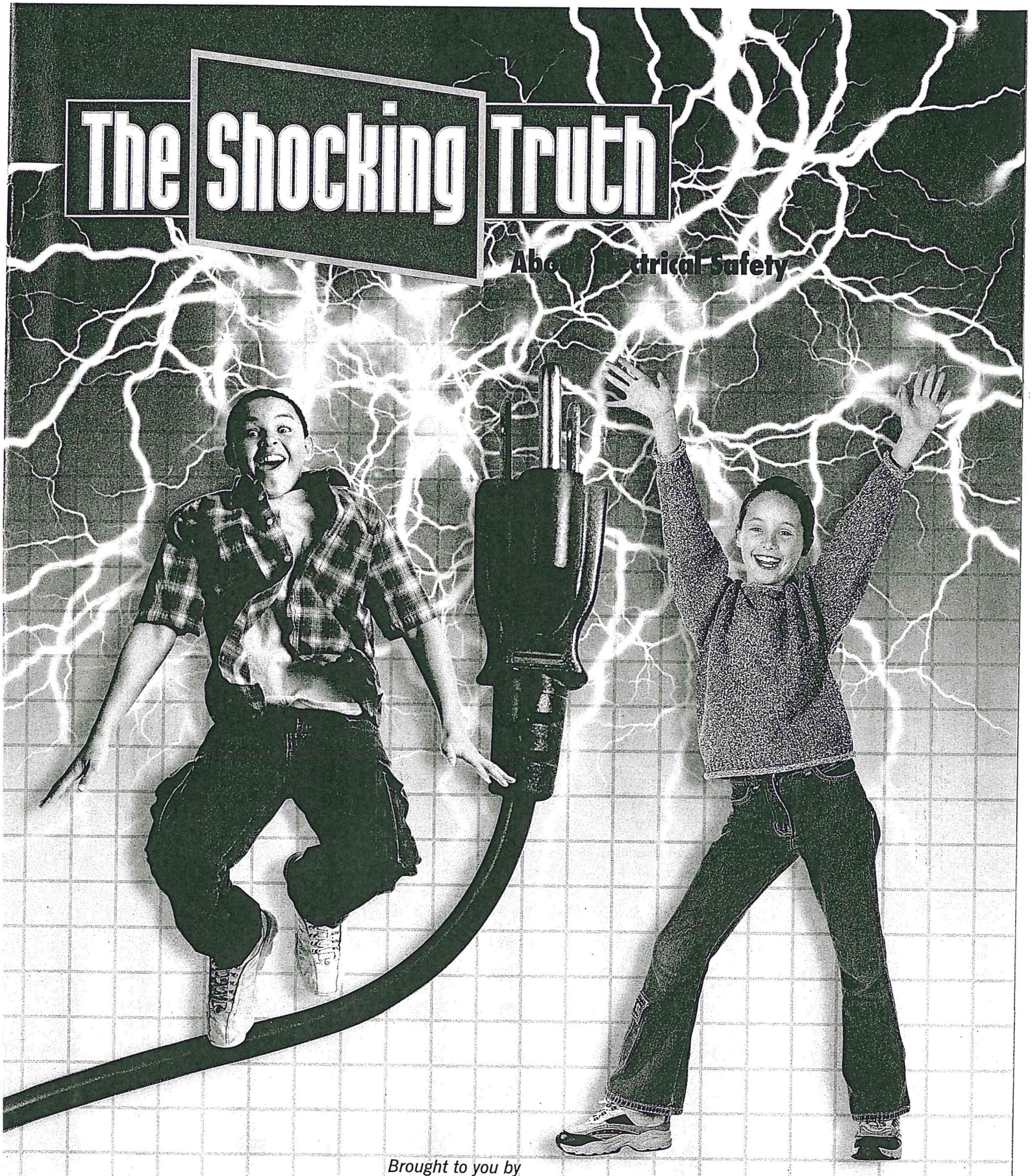


Brought to you by

Duke Energy®

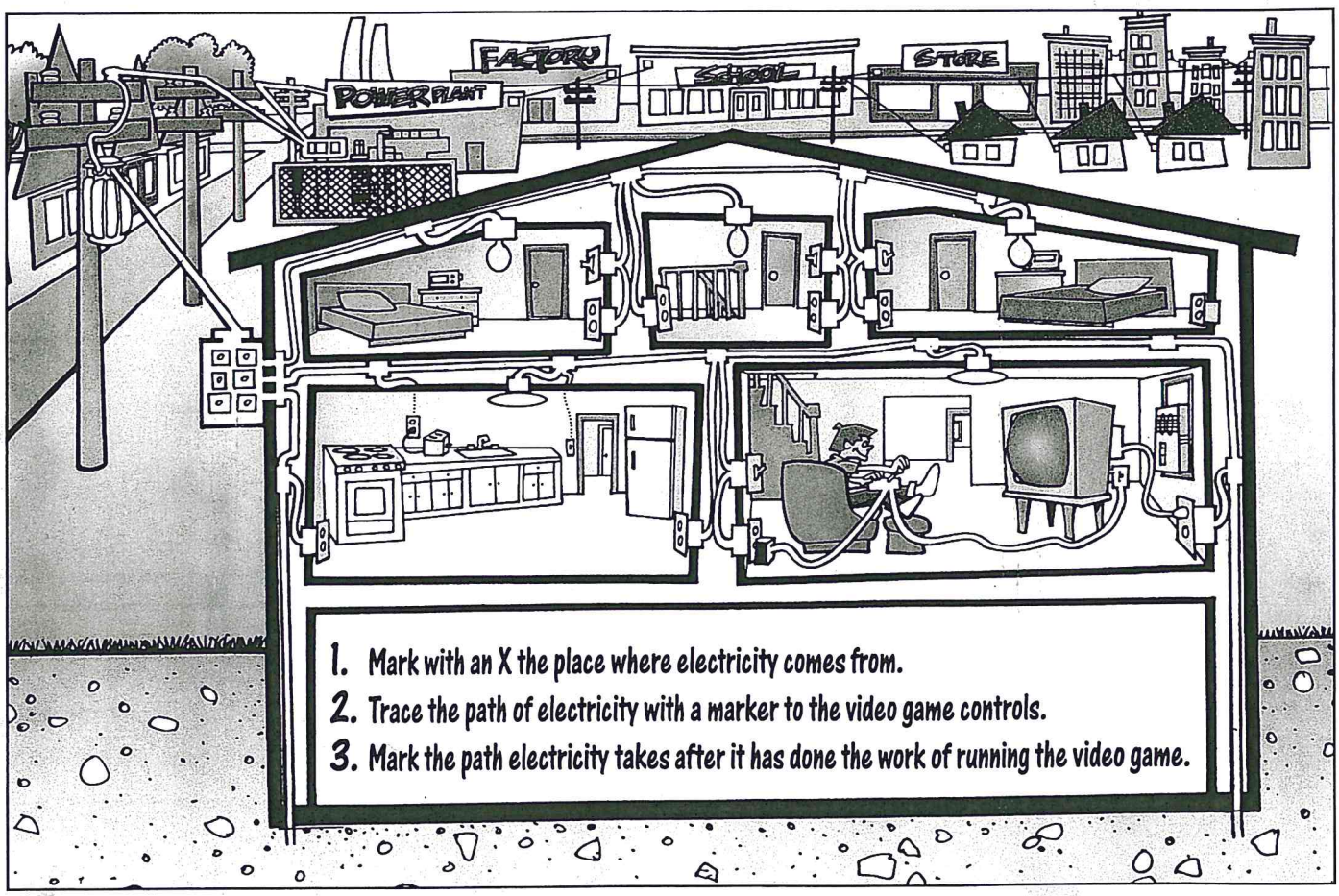
www.duke-energy.com/publicsafety/schools

We Use Electricity Every Day

Without knowing much about it!

A circuit is the path electricity travels. Your house is part of a circuit that begins at a power plant. Electricity travels through a grid of wires to the utility pole or underground lines outside your home. From the pole it travels to your home and through the inside wires—to the lights, wall switches, and outlets.

When you switch on a machine—such as a stove, power tool, clock radio, TV, or video game—you complete the circuit. Electricity flows through the power cord to the machine, then back through the cord to the outlet and out to the wires and into the grid again.



1. Mark with an X the place where electricity comes from.
2. Trace the path of electricity with a marker to the video game controls.
3. Mark the path electricity takes after it has done the work of running the video game.

Speedy Delivery

Electricity travels fast (186,000 miles per second). If you traveled that fast, you could travel around the world eight times in the time it takes to turn on a light switch.

