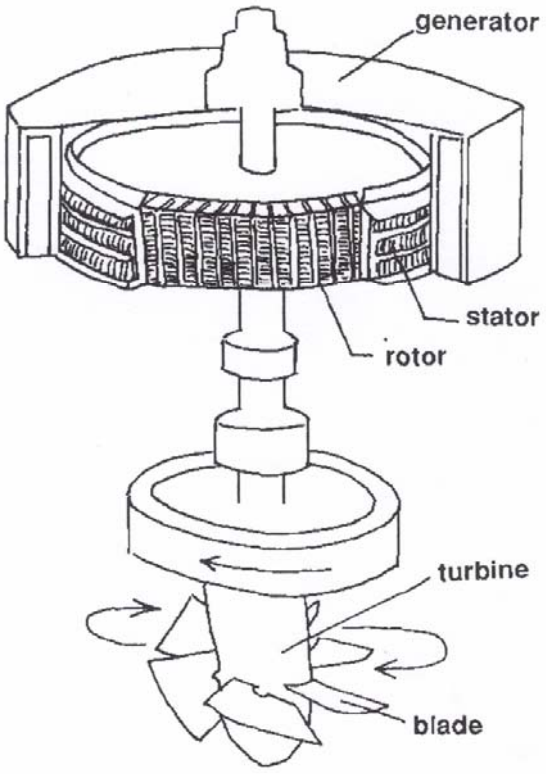
Back

THE TURBINE GENERATOR

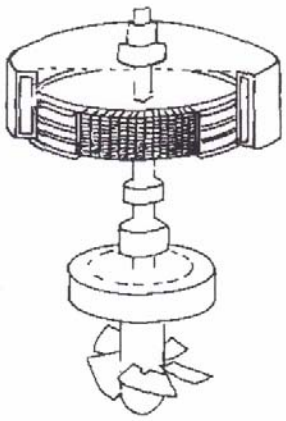


MAKING ELECTRICITY

A. Fill in the blanks. Choose from these words—electricity, generator, magnets, wire.

1. _____ are important in making electricity.
2. A _____ is a machine that makes electricity.
3. When a magnet is moved through coils of wire, _____ is made.
4. A generator has a magnet and coils of _____.

B. Label the parts of the generator. Choose from these words—blade, generator, rotor, stator, turbine.



C. Put these terms in the correct numerical order to show electricity's transmission from where it is produced to where it is needed. Number from 1-9.

_____	wires	_____	wires
_____	transformer (voltage down)	_____	transformer (voltage up)
_____	house	_____	power plant
_____	wires	_____	wires
_____	transformer (voltage down)		

ENERGY IN MOTION

OBJECTIVES

The student will do the following:

1. Define potential and kinetic energy.
2. Give examples of potential and kinetic energy.

SUBJECTS:
Science, Math

TIME:
60 minutes

MATERIALS:
stiff paper, 5 yo-yos, pins, thumbtacks or tape, colored markers, paper cups, pencils, pictures showing examples of potential and kinetic energy, student sheets (included)

BACKGROUND INFORMATION

Energy is used when matter changes or is moved. The energy matter has when it is moving is called kinetic energy. A moving train has kinetic energy. A landslide has kinetic energy. Kinetic energy is called the energy of motion.

Not all energy is kinetic energy. Some matter is able to move or change something, but is not doing it at the moment. Matter that has stored energy is said to have potential energy. This means that piles of coal or wood have potential energy. (When they are burning, they have kinetic energy.) Likewise, something that is in a position from which it would be able to exert energy (for example, a ball held high in the air or water held behind a dam) has potential energy. Potential energy is called stored energy or the energy of position.

Terms

energy: the ability to do work.

kinetic energy: the energy of motion.

potential energy: stored energy, or the energy of position.

PROCEDURE

I. Setting the stage

A. Introduce the concept of potential and kinetic energy by having the students do the following demonstration:

1. Give each of five students a yo-yo. Have them yo-yo for the class.
2. Tell the students that energy is the ability to do work. Ask if they see any evidence of energy. Many will cite the moving of the arms or the yo-yos. Tell the students that the movement of arms and yo-yos is called kinetic energy—the energy of motion.

3. Have the students with the yo-yos stop and just hold them in their hands. Tell the students another kind of energy is being demonstrated. Explain the concept of potential energy—stored energy.

