

# Heat in the Environment

### Make a Summary

During this unit, you have learned many new concepts about heat and its effects on the environment. The Chapter Review for each chapter lists the new words and terms that you learned. In this activity, you will use those words to complete a series of activities.

### Equipment and Materials

- markers
- sticky tape or glue
- sticky notes or small pieces of paper
- chart paper

### Procedure





1. Form a team of three or four people.
2. Work together to write each of the vocabulary words on the sticky notes. Write one word (or one term) only on each note.
3. Place a piece of chart paper in the centre of your team. Share the vocabulary words equally among team members.
4. Organize the words into two to five logical groupings on the chart paper. You can use any criteria you like to put the words into groups.
5. Once your team agrees on how the words are grouped, stick the words in place on the chart paper.
6. Write a title above each group that describes why the words are in that particular group.
7. Below each list of words, write one sentence that describes an important idea from the unit that is associated with that group of words.
8. Use these sentences as the basis of a paragraph or two, summarizing your learning in this unit.

## Unit C Review Questions

### What Do You Remember?

The following icons indicate the Achievement Chart categories:

- |   |  |
|---|--|
|  Knowledge/Understanding |  Thinking/Investigation |
|  Communication           |  Application            |

1. Which of the following types of energy is most commonly used for home heating? 
  - (a) chemical energy
  - (b) mechanical energy
  - (c) friction
  - (d) solar energy
2. Which form of energy transfer is primarily responsible for thunderstorms? 
  - (a) convection
  - (b) conduction
  - (c) friction
  - (d) radiation
3. Which type of rock is formed as molten lava cools? 
  - (a) metamorphic
  - (b) sedimentary
  - (c) igneous
  - (d) all of the above
4. The radiant energy of the Sun is directly transformed into electrical energy in a
  - (a) wind turbine
  - (b) photovoltaic panel
  - (c) geothermal heat pump
  - (d) nuclear reactor 

5. Decide whether each of the following statements is true or false. If the statement is false, rewrite the statement to make it true. **K/U**
- Heat is energy that is transferred from a cooler object to a warmer object.
  - Heated liquids expand much more than heated solids.
  - Visible light is a form of chemical energy.
  - Wind is caused by the transfer of energy through conduction.
6. When a substance's particles absorb energy, what happens to the motion of the particles? **K/U**
7. A cup of hot chocolate is set on a table before you drink it (Figure 1). Suggest two different ways in which energy is transferred away from the hot chocolate, allowing it to cool. **K/U**



**Figure 1**

8. What invisible form of electromagnetic radiation is emitted by low-temperature objects like the human body? **K/U**
9. Matter can exist as a solid, a liquid, or a gas. Which state(s) of matter
- has particles that are free to move long distances in all directions?
  - has the most effective forces of attraction between the particles?
  - efficiently transfers energy by conduction?
  - has a fixed volume, but takes the shape of its container? **K/U**
10. What causes lightning to form in a thunderstorm? **K/U**
11. Rearrange the following phrases into an order that describes the production of energy by a hydro-electric power plant:
- Water flows into a river.
  - A generator turns.
  - Water is held in a reservoir.
  - Electricity is produced.
  - Water flows through a penstock.
  - A turbine turns. **K/U**
12. Radiant energy from the Sun can pass through the atmosphere to reach the surface of Earth, and some of the radiant energy from Earth passes back through the atmosphere toward space. How is some of the radiant energy from Earth prevented from escaping through the atmosphere? **K/U**

### What Do You Understand?

13. Explain how thermal energy is involved in each of the following situations:
- A cool breeze blows from a lake onto a beach on a sunny summer day.
  - You clutch a cup of hot chocolate with your hands on a cold winter night.
  - A large thundercloud rolls with thunder on a springtime afternoon. **K/U A**
14. The thermal expansion of materials can be an advantage or a drawback. Provide an example of each. **K/U A**
15. How can you prevent the unwanted transfer of thermal energy in your home by
- radiation?
  - convection?
  - conduction? **K/U A**

16. Scientists studying glaciers have found that the snow is contaminated with tiny specks of black soot released from factory smoke stacks.