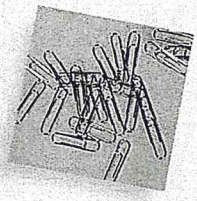
Electricity Flows Easily Through Conductors

NOT through insulators!

A conductor is a material that electricity can flow through easily. An insulator is a material that electricity cannot flow through easily. Just as a pot holder insulates you from heat, electrical insulators slow down or resist the flow of electricity.

1. Make your prediction. From the following list, circle one item that you think will conduct electricity well. Underline one item that you think will be a good insulator (will not conduct electricity). Then put a square around the one that you're not sure is a good conductor.

water
foil (aluminum)
toothpick (wood)
dry dirt



glass
paper clip (steel)
hose (air)
leather

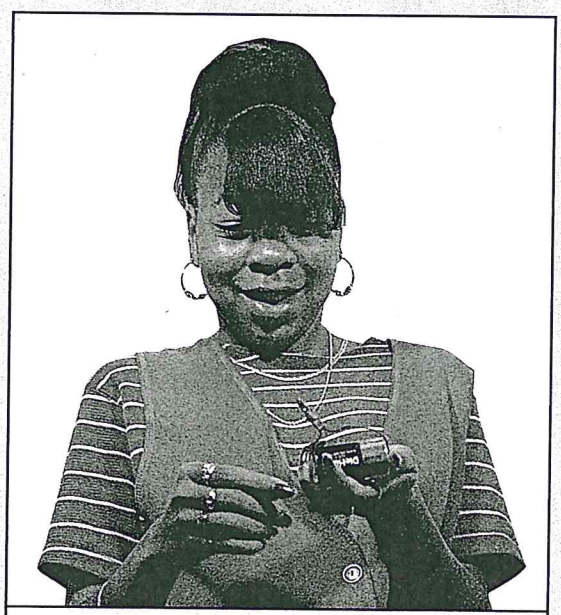
plastic
can (tin)
paper
rubber band

2. Materials. You will need one D-cell battery and a holiday minilight to test the items you chose from the list.

3. Test your choices. Try to connect the battery and bulb with each material you picked. Use a separate sheet of paper to record what happens in each trial.