B. Have the students think of other examples of kinetic and potential energy. List them on the board.

II. Activity

A. Play a game to help the students recognize potential and kinetic energy.

1. Display a chart like the following:

ENERGY	
KINETIC	POTENTIAL

The chart can be drawn on a bulletin board or made on a large piece of posterboard. If done on posterboard, the chart can serve as a display when the game is completed.

2. Show the students a stack of pictures (cut from magazines) showing kinetic and potential energy.

3. Divide the class into two teams. Have each team choose a picture and place it correctly on the chart. (Supply the teams with thumbtacks or tape.)

4. Award one point for each correctly placed picture. If a picture is placed incorrectly, award no points. When all the pictures have been placed, the team with the most points wins the game.

B. Have the students construct and use a pinwheel to demonstrate kinetic and potential energy.

1. Have each student construct a pinwheel using the student sheet "ENERGY WHEEL," included. (These need to be reproduced on heavyweight paper.)

2. Give each student a paper cup. Have them fill their cups with water.

3. Review the definitions for kinetic and potential energy. Write them on the board.

4. Have the students state which kind of energy the pinwheels and the cups of water represent.

5. Station the students at sinks or tubs, and have them pour the water over the pinwheels, stating which kind of energy the spinning pinwheels and the cups of pouring water represent. (If it is impractical to have the students do this, you may demonstrate it for them.)

C. Have the students solve an energy production problem.

1. Divide the students into pairs and give them this problem: How much water will it take to produce 100 units of energy if each turn of the pinwheel represents 5 units of energy?

2. Have the students use the pinwheel constructed in Activity B. One blade of the pinwheel should be colored a bright color (so that turns will be easier to count).

3. Provide each pair of students with a large cup of water.

4. Have the students develop a procedure that will allow them to solve the problem.

III. Follow-up

A. Have the students complete the student sheet "ENERGY MATCH," included. The answers are as follows: kinetic—moving bicycle, waterfall, burning coal, moving ball, running horse; potential—batteries, pile of wood, stretched rubber band, can of gasoline, still water.

B. Give each of the students a copy of the student sheets "ENERGY MAZE #1" and "ENERGY MAZE #2," included. Have them complete the mazes. (The first maze spells "kinetic" and the second, "potential.")

C. Have the students answer the following questions.

1. What in your experiment represented potential energy? (still pinwheel, cup of water) kinetic energy? (turning pinwheel, pouring water)

2. Can you think of any real-life situations which are related to your experiment? (windmills, waterwheels, hydroelectric power)

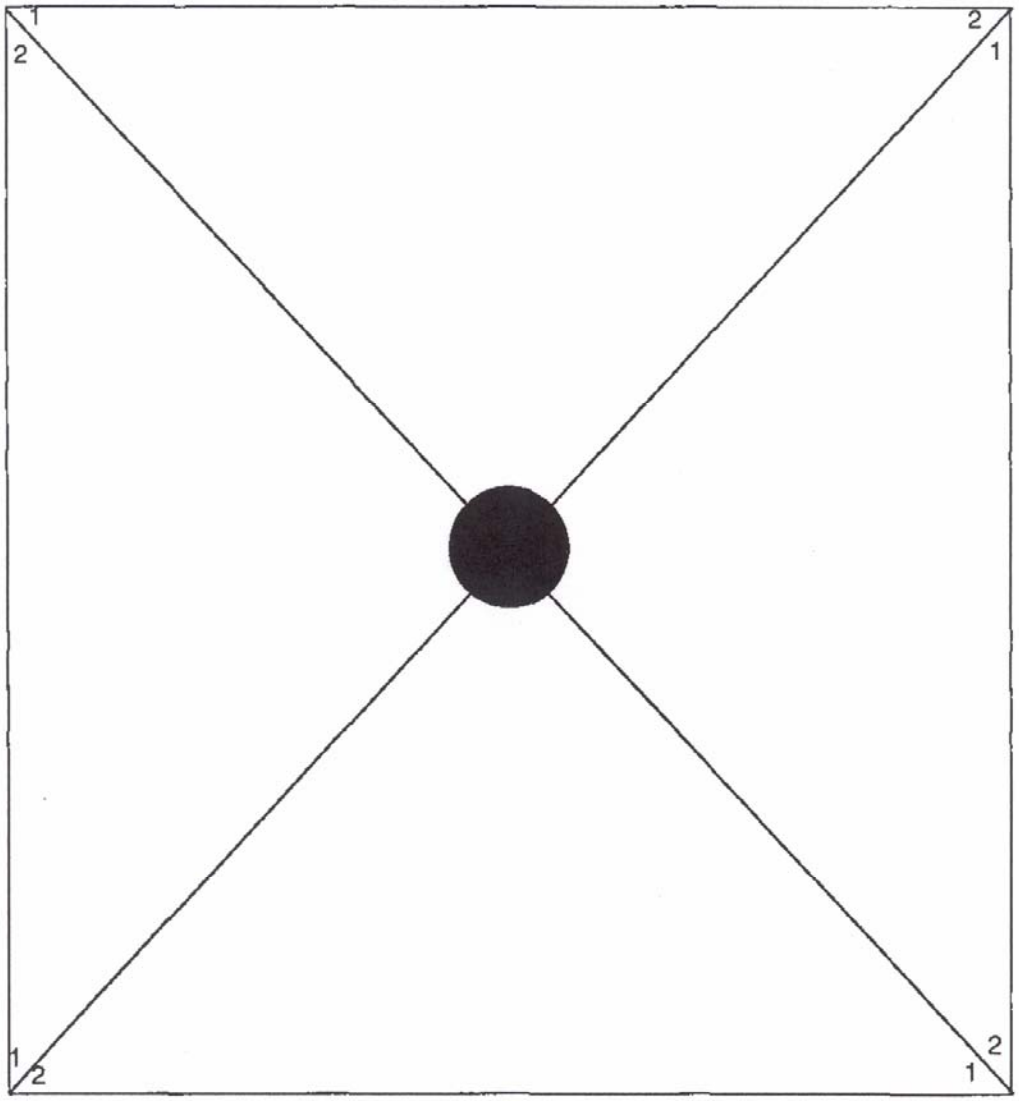
3. List some examples of kinetic and potential energy which could be found in your community.

