many kilojoules of heat must be transferred to a 480-g aluminum pizza pan to raise its temperature from 22°C to 234°C ? The specific heat of aluminum in this temperature range is $0.96 \text{ J/g}\cdot^\circ\text{C}$. Show your work.
64. As 390 g of hot milk cools in a mug, it transfers 30,000 J of heat to the environment. What is the temperature change of the milk? The specific heat of milk is $3.9 \text{ J/g}\cdot^\circ\text{C}$. Show your work.

Other**USING SCIENCE SKILLS****Figure 15-2**

65. **Applying Concepts** In Figure 15-2C, the block has 5 J of kinetic energy. How much work did the compressed spring do on the block? Explain your answer.
66. **Classifying** What form of energy does the compressed spring have in Figure 15-2?
67. **Inferring** In Figure 15-2, what has happened to the stored energy of the spring between A and B?
68. **Applying Concepts** In Figure 15-2C, how would the kinetic energy of the block in C be different if the tabletop were not frictionless? Explain your answer.
69. **Interpreting Graphics** In Figure 15-2, how has the kinetic energy of the block changed between A and B?

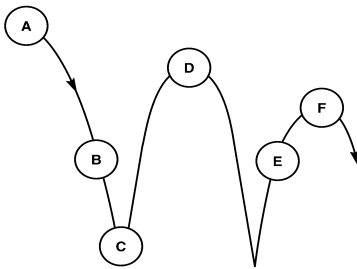


Figure 15-3

70. **Interpreting Graphics** At what location in Figure 15-3 does the ball have the least gravitational potential energy?

71. **Comparing and Contrasting** Compare the gravitational potential energy of the ball at locations B and E shown in Figure 15-3. Explain your answer.

72. **Applying Concepts** In Figure 15-3, does the total mechanical energy of the ball between locations A and F ever equal zero? Explain your answer.

73. **Inferring** In Figure 15-3, is the total mechanical energy of the ball conserved as the ball bounces? Explain your answer.

74. **Applying Concepts** Compare the kinetic energy of the ball in Figure 15-3 as it strikes the floor just before the second bounce with the first bounce (location C).

USING SCIENCE SKILLS

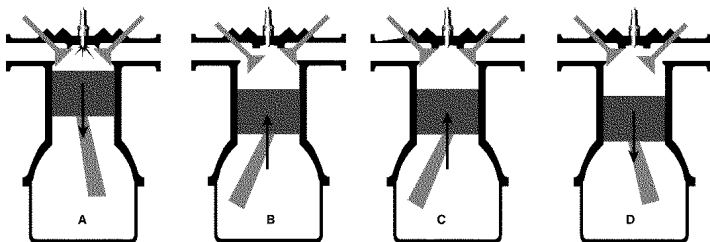


Figure 16-2

75. **Inferring** In Figure 16-2, is the temperature of the material within the cylinder greatest during the intake stroke, compression stroke, power stroke, or exhaust stroke?

76. **Interpreting Visuals** Sequence the four strokes of the engine shown in Figure 16-2 in the following order: intake stroke, compression stroke, power stroke, and exhaust stroke.

77. **Applying Concepts** What is the engine in Figure 16-2 designed to do?

78. **Applying Concepts** According to the second law of thermodynamics, why can't the engine in Figure 16-2 have an efficiency of 100 percent?

79. **Classifying** What type of combustion engine is shown in Figure 16-2?

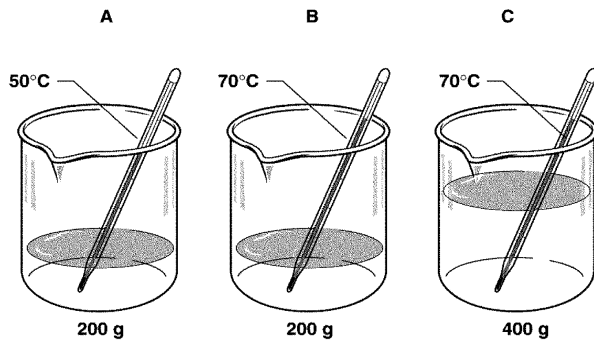


Figure 16-3

80. **Interpreting Data** Compare the average kinetic energy of the water molecules in the three beakers in Figure 16-3.
81. **Applying Concepts** Compare the thermal energy of the water in the three beakers in Figure 16-3.
82. **Applying Concepts** Equal amounts of thermal energy are transferred to the water in each container shown in Figure 16-3. Explain why the water in B has the highest final temperature.
83. **Predicting** In Figure 16-3, what will be the final temperature of the water in each container after 200 g of 70°C water is added? Assume no heat is transferred to the environment.
84. **Drawing Conclusions** The water in the three containers shown in Figure 16-3 is combined with no heat transfer to the environment. Explain whether the temperature of the mixture will be closer to 50°C or 70°C.

Essay

85. Compare and contrast biomass energy with the energy from fossil fuels.