4. Draw your setup and write the results on the page. Post your results where everyone can see.

5. Compare your results with your original prediction. Then compare with other groups. Were the results the same? If not, what might have happened to make the results different?



Cut one socket with its bulb from a string of holiday lights. Leave several inches of wire on each side extending from the socket. Strip each end of the wire. Hold one wire to each end of the battery to light the bulb.

800-428-5837
Product #36250 Run #5092 September 2012
CULVER Printed on Recycled Paper by Quad/Graphics, St. Cloud, MN®

Electricity Always Takes The Easiest Path To The Ground

Electricity travels in a path called a circuit. It will not leave the circuit unless it can find an easier path to the ground. If you touch a circuit and the ground at the same time, you become the easiest path.

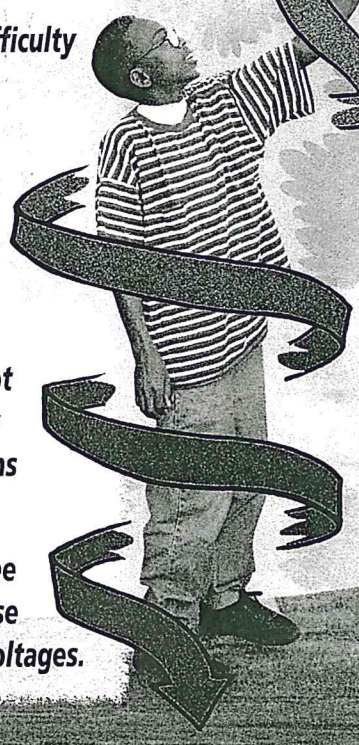
The ground is the earth or something touching the earth, like the steps of a ladder or even a roof.

The amount of electric current (measured in amperes "amps") is what hurts or kills people. The pressure of the current (measured in volts) affects how you are hurt.

Low voltage causes muscle spasms that can lock you to a circuit and cause death. High voltage often blasts a person clear of the circuit, but the shock or fall can be fatal.

What happens to the body?

1. *Chest muscles contract. This causes difficulty breathing and unconsciousness.*
2. *Heart cannot pump blood because it flutters and the veins that enter it are constricted. This happens most often at low voltages.*
3. *Burns show at the entrance and exit points of electric current. These are not like burns from the stove — electricity burns from the inside out. This happens at high voltages.*
4. *Muscle spasms make you unable to free yourself from the current and can cause bone fractures. This happens at low voltages.*



Test Your EQ

(Electricity Quotient)

The path electricity travels is called a _____.

The amount of electricity flowing through a conductor is measured in _____.

The pressure at which electricity flows is called _____.

The place where electricity is always trying to go is _____.

YOUR BODY CAN CONDUCT ELECTRICITY

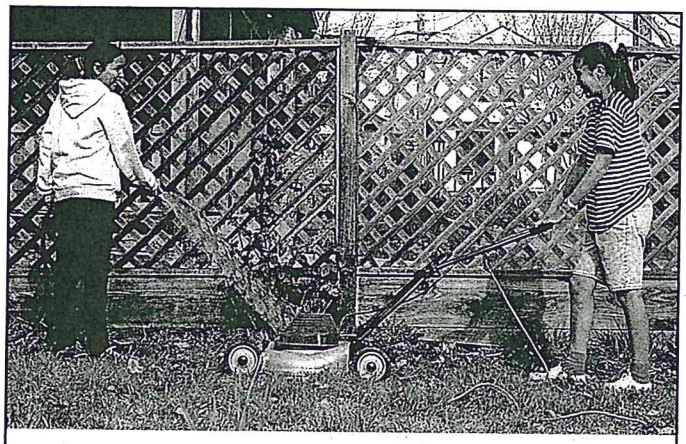
You handle electricity safely everyday. You know how to switch on the TV, the stereo, and the lights. But if handled carelessly, electricity can be dangerous for two reasons:

1. Electricity is always looking for the easiest path to the ground.

2. It can flow through water, and your body is made mostly of water. Water is a very good conductor of electricity.

LIVE WIRE SHOCKER

If a live wire inside a power tool or any appliance touches the tool body and you touch the tool, it would be like touching a bare live wire. You cannot tell from the outside of an appliance if there is a problem inside, so you should always act as if there were danger of shock.