RESOURCES

Sund, R. B., D. K. Adams, J. K. Hacket, and R. H. Mayes. Accent on Science. Columbus, OH: Merrill, 1985.

Zinn, G.A. Steps in Science. New York: Standard, 1974.

ENERGY WHEEL



1. Cut out the square above.
2. Cut along the lines from each corner to the circle. (Do not cut into the circle.)
3. Fold all corners marked number 1 to the center.
4. Push a pin through the center and all four corners and into a pencil eraser, attaching the pinwheel to the pencil.

ENERGY MATCH

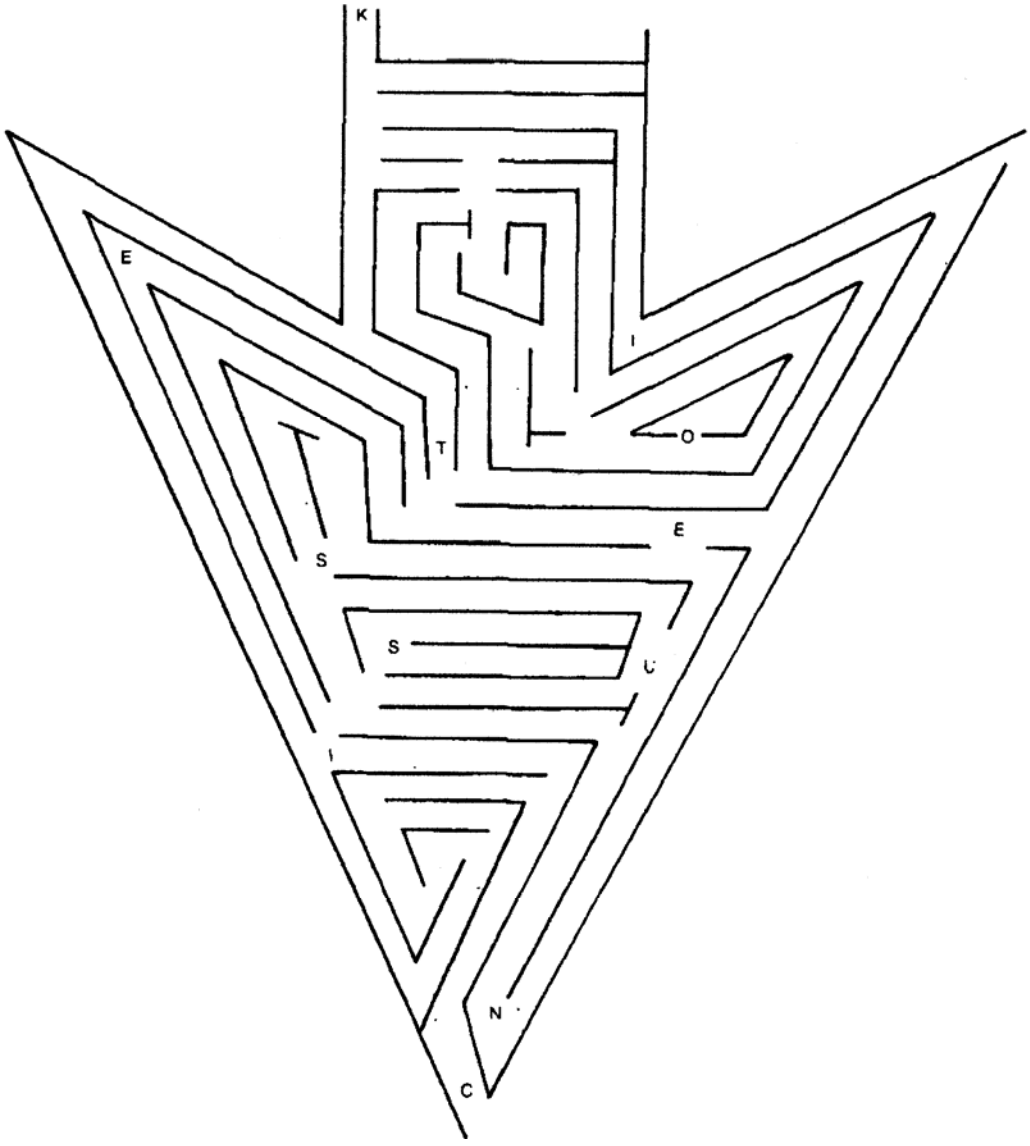
Draw lines to match the kind of energy to the examples.

