

# Directed Reading A

## Section: Temperature

1. Why must you use temperature to specify how hot or cold something is?

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### WHAT IS TEMPERATURE?

\_\_\_\_\_ 2. Temperature is a measure of which property of an object's particles?

- a. average potential energy
- b. average mechanical energy
- c. average kinetic energy
- d. average volume

3. As particles in an object move faster, they have more

\_\_\_\_\_, so that the object's temperature is higher.

4. Particles of matter move at different speeds, so when you measure an object's

temperature, you measure the \_\_\_\_\_ of its particles.

5. How does the amount of a substance affect its temperature? Explain your answer.

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### MEASURING TEMPERATURE

\_\_\_\_\_ 6. To measure the temperature of a cup of hot chocolate, you would

- a. touch it with your finger.
- b. put a thermometer in it.
- c. take a sip of it.
- d. look at the steam rising from it.

\_\_\_\_\_ 7. Mercury and alcohol are used in thermometers because

- a. they remain liquid over a large temperature range.
- b. they freeze and boil at the same temperatures as water does.
- c. they are cheaper to use than other substances.
- d. they are safer to use than other substances.

8. The increase in volume of a substance due to an increase in the temperature

of the object is called \_\_\_\_\_.

**Directed Reading A** *continued*

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9. Explain how temperature units (parts) of the Celsius scale are determined. What are the units called?
- \_\_\_\_\_
- \_\_\_\_\_
10. The temperatures 212°F, 100°C, and 373 K are \_\_\_\_\_.
11. The official SI temperature scale uses units called \_\_\_\_\_.
12. The temperature at which all molecular motion stops is called \_\_\_\_\_.
13. What equation would you use to convert temperature in degrees Fahrenheit (°F) to degrees Celsius (°C)?
- \_\_\_\_\_
14. Describe how a change in temperature of 1° differs on the Fahrenheit, Celsius, and Kelvin temperature scales.
- \_\_\_\_\_
- \_\_\_\_\_

**MORE ABOUT THERMAL EXPANSION**

Match the correct description with the correct term. Write the letter in the space provided.

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|--|---------------------|
| _____ 15. a thin strip of two different metals that coils and uncoils in response to temperature changes | a. expansion joint  |
| _____ 16. a thin glass tube filled with a liquid that measures temperature                               | b. thermostat       |
| _____ 17. a device that controls the heater in a home  | c. bimetallic strip |
| _____ 18. a gap in the pavement of a bridge that allows the bridge to expand without breaking            | d. thermometer      |

**Directed Reading A** *continued*

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19. If the weather is very hot, the pavement of a bridge can heat up enough so that \_\_\_\_\_ takes place.

20. Why are two different metals needed when making a bimetallic strip for a home thermostat?

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21. How does thermal expansion make a hot-air balloon rise?

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Skills Worksheet

# Directed Reading A

## Section: What Is Heat?

1. Why does a stethoscope feel cold?
- \_\_\_\_\_

### TRANSFERRED THERMAL ENERGY

- \_\_\_\_\_ 2. Under what condition can heat pass between two objects?
- The objects must both be hot.
  - The objects must both be large.
  - The objects must be at different temperatures.
  - The objects must have a lot of energy.
- \_\_\_\_\_ 3. What happens if two objects come in contact with each other and one object is at a higher temperature than the other object?
- The temperatures of both objects decrease.
  - The temperatures of both objects increase.
  - Energy is transferred from the object with a lower temperature.
  - Energy is transferred from the object with a higher temperature.
- \_\_\_\_\_ 4. If a large pan of soup and a small bowl of soup have the same temperature, what do you know about the thermal energy of the two containers of soup?
- The large pan of soup has more thermal energy.
  - The small bowl of soup has more thermal energy.
  - The pan and bowl of soup have the same thermal energy.
  - Not enough is known about either object's thermal energy to say.
5. When two objects are touching each other and are at the same temperature, there is no net change in either object's \_\_\_\_\_.

### CONDUCTION, CONVECTION, AND RADIATION

- \_\_\_\_\_ 6. Which of the following is NOT a form of thermal energy transfer?
- conduction
  - conversion
  - convection
  - radiation

**Directed Reading A** *continued*

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- \_\_\_\_\_ 7. Thermal conduction occurs when particles with higher average kinetic energies transfer energy
- a. through collision to particles with higher kinetic energies.
  - b. through collision to particles with lower kinetic energies.
  - c. through fluid movement to particles with higher kinetic energies.
  - d. through fluid movement to particles with lower kinetic energies.