***Look** at this picture.*

***Predict** what will happen.*

***Explain** why you predict these events.*

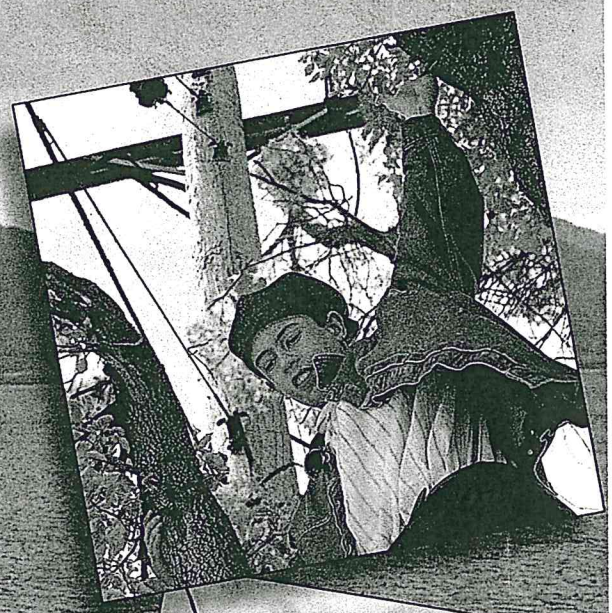
***Discuss** your ideas with a partner, with a small group or as a class.*

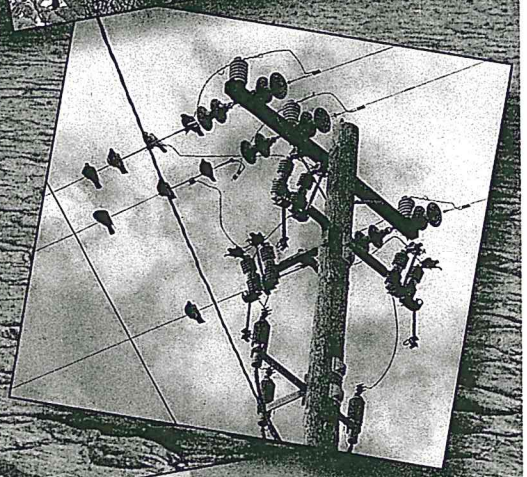
Prediction

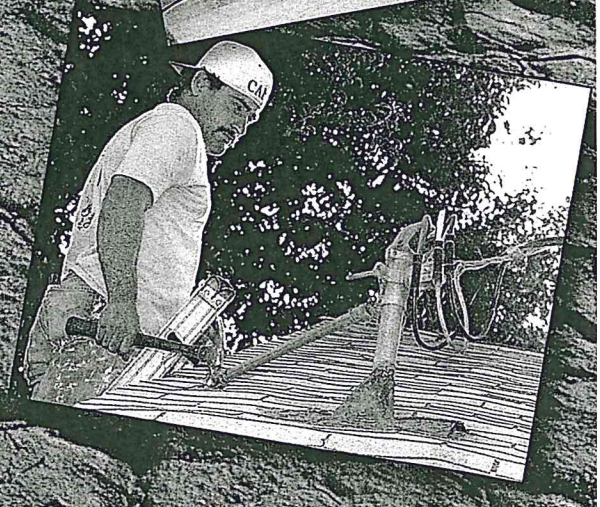
Reason

Electricity, You, And The Ground

If you come between electricity and the ground, you become the easiest path. Work with a partner to explore what you know about where you might find dangerous situations with electricity.







1 *In order to be electrocuted, you must be in contact with two things. What are they?*

2 *Discuss with your partner how the person or animal in each picture could become the easiest path to the ground.*

3 *Draw the path electricity would take to the ground in each human example.*

4 *Can you draw the path to the ground through the birds on the wire? Why is this example different from the others?*

Electricity, You, And Water

Why is it dangerous to squirt water at power lines?

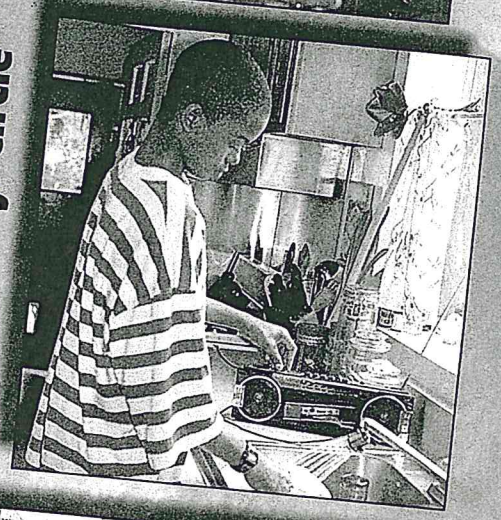
If you touch electricity and the ground at the same time, you become the easiest path to the ground. And you will get hurt.

You could also become part of electricity's path to ground if you are touching water that touches electricity. Electricity would travel through the water and through you to the ground.

Even insulators don't always work when they are wet.

Ground Fault Circuit Interrupters (GFCIs) monitor the flow of electricity. If there is more electricity going out of a cord than coming back, it means that some electricity is traveling to the ground instead of back through the circuit. The GFCI interrupts power automatically to prevent shock.