(a) How could this observation help explain why glaciers are melting faster than predicted?

(b) Is the melting of glaciers an environmental concern? Explain. **K/U A**

17. When engineers design a device or structure composed of different materials, they consider how materials expand and contract. Why is this an important consideration? Provide an example. **K/U A**

18. On a particularly cold winter day, you hear a neighbour exclaim, “So much for global warming!”

(a) What does your neighbour mean by this statement?

(b) Is your neighbour’s exclamation reasonable? Explain. **K/U A**

### Solve a Problem!

19. You have just been selected to join a field trip to the Arctic in January. What type of clothing will you pack? Describe the properties of the clothing that you will choose. Explain your choices. **T/I A**

20. An adventure company wants to design a new camp stove to be used by backpackers to boil water while out on the trail. Using a small candle as a source of thermal energy, suggest a design that will transfer the greatest amount of energy from the burning candle into the water in a kettle. Draw a detailed sketch of your camp stove design. **T/I**

21. To help keep pizza hot during delivery, restaurants put the pizza boxes in a delivery bag (Figure 2).

(a) How does the design of the pizza bag help to keep the pizza hot?

(b) How could the delivery bag in Figure 2 be improved? **K/U A**



Figure 2

22. The Space Shuttle has a “Thermal Protection System” mainly consisting of thick dark tiles that line the bottom surface. These tiles protect the Shuttle and its occupants when it re-enters Earth’s atmosphere prior to landing.

(a) Why would the bottom surface of the Space Shuttle warm up as it descends through Earth’s atmosphere?

(b) What form of energy transfer do you think the tiles are designed to prevent?

(c) If you were a NASA engineer assigned the task of designing these tiles, what material would you use? What would influence your choice? **K/U A**

23. Methane is one of the greenhouse gases you read about in Section 9.3. Methane has a much higher global warming potential than carbon dioxide. One kilogram of methane warms Earth 25 times as much as 1 kg of carbon dioxide. Research the main sources of methane. How can you reduce the amount of methane released into the atmosphere as a result of your actions? **T/A A**

### Create and Evaluate!

24. Most scientists believe that global warming is mainly caused by an increase of greenhouse gases, like carbon dioxide, in the atmosphere. Create a plan to make one change in your life that will reduce your greenhouse gas emissions. Evaluate your plan, and explain why it will have the desired effect. **T/A**
25. Which devices in your home use the most energy? What can you do to reduce the amount of energy they use? Research more about the energy consumption of home devices by using the Internet or going to the library. Based on your research, evaluate which devices in your home would be best to replace or upgrade so that you can reduce your family's energy consumption. **T/A**

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26. A scientist claims that “it takes more energy to make ethanol biofuel than you get out of it.” Evaluate this claim by researching and comparing the amount of energy needed to make a litre of ethanol from corn and the energy we can get from the litre of ethanol. **T/A**

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### Reflect on Your Learning

27. Thermal energy has both positive and negative effects on the environment. Draw a table similar to Table 1 in your notebook. Complete the table by listing the positive and negative effects of thermal energy that you have learned. In the third column, list facts that you may have found particularly interesting or meaningful.

**Table 1** Effects of Thermal Energy on the Environment

Positive	Negative	Interesting/ Meaningful

28. Reread Section 9.3. Think about the issues presented in this section. Write a brief expository paragraph, a poem, or a lyric that expresses your feelings about these issues. If you prefer, you may draw a cartoon, compose a poster, or write a slogan. Share your composition with a classmate and discuss common interests and concerns.
29. The particle theory is a model that helps us visualize an idea.
- How did using a model (the particle theory) help you as you learned about how energy affects matter?
  - What are the disadvantages of using a model like the particle theory?
  - How have you used this model to help make sense of the things you see in the world around you?