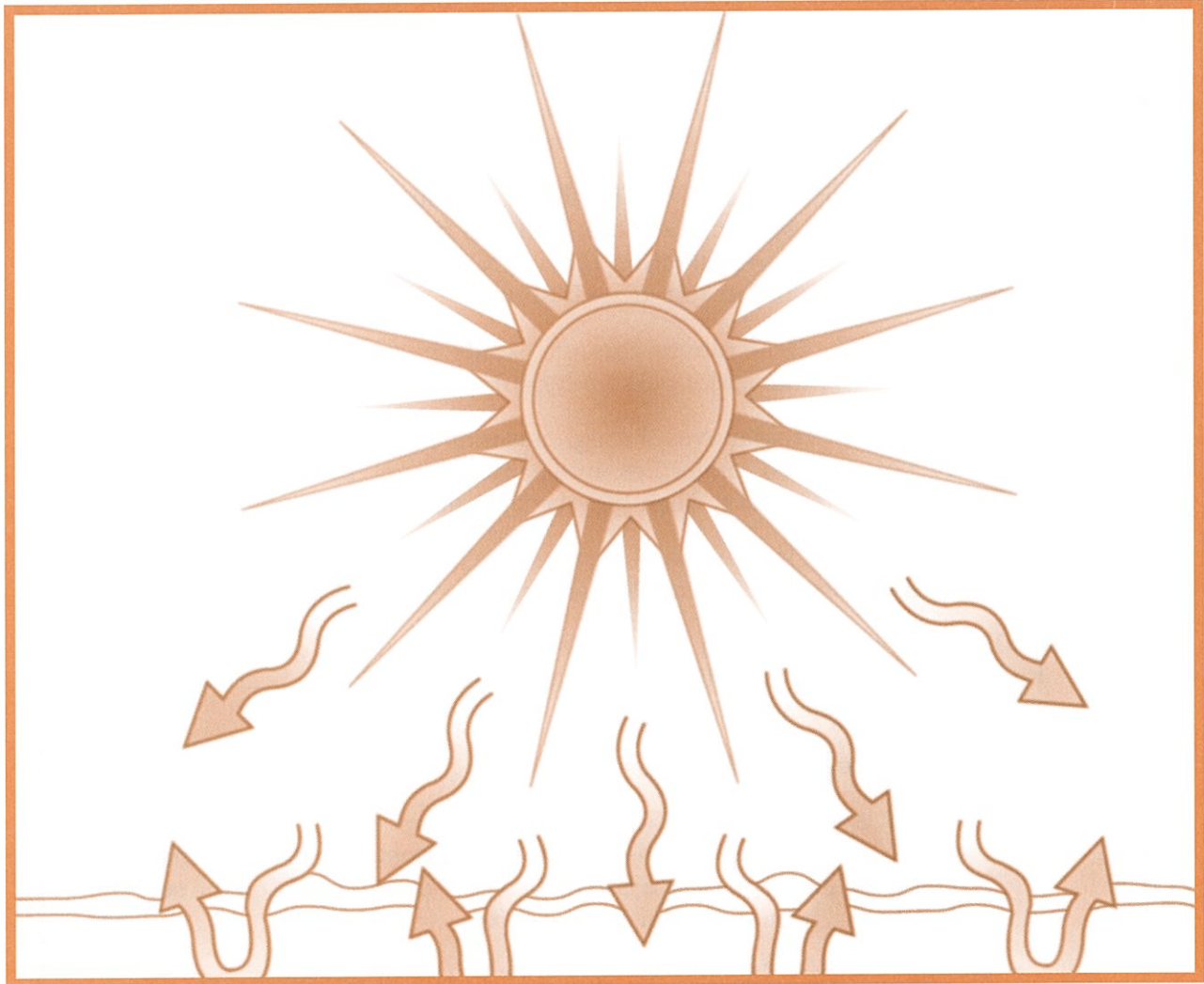


How does the sun heat the atmosphere?



KEY TERMS

conduction: movement of heat through a solid

convection: movement of heat through a liquid or a gas

radiation: movement of energy through empty space

LESSON | How does the sun heat 12 | the atmosphere?

Without the sun, there would be no life on earth. Plants need the sun to help them grow. Without plants we would have no food to eat and no oxygen to breathe. The sun also gives us warmth. The sun heats the atmosphere and all the lands and waters.

When the sun's light is absorbed by the earth's surface, it is changed to heat. Heat does not stay in one place. It moves from place to place. Heat moves in three ways—**conduction** [kon-DUCK-shun], **convection** [kon-VEK-shun], and **radiation** [ray-dee-AY-shun].

CONDUCTION Heat moves through solids by conduction. In conduction, vibrating molecules pass on heat from molecule to molecule.

CONVECTION Heat moves through gases and liquids by convection. In convection, heated molecules move away from the heat. Cooler molecules take their place. Then they become heated too.

When air is heated, it expands. As warm air expands, it becomes lighter. Warm air is lighter than cool air. Warm air rises. Cooler, heavier air sinks.

RADIATION Conduction and convection need molecules to work. Radiation does not. Radiation is the movement of light or heat energy through empty space.

Now let us trace the sun's energy.

- The sun is about 150 million kilometers from earth. Most of this distance is empty space where there are almost no atoms or molecules. Such an empty space is called a vacuum. Energy from the sun moves through this vacuum by radiation.
- The sun's energy then hits the atmosphere. The air molecules become heated by radiation.
- The sun's energy reaches the land and water on earth. The water becomes heated by convection. The land becomes heated by conduction.

Some of the heat from the land and water reflects back into the atmosphere. This warms the atmosphere even more.