Cross out the pictures in which you could get hurt by electricity. Circle the safe ones.



Electricity Can SHOCK burn or KILL you!

Electricity flows through water almost as easily as it travels through the wire that brings electricity to your house. Your body is 70% water. So if you touch electricity, electricity will flow through you, and you will be badly hurt.

The amperage of the electric current and length of time you're in contact with it determine the injury.

Milliamps	Effects
0	Can just feel it
5	Can't let go
10	
20	Possibly fatal
30	
40	
50	
60	Probably fatal
70	
80	
⇩	
800	
⇩	
8000	

1 milliamp = 1/1000 amp

What's A Watt?

A watt measures the amount of work done by electrical power. It takes more power to run the hair dryer on ***high (1500 W)*** *than on* ***low (800 W)****.*

1. It takes about 1 amp to light a 100-watt light bulb in your home. How many milliamps would be needed?

   _____

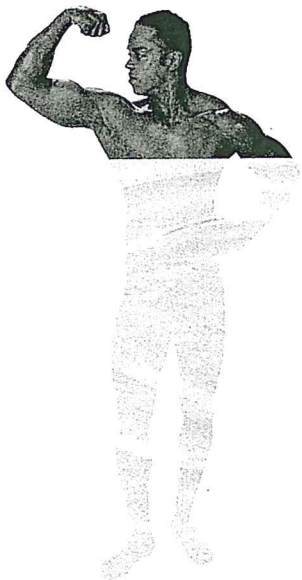
2. How many milliamps would be needed to run a 1000-watt hair dryer?

   _____

3. From looking at the chart, what would probably happen to a person who contacted 1 amp of electricity in their home by accident?

   _____

How much of your body is composed of water?



Sometimes The Dangers Of Electricity Are Not Obvious

Signs and adults warn you of danger. But sometimes you have to use what you know about electricity, your body, and the ground to figure out what is dangerous.

Match the picture with its description by writing the letter in the white box. Discuss with a partner how you can tell that there is danger from electricity in each picture. Share your ideas as a class.

A Transmission towers carry high voltage electricity over long distances.

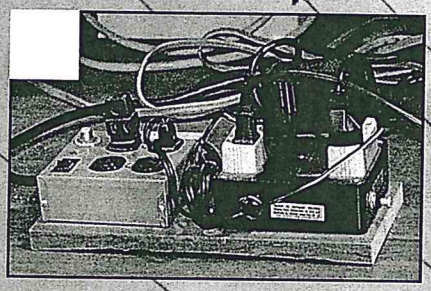
B Substations lower the voltage for local distribution.

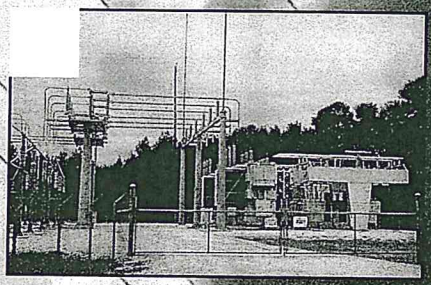
C Electric lines to your house may look insulated, but it's usually just weatherproofing.

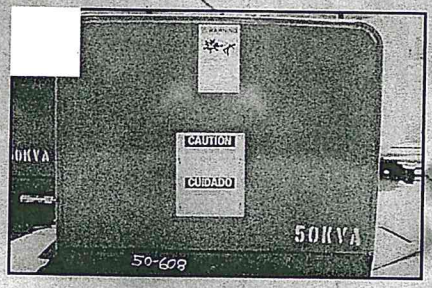
D Electricity goes to transformers so the voltage can be lowered once more before it goes into your home.

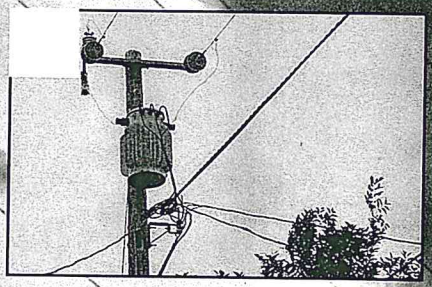
E If distribution wires are underground, electricity goes to a pad-mounted transformer before it enters your house.

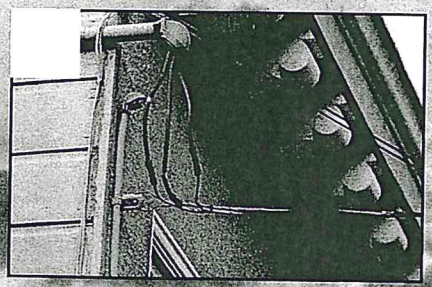
F The electrical circuits in your house only carry a certain amount of electricity. If you plug in too many things to an outlet, the circuit could overheat and cause a fire.

