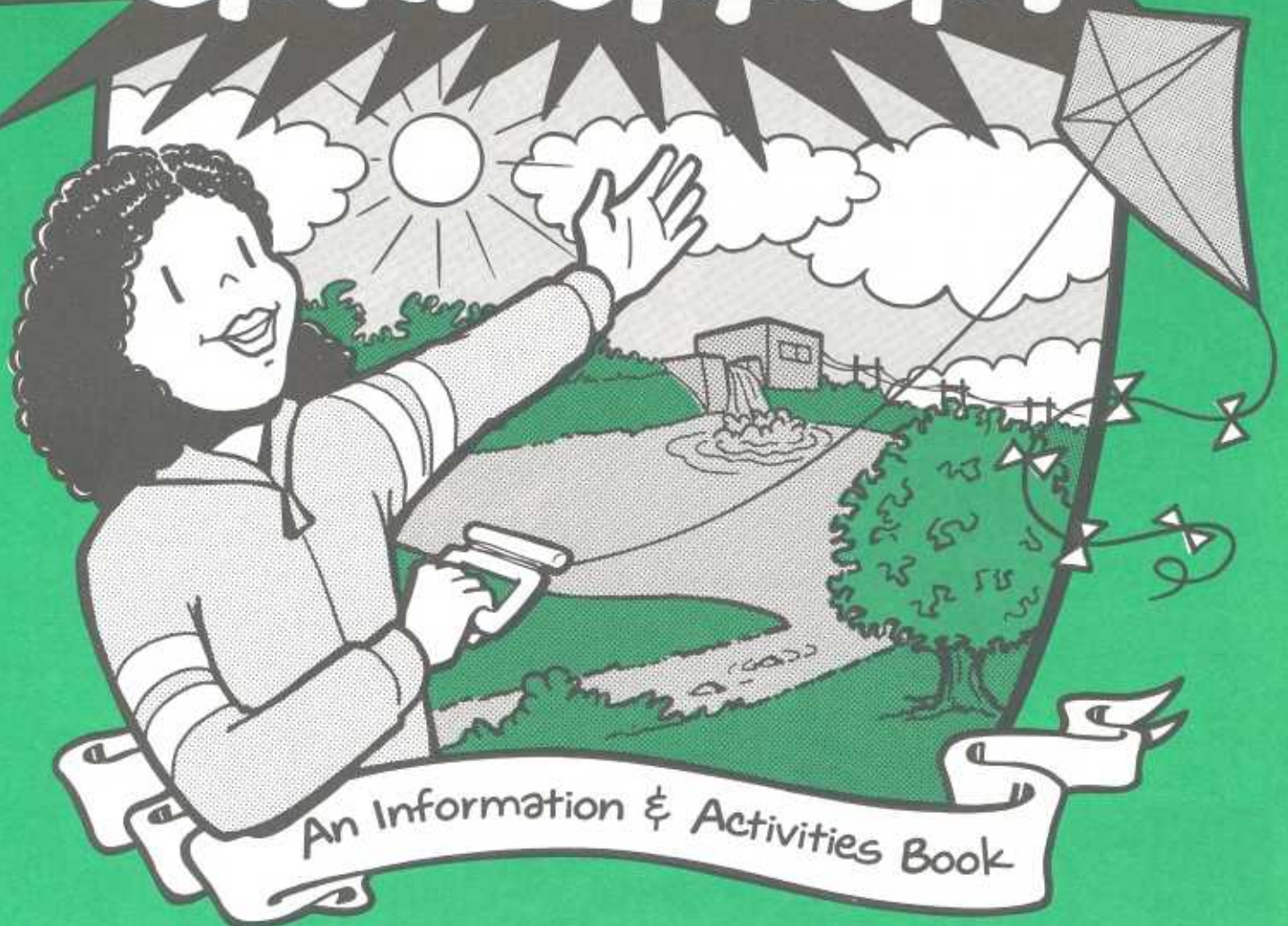


LET'S LEARN ABOUT

ENERGY

AND THE

ENVIRONMENT



An Information & Activities Book

GPU Nuclear

Energy and the environment

-- A CLOSER LOOK




















Every day, each one of us uses about 60 gallons of water and breathes in thousands of gallons of air. We depend on our environment for survival. And, the things in our environment depend on one another, too.

EVERY LIVING THING IS PART OF A FOOD CHAIN.