	moving bicycle
	batteries
	pile of wood
Kinetic	waterfall
	burning coal
	stretched rubber band
Potential	moving ball
	can of gasoline
	running horse
	still water

ENERGY MAZE #1

The correct path through the maze will lead to letters spelling the word which will complete the following sentence.

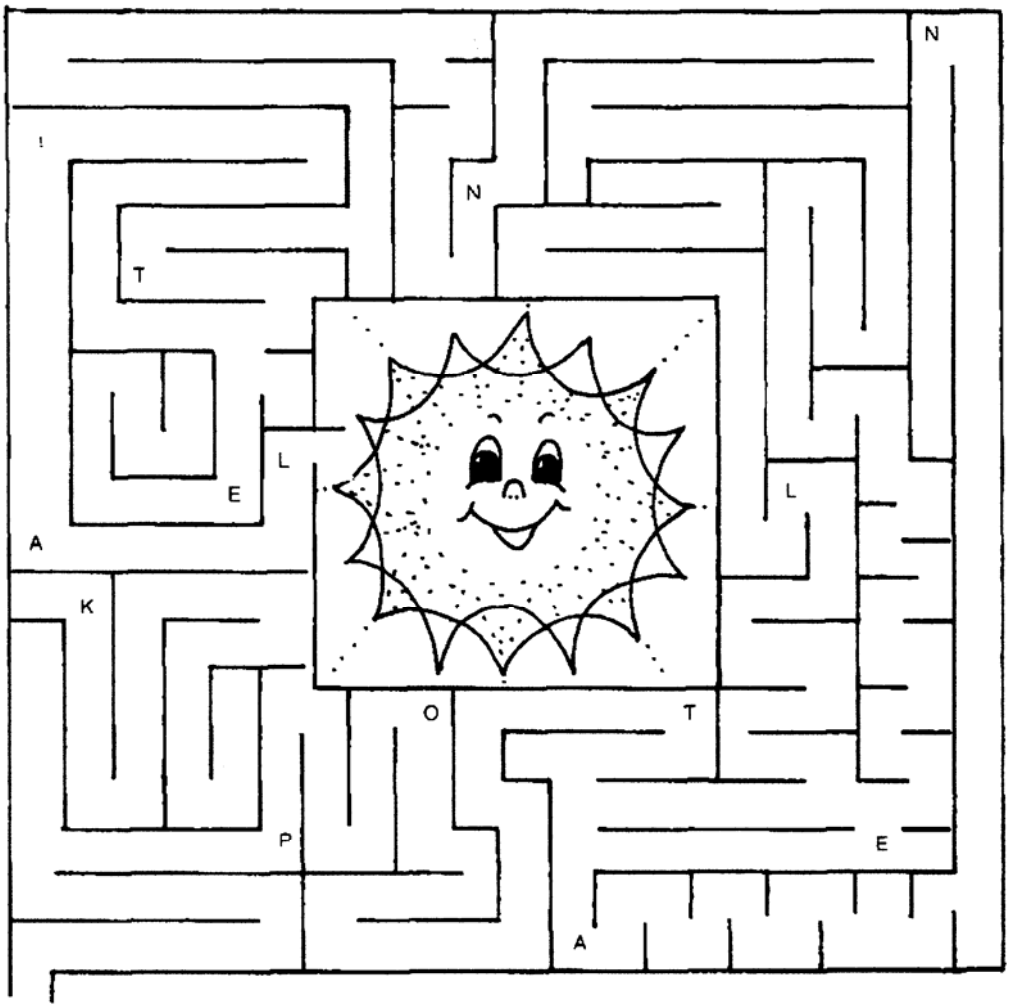
The energy of moving matter is called _____ energy.



