

SCIENCE 309

HEAT ENERGY

CONTENTS

I. WHERE WE GET HEAT ENERGY	4
Friction	7
Fire	9
Electricity	15
Our Bodies	19
The Sun	22
II. WHAT HEAT ENERGY IS AND DOES	29
Definition of Heat Energy	31
Effects of Heat Energy	34
Movement of Heat Energy	45
III. HOW HEAT ENERGY AFFECTS OUR LIVES	54
Benefits of Heat Energy	55
Problems of Heat Energy	57
Ecology of Heat Energy	61

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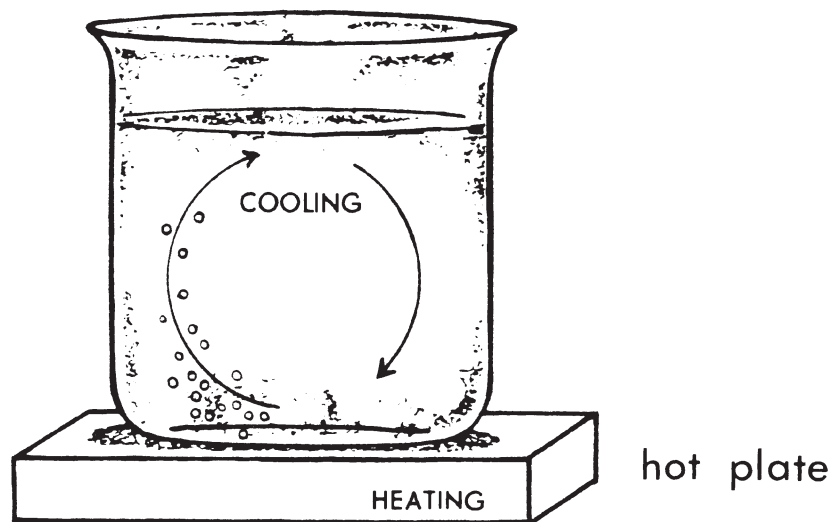
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MOVEMENT OF HEAT ENERGY

Heat energy moves in different ways. It moves through gases by **convection**. When you filled the balloon by heating the air inside, the balloon moved up. Heated gas expands. It is lighter than cooler gas. Heavy, cold gas stays near the ground and pushes the light gas up. This change is convection.

Convection works on liquids, too. As you watched the water get hot, you could see tiny bubbles coming from the bottom of the pan. Heat energy from the hot plate worked on the water molecules near the bottom of the pan. Those molecules began to vibrate very fast and move away from each other. The water at the bottom of the pan expanded. The cooler, heavier water moved to the bottom of the pan and pushed the heated water molecules up and out.



Convection in Liquid

You learned in the first section that the energy from the sun is called *radiant energy*. It moves in waves. This movement is called **radiation**. Heat energy can move by radiation. It cannot move as far as the energy of the sun.

Did you ever stand by a hot campfire on a cold day? How did your face feel?
_____ How did your back feel?
_____ What if you turned around?
How would your face feel then? _____
Your back? _____

Heat energy is **radiating** from the fire. It moves through the air in waves. The radiation waves get weaker as they meet the cooler air. Radiation cannot turn corners. That is why your back stays cold when you are facing the fire.

Heat energy moves through solids by **conduction**. Some solids are better **conductors** of heat energy than others. You will find out which solids **conduct** heat better than others.



Optional experiment to find out about conduction.



You will need these things:

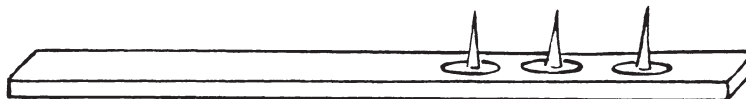
a heat source	a copper tube
a large metal can	a wooden stick
six thumbtacks	candle



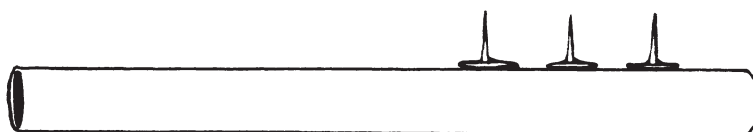
Follow these directions. Put a check in the box as you do each step.

- ☐ 1. Drip the wax to fasten three thumbtacks at the ends of the wooden stick and the copper tube. They should look like these drawings.

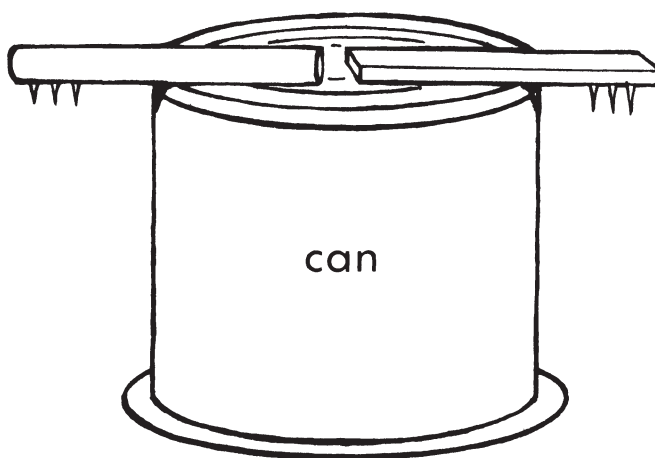
wooden stick



copper tube



- ☐ 2. Place the can upside down over the burner of the heat source.
- ☐ 3. Place the wooden stick and the copper tube on the top of the can. The ends with the tacks should be out over the edge of the can with the tacks pointing down. Look at this drawing.



- ☐ 4. Read the questions after number five, so you will know what to watch for.
- ☐ 5. Turn on the hot plate and observe what happens to the tacks.



Answer these questions. Use complete sentences.

2.29 Which tack fell off first? _____

2.30 What happened to the tacks on the wooden stick?

2.31 Did the tacks fall from the copper tube all at one time? _____ What do you think happened?

2.32 Which is the best conductor of heat energy?

2.33 Copper is a metal. If you were going to roast a marshmallow over a campfire, would you rather do it on a metal fork or on a green, wooden stick? Explain your answer. _____

Heat energy is conducted from one molecule to the next as it passes through solids. Some solids burn. Other solids are good conductors of heat energy but do not burn. God made sure that the earth had different resources for different jobs. Copper is a good conductor. It can be used to make pans for cooking food. Wood is a good fuel. It can help to provide the heat to cook the food. Wood is also a good material for building. A wood house stays much cooler in summer and warmer in winter than one made of copper. A wood house does not allow as much heat energy to pass through.



Write as many words as you can think of that have the -dge ending.

- 2.34 In the activity you just did, you put the tube and the stick over the edge of the can. *Edge* is an example of a group of words with -dge endings. Think of the sound of -dge in edge. It makes the same sound as the g in energy. Say the sound to yourself. Write as many words as you can think of that have -dge endings.

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

In this section of the LIGHTUNIT, you have learned a definition for heat energy. You know that heat causes gases to expand and rise. You showed that heat energy causes liquids to expand, change into gases, and evaporate. You also learned that heat energy makes solids expand, change into liquid, or evaporate.

You read about some ways that heat energy moves through gases, liquids, and solids. You also showed that some solids conduct heat energy better than others.



Complete this activity.

2.35 List the three ways heat energy moves. Look on pages 45 and 46.

a. _____

b. _____

c. _____