For example, diagram #1 below shows a food chain in the forest: insects eat plants, mice eat insects, snakes eat mice, snakes die and their remains help provide nutrients for plants. Now, it's your turn to have some fun. Unscramble the names of the living things below to complete the other food chains. Use the pictures at the bottom to help you.

1				
2		SWORMEARTH	SGNOBIRDS	
3	ASPLTN		ICEM	OFESX

FOSSIL FUELS

ARE IMPORTANT ENERGY RESOURCES

You probably know that we use fossil fuels for heating, cooking, and running our cars. But did you know that oil, coal and natural gas are also used in making shampoo, nail polish and detergents?



WORD SEARCH

All of the products below are made using fossil fuels as raw materials. Find and circle each word in the grid. Words may be written across, up and down, or on a diagonal. (Note: one diagonal word is written backwards.)

OIL PRODUCTS

- | | |
|-------------------------------------|-------------------------------------|
| <input type="checkbox"/> PERFUME | <input type="checkbox"/> ROOFING |
| <input type="checkbox"/> DYE | <input type="checkbox"/> INSULATION |
| <input type="checkbox"/> EXPLOSIVES | <input type="checkbox"/> BATTERIES |

COAL PRODUCTS

- | | |
|-----------------------------------|--------------------------------------|
| <input type="checkbox"/> SNEAKERS | <input type="checkbox"/> TENTS |
| <input type="checkbox"/> INK | <input type="checkbox"/> UNDERWEAR |
| <input type="checkbox"/> ZIPPERS | <input type="checkbox"/> PHOTOGRAPHS |
| <input type="checkbox"/> SWEATERS | <input type="checkbox"/> DEODORANT |










NATURAL GAS PRODUCTS

- | | |
|--------------------------------|----------------------------------|
| <input type="checkbox"/> FILM | <input type="checkbox"/> PAINT |
| <input type="checkbox"/> NYLON | <input type="checkbox"/> PLASTIC |

A	P	E	R	F	U	M	E	B	D	E	Z
G	H	L	K	M	T	N	P	R	T	V	I
U	W	Y	A	Z	E	G	D	F	H	I	P
N	F	J	L	S	N	M	O	Q	R	T	P
D	U	I	S	V	T	X	Y	D	Y	E	E
E	X	P	L	O	S	I	V	E	S	Q	R
R	S	H	A	M	A	N	C	O	D	C	S
W	N	O	H	I	J	K	L	D	N	T	W
E	E	T	N	O	N	R	T	O	Y	V	E
A	A	O	B	D	F	T	L	R	E	G	A
R	K	G	L	M	P	Y	O	A	R	V	T
S	E	R	W	Y	N	F	C	N	E	F	E
H	R	A	K	L	O	X	Z	T	D	H	R
W	S	P	B	A	T	T	E	R	I	E	S
T	U	H	M	R	O	O	F	I	N	G	Z
I	N	S	U	L	A	T	I	O	N	A	Y

OTHER NATURAL RESOURCES PROVIDE ENERGY, TOO

To find out the names of some other energy sources, solve each puzzle below. Then, use your answers (and the one from the example) to solve the riddles.