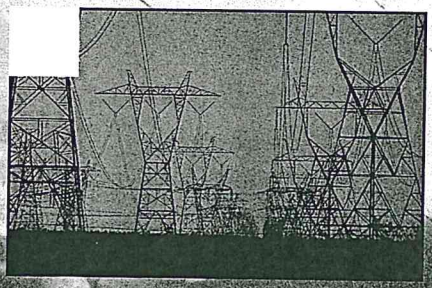












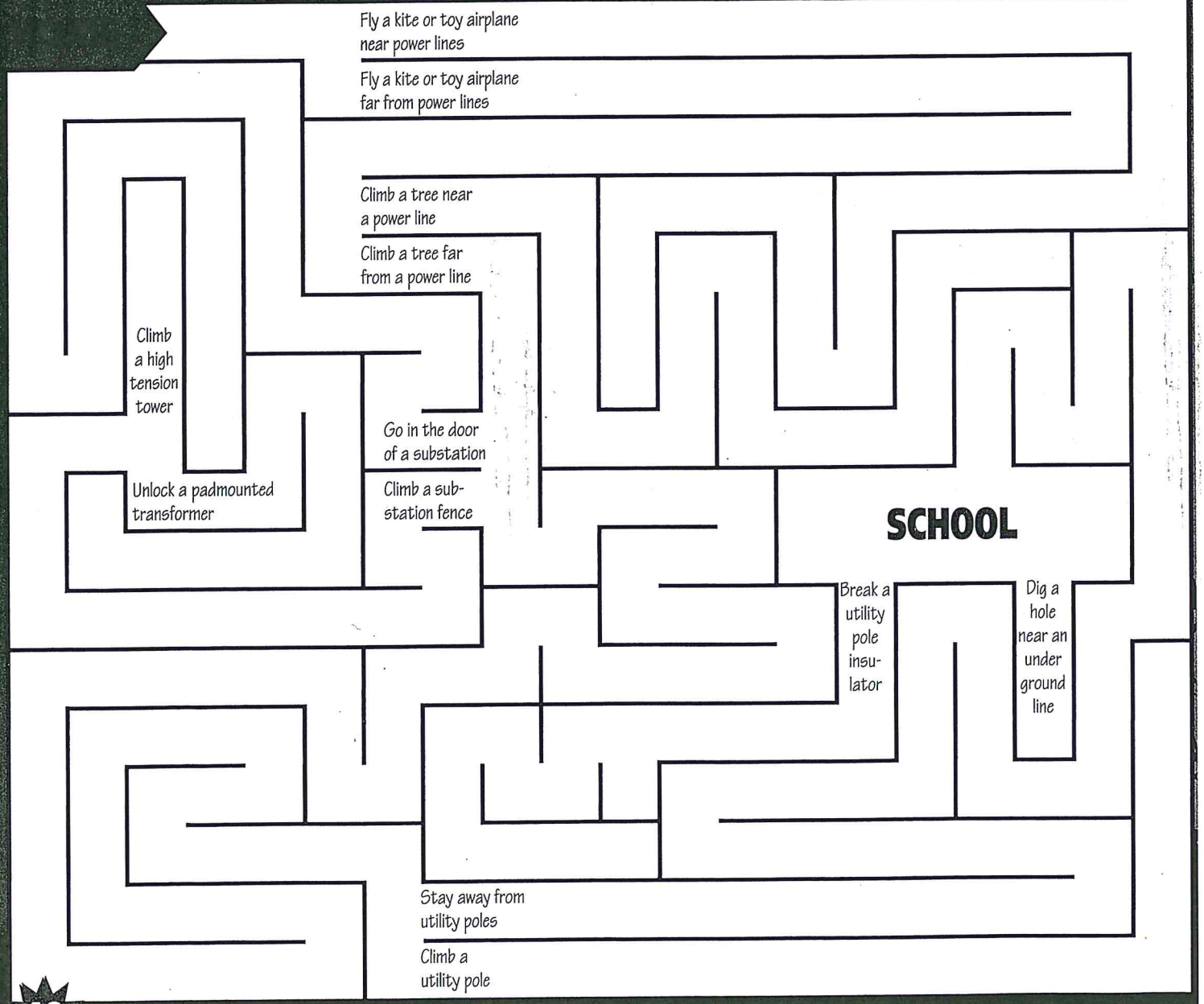
Light Up The Moon!

If you had a light on the moon connected to a switch in your bedroom, it would take only 1.26 seconds for it to light up, 238,857 miles away.

STAY AWAY

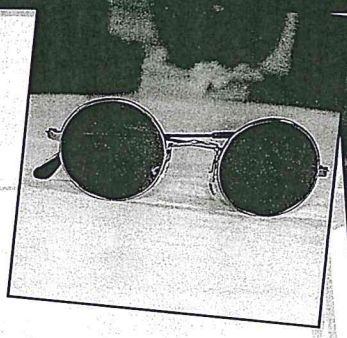
From Electric Lines And Utility Equipment!

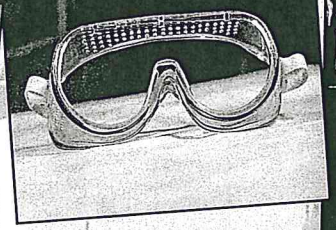
Stay out of danger on your way to school by making the right choices in the maze below!