ENERGY MAZE #2

The correct path through the maze will lead to letters spelling the word which will complete the following sentence.

Energy which is stored is called _____ energy.



GLOSSARY

attract: to pull closer.

chemical energy: energy stored in matter because of its composition; energy that is released when compounds change; e.g., the energy stored in fuel.

circuit: a path for the flow of electrical current; composed of elements such as a source of electricity, something that uses electricity, and the wires connecting them.

coal: a major fuel resource formed from ancient plant remains that have partially decayed and, through time and pressure, become a carbon-rich rock material.

compass: an instrument used for determining geographical directions by means of a pivoting magnetic needle (which always points north).

conductor: material through which electricity can flow.

current electricity: the flow of electricity; the movement of electrons through a circuit.

electrical energy: energy produced by electrons pushing through wires.

electromagnet: a soft iron core wound with a coil of wire; it becomes magnetic when an electric current passes through the wire.

energy: the ability to do work.

energy chain: a series of energy transformations from one form to another.

fossil fuels: fuels formed from the remains of ancient plants and animals; for example, coal, oil, or natural gas.

galvanometer: an instrument used to detect electric current.

generator: a machine that converts mechanical energy to electrical energy.

heat energy: the internal energy of a substance or object due to the movement of its particles.

hydroelectricity: electricity produced by generators powered by the energy of falling water.

insulator: material through which electricity cannot flow easily.

kinetic energy: the energy of motion.

light energy: a form of energy that travels in waves and can be detected by the unaided human eye.

magnetic energy: the energy of attraction for iron and similar materials; such materials may have this energy naturally or it may be induced in them (as with an electromagnet).

magnetic field: the space around a magnet in which there is magnetic force.

magnetism: a magnet's force of attraction.

mechanical energy: energy possessed by the moving parts of machines.

natural gas: a fossil fuel; a mixture of gases (mostly methane) often found with petroleum deposits.

nuclear energy: the energy released when the nuclei of uranium atoms are split.

oil: petroleum; a fossil fuel; a thick liquid mixture of substances formed from partially decayed ancient living things.

parallel circuit: a circuit in which the elements that use electricity are arranged so the same voltage is applied at each one; that is, a circuit that consists of more than one path through which electricity can flow.

poles: the ends of a magnet; designated "north" and "south."

potential energy: stored energy, or the energy of position.

repel: to push away.

rotor: a generator's rotating core which is electromagnetized; its rotating magnetic field causes an electrical current in the stator.

series circuit: a circuit in which all the elements that use electricity are connected one after the other so that the current's voltage is divided among them; that is, a circuit that consists of only one path through which electricity can flow.

solar energy: the heat and light energy radiated from the sun.

sound energy: the form of energy which travels in waves and causes the vibration of particles of air, water, or solids; detected by the ears.

stator: the stationary generator part within which the rotor spins; electric current is produced in the stator by the rotor's rotating magnetic field.

transformer: a device that changes the voltage of an electric current.

turbine: a bladed wheel made to turn by the pressure of steam, water, or air against its blades; it is connected to a generator and supplies the generator with the mechanical energy to be converted into electrical energy.

voltage: the force that pushes electric current along a circuit.