A.  +  -  -  +  +  -  -  + 
WAVE + STRING - (RING) - (VEST) + TEN + UTAH - (AH) - (NUT) + R = WATER

B.  -  +  -  -  +  - 

C.  -  +  -  +  +  - 

D.  -  +  +  - 

E.  -  +  +  -  +  - 

1. I can be strong or gentle. My energy can be used to pump water, run machines and generate electricity. Who am I?

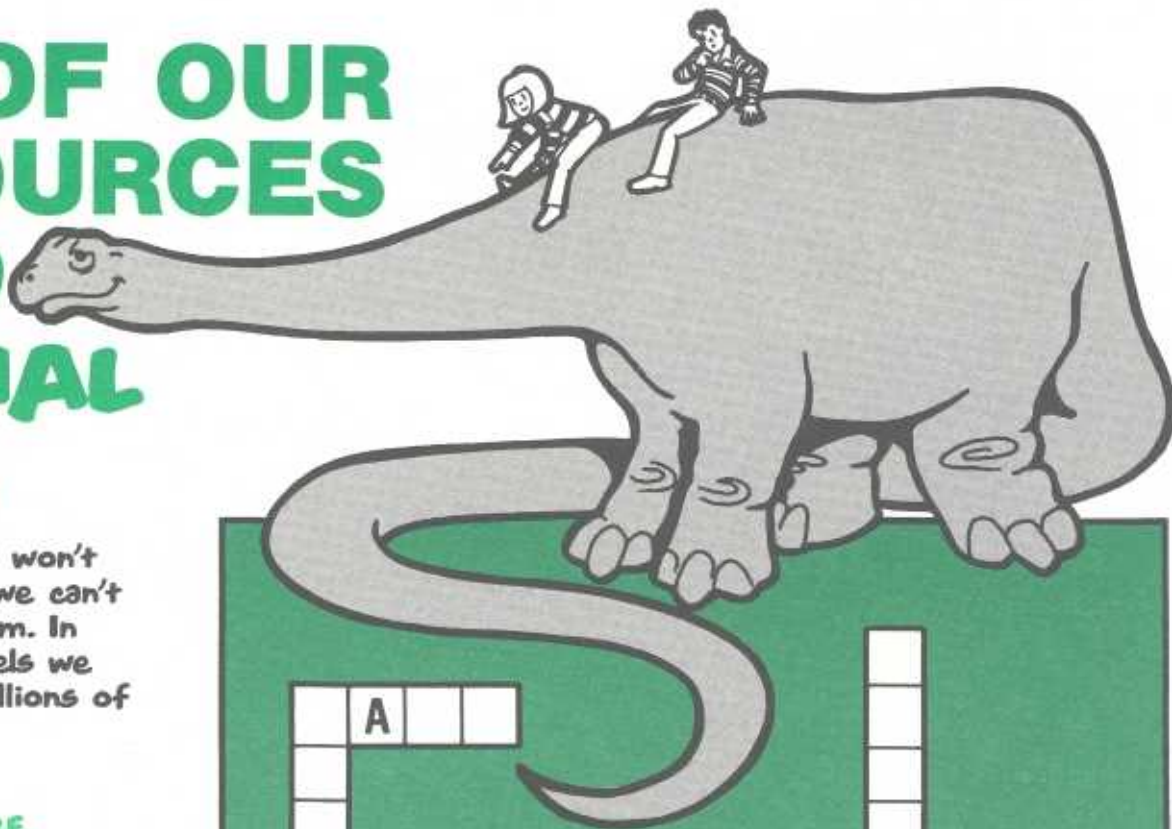
2. I'm warm and radiant. I'm the source of solar energy. Who am I?

3. I'm all wet. I help produce electricity by powering large turbines at hydroelectric plants. Who am I?

4. I'm hard, heavy, silvery and metallic. I'm used in nuclear power plants. Who am I?

5. When water is heated, I'm produced. When I come from beneath the earth's crust, I'm called "geothermal energy." Who am I?

ALL OF OUR RESOURCES NEED SPECIAL CARE



Fossil fuel supplies won't last forever. And, we can't make more of them. In fact, the fossil fuels we use today took millions of years to form.

TO FIND OUT MORE,

read the paragraphs below. Then try to fit the underlined words into the puzzle. Some letters are already in place to get you started.