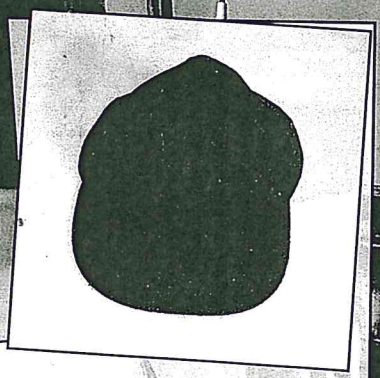
People Who Work With Electricity Use Special Protective Gear

People who work around electricity use special gear. Choose one in each pair that you think they use and tell why.

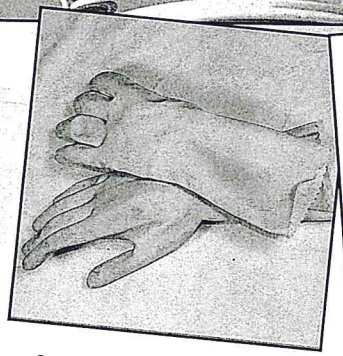


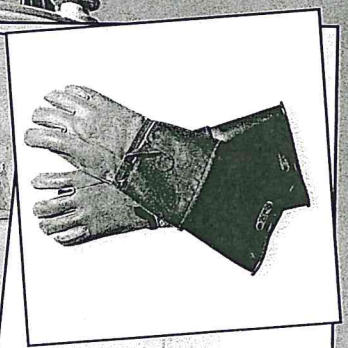


WHY?



WHY?





WHY?

What To Do If You See Broken Or Downed Power Lines

DANGEROUS

Always assume that downed power lines are carrying electricity. If you come across a downed power line, here's what to do:

If you're in a car with a power line on or near it, stay there until rescue and utility workers arrive. If people come near to see if they can help you, warn them to stay away. Then ask them to call for help. When you are in the car, you are not part of the path to ground. Why?

_____

_____

_____

If you must leave because of fire or other danger, do not step out of the car. Instead, jump as far as you can with both feet together. Then roll or shuffle away. Don't touch the car and the ground at the same time. Why not?

_____

_____

Don't try to help someone else from the car while you are standing on the ground. Why not?

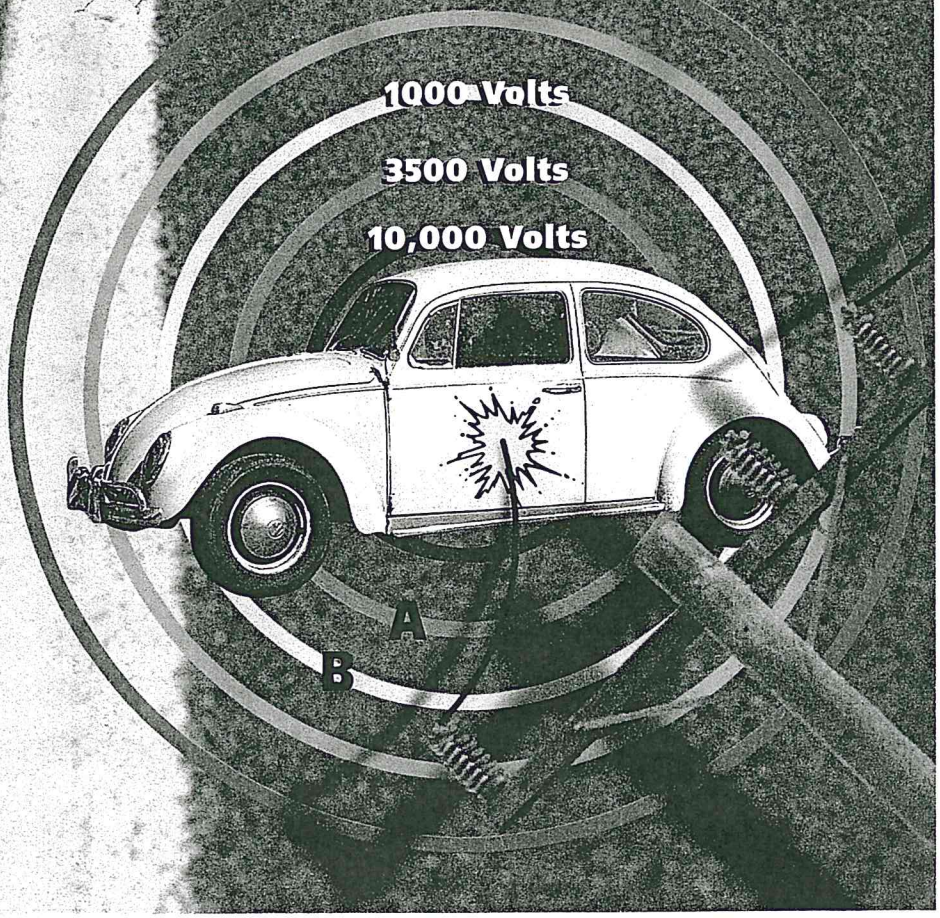
_____

_____

_____

Once you jump from a car with an electric wire on it, is the danger over? It depends on the situation. Electricity can spread out through the ground in a circle from any downed line. The voltage drops as you move away from the point of contact. You should roll or shuffle away from the line because if one foot were in a higher voltage zone than the other, you would become a conductor for electricity.