- \_\_\_\_\_ 8. Substances that do not conduct thermal energy very well are called
- a. thermal convectors.
  - b. thermal conductors.
  - c. thermal exchangers.
  - d. thermal insulators.

9. What are materials that transfer thermal energy well called?

\_\_\_\_\_

10. Transfer of thermal energy by the movement of a liquid or a gas is called \_\_\_\_\_.

11. When you boil water, the water near the stove burner becomes less \_\_\_\_\_ because the temperature of the particles increases and, as a result of their increased energy, they spread apart.

12. The circular motion of a liquid or gas due to a density difference that results from temperature differences within the liquid or gas is called a(n) \_\_\_\_\_.

13. The transfer of thermal energy by electromagnetic waves is called \_\_\_\_\_.

14. Energy transfer across empty space involves \_\_\_\_\_, such as visible light and infrared waves.

15. Your body feels warmer when it absorbs \_\_\_\_\_ waves.

16. Explain how certain greenhouse gases cause the temperature of Earth's atmosphere to increase.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Directed Reading A** *continued*

17. Explain how the greenhouse effect in Earth's atmosphere can be both helpful and harmful.

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**HEAT AND TEMPERATURE CHANGE**

18. The rate at which a substance conducts thermal energy is called \_\_\_\_\_.

19. Explain why a metal seat belt buckle is hotter to the touch than the cloth of the seat belt when both have been exposed to the same amount of sunlight for a long time.

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20. When equal amounts of energy are transferred to or from equal masses of different substances, the substances will undergo different changes in temperature because of their different \_\_\_\_\_.

21. Specific heat is the amount of energy needed to change the temperature of \_\_\_\_\_ (amount) of a substance by \_\_\_\_\_.

22. Explain why water does not heat up or cool off as quickly as air does.

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**Directed Reading A** *continued*

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23. The specific heat values of most \_\_\_\_\_ tend to be quite low.
24. To calculate the amount of energy transferred by heat to or from an object, you must know the mass of the object, the change in the object's \_\_\_\_\_, and its \_\_\_\_\_.
25. When the value for heat is \_\_\_\_\_, it means that energy has been transferred from an object, so that the object's temperature has decreased.

Skills Worksheet

# Directed Reading A

## Section: Matter and Heat

1. Why does a frozen juice bar melt on a hot day before you have finished eating it?

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### STATES OF MATTER

2. The physical forms in which a substance can exist are called \_\_\_\_\_.

\_\_\_\_\_ 3. The state of matter of a substance does not depend on

- a. the speeds of the particles in the substance.
- b. the masses of the particles in the substance.
- c. the attraction between the particles in the substance.
- d. the pressure around the particles in the substance.

\_\_\_\_\_ 4. If you have equal masses of a substance in each of its three familiar states and each at a different temperature, the substance will have the least thermal energy as a

- a. plasma.
- b. gas.
- c. liquid.
- d. solid.

5. Why does a substance have more thermal energy as a gas than as a liquid or as a solid?

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Match the correct description with the correct term. Write the letter in the space provided.

- \_\_\_\_\_ 6. The particles of a substance are able to slide past one another.      a. solid
- \_\_\_\_\_ 7. The particles of a substance move independently of one another.      b. liquid
- \_\_\_\_\_ 8. The particles of a substance vibrate in place.      c. gas



**Directed Reading A *continued***

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**CHANGES OF STATE**

- \_\_\_\_\_ 9. What is a change in a substance from one state of matter to another called?
- a. a chemical change
  - b. a change of state
  - c. a physical property
  - d. a change of identity
- \_\_\_\_\_ 10. A change of state changes
- a. the physical properties of a substance.
  - b. the chemical properties of a substance.
  - c. the melting point of a substance.
  - d. the boiling point of a substance.
- \_\_\_\_\_ 11. When a gas changes to a liquid, the change of state is called
- a. freezing
  - b. melting.
  - c. boiling.
  - d. condensing.
- \_\_\_\_\_ 12. When a solid changes to a liquid, the change of state is called
- a. freezing.
  - b. melting.
  - c. boiling.
  - d. condensing.
13. Why does the temperature of a substance remain constant when the substance undergoes a change of state?

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**HEAT AND CHEMICAL CHANGES**

14. New substances are formed during a(n) \_\_\_\_\_.
15. How does thermal energy cause substances to undergo chemical change?  
Explain your answer.

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**Directed Reading A** *continued*

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16. Is energy always released during a chemical change? Explain your answer.

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17. The unit of energy used to measure chemical energy in food is called

a(n) \_\_\_\_\_.