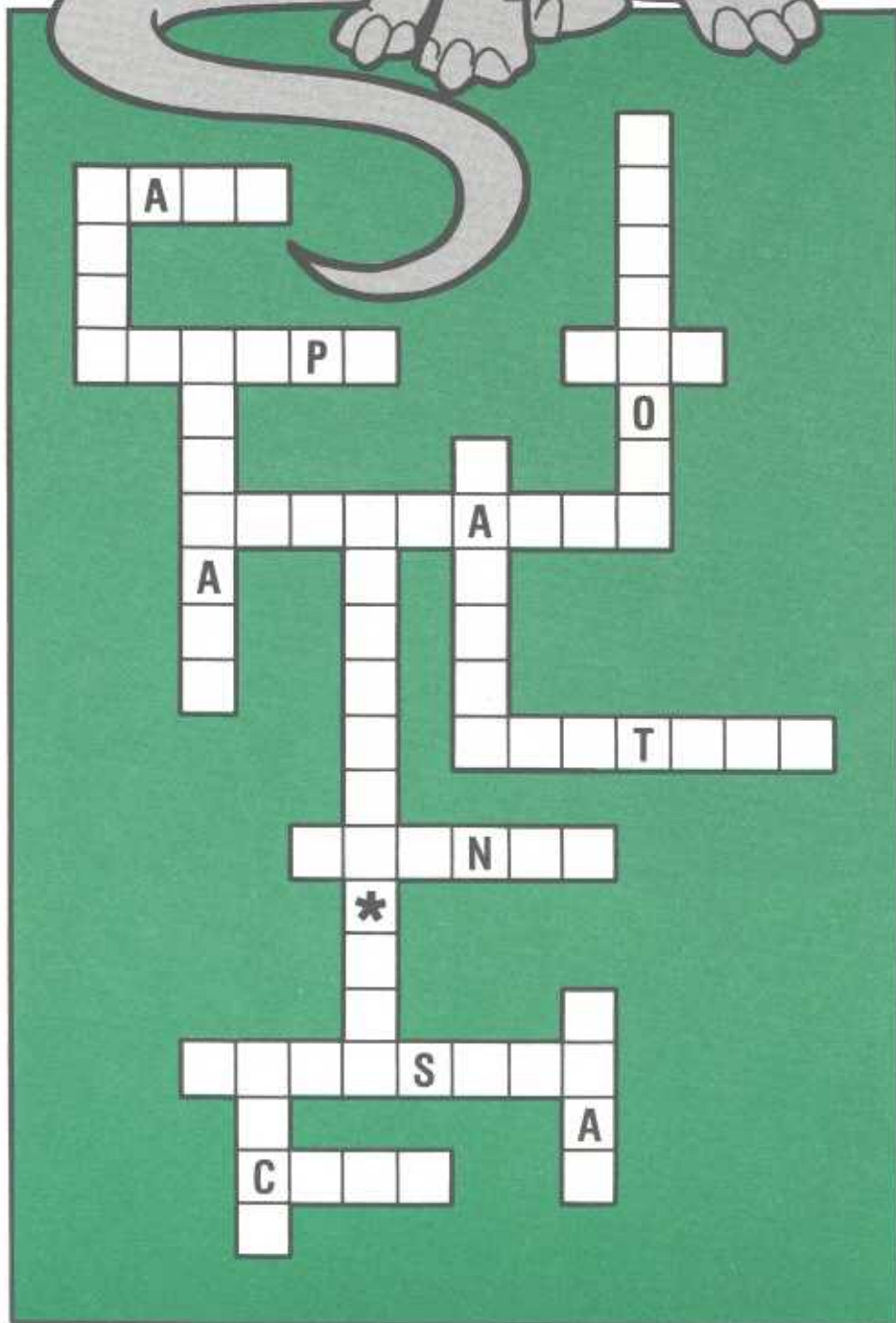
Hundreds of millions of years ago, plants and animals lived in shallow swamps and seas that covered much of the earth.

Plants and animals died and sank to the bottom of the swamps and seas. Layers of rotting plant and animal matter gradually built up.

As the earth's crust shifted with time, mountains formed and sand from the mountains washed into the swamps and seas.

Eventually, the sand became rock. The rock put tremendous pressure on the dead plant and animal matter.

Over millions of years, this pressure plus great heat from inside the earth turned the rotting plant and animal matter into coal, oil and natural gas.



Many resources are part of a **SENSITIVE NATURAL BALANCE**



Disrupting this balance can cause serious problems. To find out more, read the description on the left. Then, use the bold letters to fill in the blanks on the right.

THE PROBLEM

SOME POSSIBLE RESULTS

1

Burning fossil fuels produces many gases, including sulfur dioxide and nitrogen oxide. When these 2 gases combine with moisture in the air, they can contribute to the formation of acid rain.

When a body of water contains too much carbon, fish may die. Acid rain may damage structures, stone buildings and paint on cars over time.

2

Ozone in the upper atmosphere helps protect us from the sun's harmful rays. Certain man-made chemicals (chlorofluorocarbons) used in freezers, air conditioners and aerosol sprays can destroy the ozone.

Damage to the ozone layer could release cases of skin cancer, and harm crops and human life.

3

One of the greatest threats to wetlands is development. For example, some people want to use wetlands for building sites, for farming, or sometimes for canals.

Destroying wetlands destroys the living and breeding grounds of many forms of wildlife. It may also destroy natural flood protection and a natural water filtration system.

MEETING THE POLLUTION

CLEANER AIR

Donny, Norma and the rest of the science club toured a local power plant that uses coal to generate electricity. During their tour, they saw what people at power plants are doing to help prevent air pollution.

Read each paragraph to the right of the code. Then decode the letters to find out the name of the device or process that the kids saw.