If by accident a person touched point A and point B at the same time, what amount of voltage would flow through the person's body?



What To Do In An Electrical Fire

Electricity is hot! It can cause fires in these ways:

- A hot electrical device, like a lightbulb, gets too close to something that can burn and that something catches fire.
- The insulation on an overloaded extension cord may burn or melt, exposing live wires. Live wires can spark and cause a fire.

Electrical Fires are different than other fires because they have a source of electricity that is still conducting electric current.

In Case of Electrical Fire:

- Leave the area.
- Telephone for help from a safe location, or tell an adult about the fire.
- Tell an adult to use a proper chemical fire extinguisher on the fire.

What would happen if someone tried to put out an electrical fire with water?

_____

_____

Plan an emergency escape route with your family.

What To Do

If Someone Has Been Shocked Or By Electricity

You can help people who are in trouble. But in an electrical emergency, the hardest thing to remember is that the best help may be to stay away.

Just like an electrical fire, call for help. Stay far away from a person who has been shocked or a vehicle with an electric line on it.

Think: Could you safely touch a person who was shocked if the person were still in contact with the source of electricity? Why or why not?

What to do

1 Tell an adult to pull the plug from the outlet or to turn off the power at the fuse box or circuit breaker.

2 Call for help (usually 911). Tell them it is an electrical accident.

3 When the victim is not in contact with the source of electricity, and you're sure there is no danger, tell an adult to give first aid:

- If the victim is not breathing, give CPR or mouth to mouth resuscitation.
- Loosen the victim's clothing. Keep the victim warm and lying down until help arrives.
- Don't touch the burns, break blisters, or remove burned clothing. You cannot tell if there are electrical burns inside the body, so be sure the person is taken to a doctor.

Electricity

CAN BE DANGEROUS!

My name is Ellen Weiss, and I work for a construction company. Because I work with power lines, I have been trained to know the dangers of electricity. At work, I am cautious because I work on a team and my good sense ensures the safety of those around me. I got hurt by electricity at home, when I wasn't respecting electricity the same way I do at work.

It was a Saturday afternoon and I decided to do some yardwork. I pruned my rose bushes, pulled some weeds, and then I decided to take my electric lawn mower out. That was where I made two mistakes. For one thing, my grass was very wet from all of the watering. And for another, I didn't notice that the insulation rubber around my power cord had frayed during storage in my shed. Needless to say, I experienced quite a *SHOCK*. Before I knew what was happening to me, the electricity was flowing from the exposed wires, down around the wet ground and up through me. Luckily a friend was in the yard with me. She acted instantly, pulling the plug from the electrical outlet, and saving my life. The shock had knocked me unconscious, but had not stopped my heart. This event changed my life! I will never take electrical safety for granted again!!

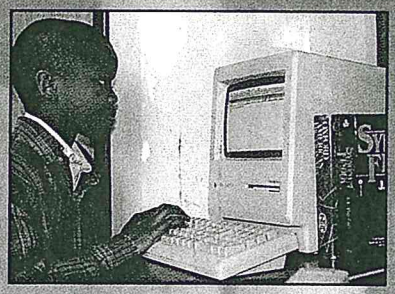
People just like you get hurt by electricity every day. Some people don't know how to be safe around electricity. Sometimes they know the rules, but they are careless. Sometimes something happens just by accident. Sometimes a person might ask you to do something around electricity that you are not comfortable doing.

Find someone who has a story to tell about an electrical accident. Ask them for details of the story Where were they? What happened? Why did it happen? What thoughts did they have afterwards? Was anyone with them? What did they do? Has it had an effect on the safety measures they take around electricity? Read your story to a partner. Talk about what could have been done to prevent the accident.

Water + Electricity = Danger

Stay Safe Around Electricity!

This puzzle will tell you how to be safe around electricity. You can find all the answers inside this magazine.



Across Clues

2 If you put your _____ between electricity and the ground, electricity will flow through you.

4 You can be safe around _____ if you take the right precautions.

8 Coming in contact with electricity can cause _____, burns, or death.

9 The path electricity travels in is called a _____.

10 GFCI's are Ground _____ Circuit Interrupters.

11 Fly kites in_____ areas away from overhead power lines.

14 Overloaded _____ can cause electrical fires.

16 Obey warning signs like Danger High _____.

Down Clues

1 Electricity flows through _____ easily. Metals, water, and humans are examples of them.

3 _____ electric cords can cause shock and fire.

5 Electricity always seeks the _____ path to the ground.

6 _____ prevent the passage of electricity. They keep the electricity flowing through wires.

7 Birds can sit on an electric line because they are not touching the _____.

12 Don't climb transmission _____, utility poles, or substation fences.

13 The safest thing to do in an electrical emergency is to call for _____.

15 The human body is 70% _____.