CONDUCTION, CONVECTION, AND RADIATION

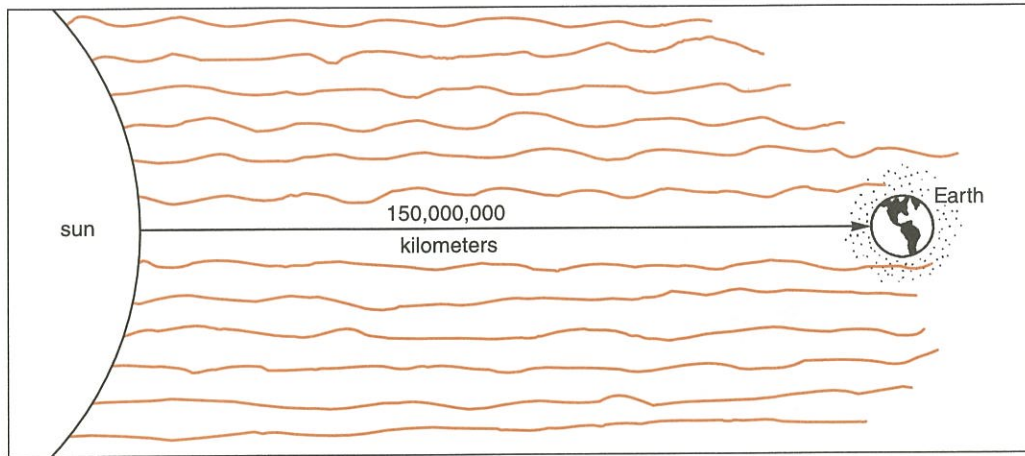


Figure A

1. Most of the distance between the sun and the earth is _____ .
air, empty space
2. The sun's energy moves through outer space by _____ .
conduction, convection, radiation
3. Radiation _____ need atoms and molecules to work.
does, does not

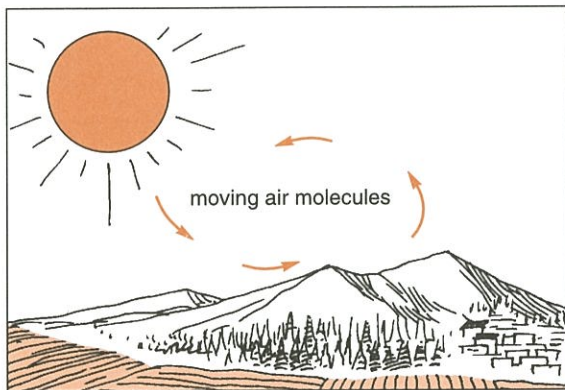


Figure B

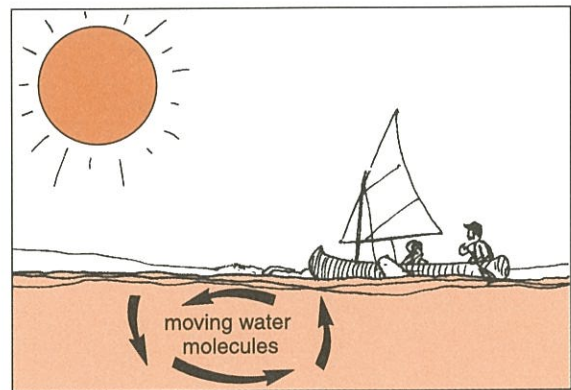


Figure C

4. Heat moves through gases and liquids by _____ .
conduction, convection, radiation
5. Convection _____ need atoms and molecules to work.
does, does not
6. What are liquids and gases made of? _____

7. After atoms and molecules of gases and liquids are heated, they _____ .
rise, sink
8. Warm air is _____ than cool air.
lighter, heavier



Figure D

9. Heat moves through solids by _____ .
conduction, convection, radiation
10. Conduction _____ need atoms and molecules to work.
does, does not
11. What are solids made of? _____
12. Explain how heat moves through solids. _____

FILL IN THE BLANK

Complete each statement using a term or terms from the list below. Write your answers in the spaces provided. Some words may be used more than once.

expands
atmosphere
radiation
convection

atoms and molecules
conduction
rises

1. The three ways that heat moves from place to place are _____, _____, and _____.
2. Heat moves through solids by _____.
3. Heat moves through liquids and gases by _____.
4. Heat moves through empty space by _____.
5. In conduction and convection, heat is carried by _____.
6. When air is heated, it _____.
7. As warm air expands, it _____.
8. Heat moves through the atmosphere by _____.
9. Rocks and soil are heated by _____.
10. Some of the heat from the land and water bounce back into the _____.

MATCHING

Match each term in Column A with its description in Column B. Write the correct letter in the space provided.

	Column A	Column B
_____	1. sun	a) the way heat moves through empty space
_____	2. conduction	b) mixture of gases
_____	3. convection	c) warms our entire planet
_____	4. radiation	d) the way heat moves through gases and liquids
_____	5. atmosphere	e) the way heat moves through solids

TRUE OR FALSE

In the space provided, write "true" if the sentence is true. Write "false" if the sentence is false.

- _____ 1. Heat stays in one place.
- _____ 2. Heat moves only where there are atoms and molecules.
- _____ 3. Heat moves in three different ways.
- _____ 4. In solids, heat moves by convection.
- _____ 5. In gases and liquids, heat moves by convection.
- _____ 6. Conduction and convection need atoms and molecules.
- _____ 7. In empty space heat moves by radiation.
- _____ 8. There are many atoms and molecules in outer space.
- _____ 9. The earth gets its heat from the sun.
- _____ 10. Heat can be reflected.

REACHING OUT

In what simple way can you show that the earth bounces some heat back into the atmosphere? (You need no instruments to do this—only your hand.)