CODE

A = J	G = Y	N = U	U = P
B = C	H = S	O = A	V = X
C = H	I = L	P = K	W = Z
D = N	J = F	Q = R	X = T
E = V	K = D	R = W	Y = M
F = Q	L = I	S = B	Z = E
M = O	T = G		

CLEANER WATER

The federal government, cities, towns, and industries are working to protect our water from contamination by poisonous chemicals, landfill waste and other sources of pollution.

The maze on the next page shows what happens at a water treatment plant. As you come to each stop, read the appropriate passage below to find out more.

- 1 These strain the water to keep out fish, large sticks, etc.
- 2 Pumps send the water to this special tank. Dirt and other matter settle to the bottom of the tank.
- 3 Chemicals are added to the tank so small particles in the water will clump together. These clumps ("floc") settle to the bottom of the tank.
- 4 This may be added to "soften" the water (remove minerals that interfere with the water's ability to clean clothes).
- 5 The dirt, floc, and other substances that settle to the bottom of the tank are called "sludge." Sludge is pumped to a "sludge lagoon" (a pond where the sludge is collected).
- 6 This may be added to the water to destroy certain harmful chemicals and bad odors, tastes and colors.
- 7 This traps fine particles and other impurities.
- 8 Here, chlorine is added to the water to destroy germs that may cause illness.
- 9 These send the clean water to your city's or town's water-supply system.

There's still a lot of work ahead, but progress is being made!

CHALLENGE

- 1** This process uses water or a solvent (a substance that can dissolve another substance) to remove sulfur from crushed coal.

B M O I R O H C L D T

- 2** These devices work like giant vacuum cleaners. Dust-filled air is drawn through the bag. The dust sticks to the bag's fabric, and clean air passes through.