18. A Calorie is equivalent to \_\_\_\_\_ J.

19. A device used to measure heat is called a(n) \_\_\_\_\_.

20. Describe how a bomb calorimeter is used to determine the energy contained in a food sample.

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Skills Worksheet

# Directed Reading A

## Section: Heat Technology

1. Besides a heater, name three other examples of heat technology.

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### HEATING SYSTEMS

2. A hot-water heating system makes use of the high

\_\_\_\_\_ of water to heat the rooms in a building.

3. In both hot-water and warm-air heating systems, thermal energy spreads

through the air in rooms by means of \_\_\_\_\_.

4. In a warm-air heating system, warm air travels from the furnace

through \_\_\_\_\_ to different rooms.

5. A material that reduces the amount of thermal energy needed to heat or cool

a building is called \_\_\_\_\_.

6. In what ways does a passive solar heating system differ from an active solar heating system?

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Match the correct description with the correct term. Write the letter in the space provided.

\_\_\_\_\_ 7. pumps heated water through the pipes of an active solar heating system

a. solar collector

b. pump

\_\_\_\_\_ 8. collects the cooled water in an active solar heating system

c. fan

d. water storage tank

\_\_\_\_\_ 9. uses sunlight to heat the water in an active solar heating system

\_\_\_\_\_ 10. blows air over hot-water pipes to transfer thermal energy to the air.

**Directed Reading A *continued***

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**HEAT ENGINES**

- \_\_\_\_\_ 11. What is a heat engine?
- a. an engine that makes fuel
  - b. a machine that changes heat into mechanical energy
  - c. a machine used to generate electricity
  - d. an engine that uses a flywheel
- \_\_\_\_\_ 12. In the process of combustion,
- a. fuel combines with oxygen to produce thermal energy.
  - b. fuel combines with steam to produce thermal energy.
  - c. air combines with water to produce steam.
  - d. air combines with oxygen to produce steam.
- \_\_\_\_\_ 13. A heat engine that burns fuel inside the engine is called a(n)
- a. electric engine.
  - b. external combustion engine.
  - c. internal combustion engine.
  - d. difference engine.
14. One example of an external combustion engine is a(n)  
\_\_\_\_\_, in which fuel is burned outside a boiler to heat water.
15. In a steam engine, the steam produced expands and pushes a piston, which can be attached to other parts of the machine that do  
\_\_\_\_\_.

**Match the correct description with the correct term. Write the letter in the space provided.**

- |   |                       |
|---|-----------------------|
| _____ 16. The piston is pulled down, drawing the mixture of air and gasoline into the cylinder.   | a. compression stroke |
| _____ 17. The piston is pushed up, compressing the fuel mixture.  | b. exhaust stroke     |
| _____ 18. The compressed fuel mixture is ignited, causing the mixture to burn and the product gases to expand and push the piston down. | c. intake stroke      |
| _____ 19. The piston is moved up, pushing the exhaust gases out of the cylinder.  | d. power stroke       |

**Directed Reading A** *continued*

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**COOLING SYSTEMS**

- \_\_\_\_\_ 20. An air conditioner is a cooling system that transfers
- a. thermal energy from a cool area outside to a warm area inside.
  - b. specific heat from a cool area outside to a warm area inside.
  - c. thermal energy from a warm area inside to a warmer area outside.
  - d. specific heat from a warm area inside to a cool area outside.
- \_\_\_\_\_ 21. To transfer thermal energy from an area at a lower temperature to an area at a higher temperature, a cooling system
- a. must do work.
  - b. must have a large thermal conductivity.
  - c. must have a high specific heat.
  - d. must produce a large amount of thermal energy.
- \_\_\_\_\_ 22. Work in a cooling system is done by the
- a. refrigerant.
  - b. condenser coils.
  - c. compressor.
  - d. thermal energy.
23. A gas that has a boiling point below room temperature, which allows it to condense easily, is called a(n) \_\_\_\_\_.
24. Explain why the back of a refrigerator feels warm.

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**Directed Reading A** *continued*

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**HEAT TECHNOLOGY AND THERMAL POLLUTION**

- \_\_\_\_\_ 25. Thermal pollution is
- a. the excessive heating of the atmosphere.
  - b. the excessive heating of a body of water.
  - c. the excessive heating of an area of ground.
  - d. the excessive heating of a large work place.
- \_\_\_\_\_ 26. The increased temperature of water that is heated in a power plant and returned to lakes and streams
- a. increases the population of plants in the bodies of water.
  - b. causes flooding.
  - c. contaminates the water.
  - d. causes harm to animals living in the bodies of water.

27. What can be done so that power plants reduce thermal pollution?

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