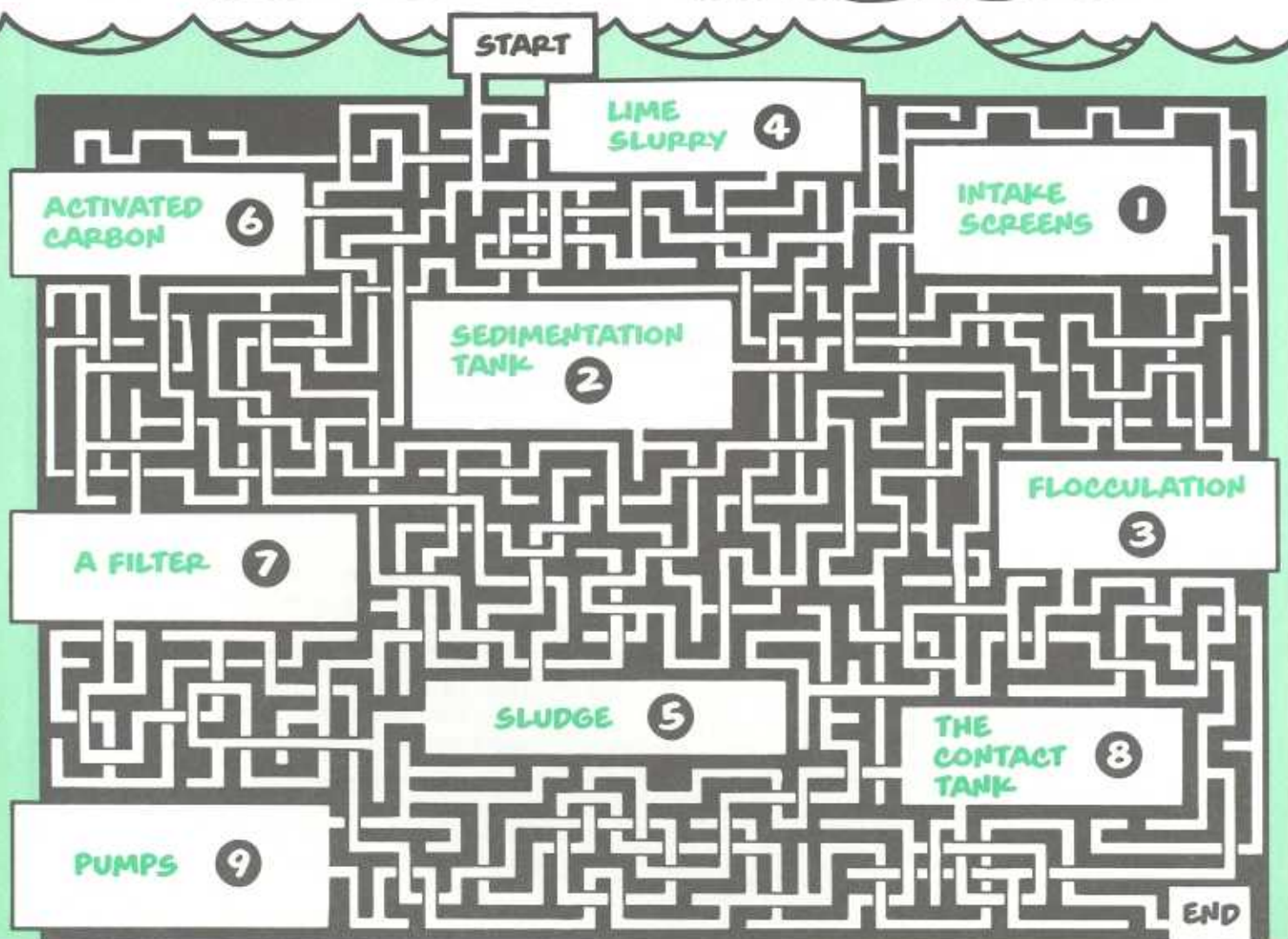
S O T C M N H Z H

- 3** These devices remove particles from air by drawing the air through an electric field. Particles are given an electric charge so they'll stick to collection plates. Later the particles are knocked loose into special bins.

U Q Z B L U L X O X M Q H

- 4** In this process, gases produced by burning coal are passed through a mixture of lime and water. This mixture captures sulfur gases so they won't escape through the smokestack.

H B Q N S S L D T



PUTTING THE LAND BACK TOGETHER



Many steps are being taken to protect another of our natural resources -- land.

For example, the coal industry is using a technique called "land reclamation" to restore land used for surface mining (sometimes called "strip mining").

To find out how surface mining and land reclamation work, correctly match the phrases below.

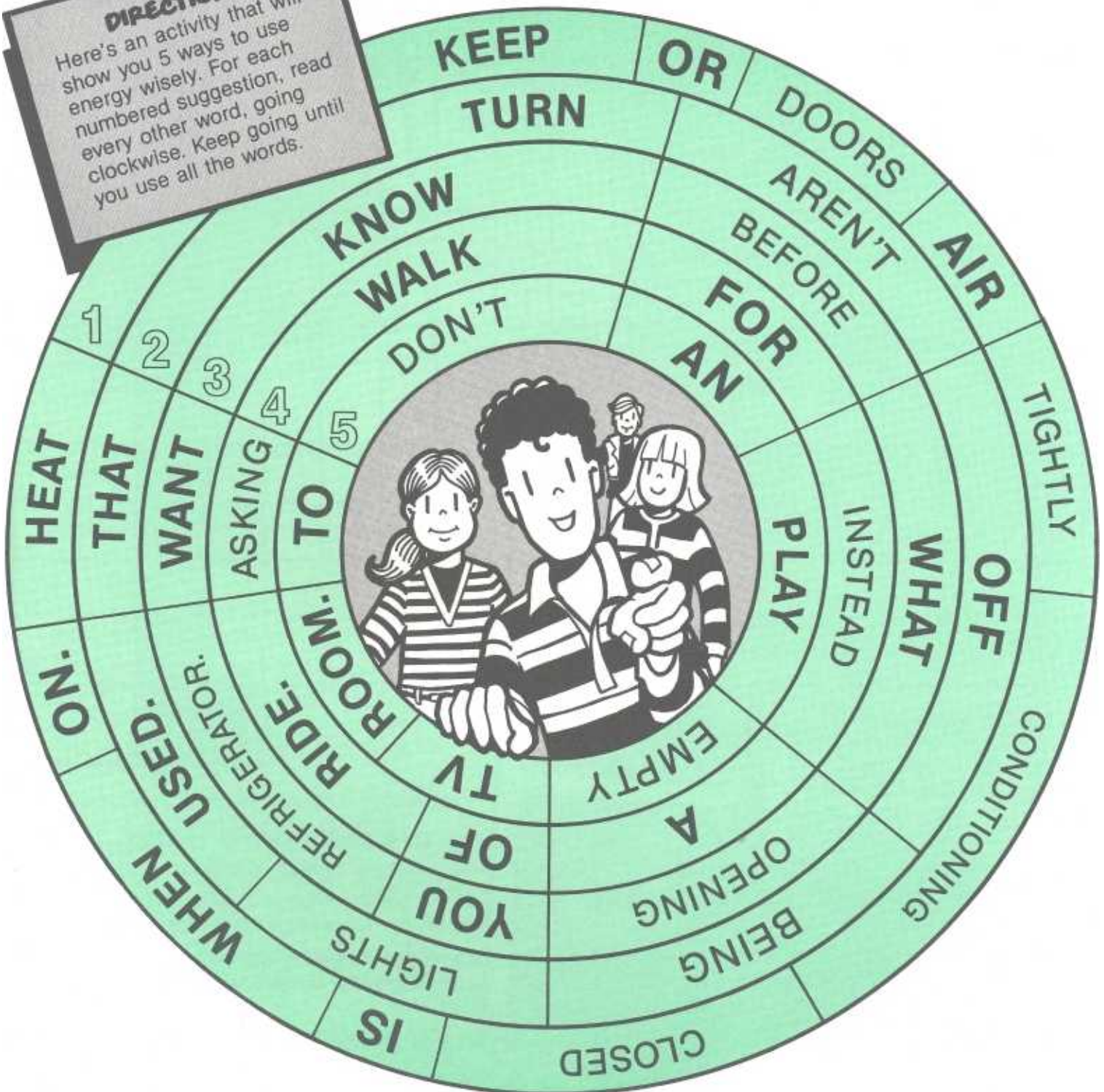
- | | | | | |
|---|--|--------------------------|---|--|
| 1 | Surface mining is used . . . | <input type="checkbox"/> | A | . . . on top of the overburden. |
| 2 | Rocks and soil above the coal ("overburden") are removed and . . . | <input type="checkbox"/> | B | . . . leaving a large hole in the ground. |
| 3 | The coal is removed, . . . | <input type="checkbox"/> | C | . . . farming, recreation or other purposes. |
| 4 | Bulldozers push piles of overburden . . . | <input type="checkbox"/> | D | . . . back into the large hole. |
| 5 | The topsoil is replaced . . . | <input type="checkbox"/> | E | . . . drainage ditches are dug, and trees and grass are planted. |
| 6 | To help protect the soil from erosion (washing away), . . . | <input type="checkbox"/> | F | . . . piled up in "spoil banks" to one side, with the topsoil carefully separated. |
| 7 | When the land is fully reclaimed, it may be used for . . . | <input type="checkbox"/> | G | . . . when coal deposits are close to the surface of the earth. |

You can be part of the
PO 1100 SO 1100

Using energy wisely is one way to fight air pollution. For example, when you save energy at home and school, you help reduce the amount of fossil fuel that the power plant must burn to produce electricity. Burning less fossil fuel means there'll be less smoke to clean at power plants -- and less chance for pollution.

DIRECTIONS:

DIRECTIONS:
Here's an activity that will show you 5 ways to use energy wisely. For each numbered suggestion, read every other word, going clockwise. Keep going until you use all the words.



MAKE EVERY DROP COUNT



Water is a resource we often take for granted. We turn on the faucet, and there it is. To make sure that we always have plenty of water, it's important that we conserve water whenever we can.

FIND OUT HOW MUCH WATER YOU USE

Use the chart below to figure out how much water you use just for personal hygiene (keeping yourself clean) each week. Then, use the water-saving tips at the bottom of the page to help conserve water.

HOW USED	APPROXIMATE AMOUNT USED*	NUMBER OF TIMES USED (Put a check mark for each use)							X	TOTAL
		S	M	T	W	T	F	S		
Taking Bath	30 gallons								x30	
Taking Shower	20 gallons for about 4 minutes								x20	
Using Toilet	4 gallons								x4	
Brushing Teeth	$\frac{1}{4}$ gallon								x $\frac{1}{4}$	
Washing hands or face	2 gallons								x2	
									WEEK'S TOTAL	

*These amounts are estimates. Water-saving shower heads, toilet tanks and faucets can reduce the amount of water used.



REMEMBER – besides the water you use for personal hygiene, your family uses water for cooking, washing dishes, doing laundry, washing the car, house-cleaning and many other purposes.

SOME TIPS FOR SAVING WATER

1. Take a shower instead of a bath – and keep your shower short!
2. Turn off the faucet while brushing your teeth.
3. Keep a jar of water in the refrigerator, so you won't have to let water run when you want a cold drink.
4. Tell a parent about any leaky faucets.
5. Wait until the dishwasher is full before running it.

USE IT, AND REUSE IT



That's what recycling is all about. Recycling is reusing materials (such as glass, aluminum, and paper) instead of throwing them away. Recycling saves resources, and it reduces the amount of trash that cities and towns must get rid of.

RECYCLE SOME PAPER

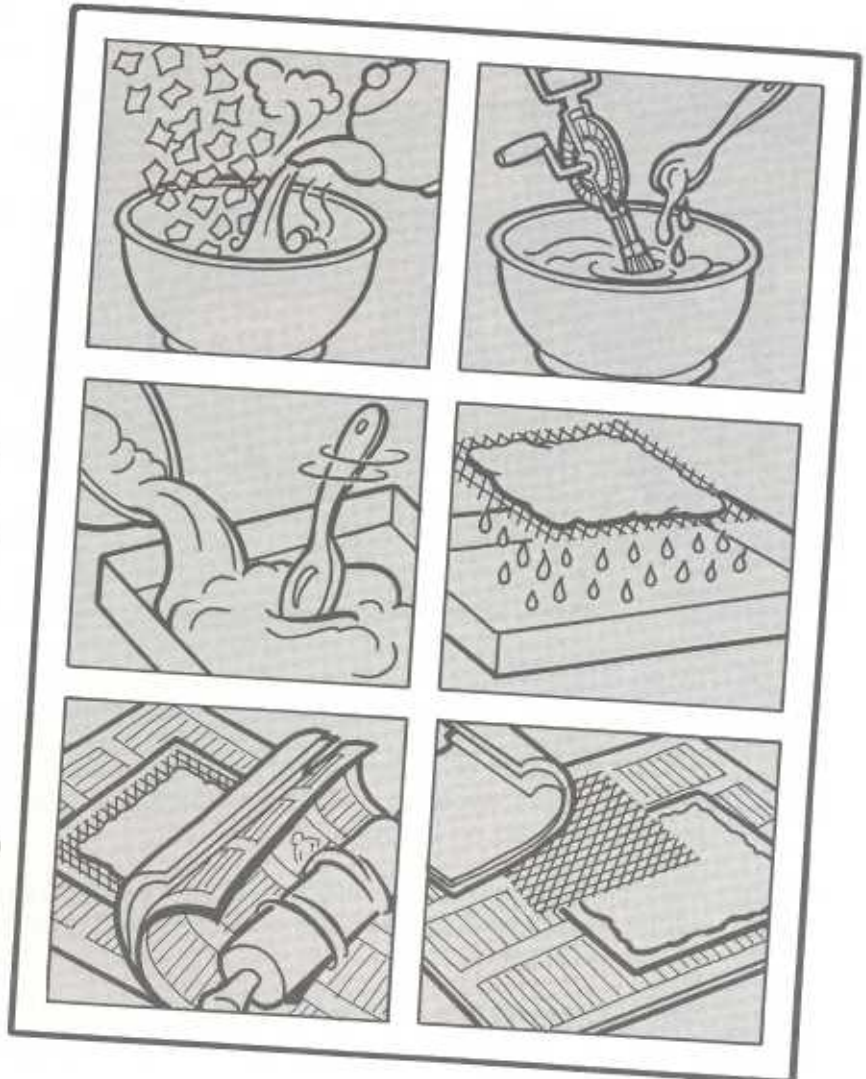
Here's a chance to make your own paper. Follow the directions carefully.

WHAT YOU NEED:

- 2-3 pieces of used paper or a sheet of newspaper
- A piece of screen (the size of the paper you want to make – 3-by-3 inches is large enough)
- A flat pan (larger than the screen)
- A bowl
- A measuring cup and teaspoon
- An eggbeater (or electric blender, if an adult is helping)
- A jar or rolling pin
- More newspaper
- 3 or more pieces of blotting paper or felt (same size as the screen)
- Hot water
- Instant starch (optional)

WHAT TO DO

1. Tear paper into tiny pieces and place in bowl.
2. Add 2 cups hot water. Beat with egg-beater (or use blender) to make "pulp."
3. Add 2 teaspoons starch (will make paper stronger).
4. Pour pulp into pan (stir well to keep fibers from settling to bottom).
5. Slide screen into pan. Move screen gently and smoothly back and forth until it's covered with pulp.
6. Lift screen out carefully. Let it drain for about a minute.
7. Lay screen, pulp side up, on a blotter (or piece of felt) that's on top of some newspaper.
8. Put another blotter and more newspaper on top of the pulp. Use jar or rolling pin to squeeze water out.
9. Remove top newspaper. Turn over what's left. Remove blotter and screen without moving pulp.
10. Place a dry blotter on the pulp. Let the pulp dry thoroughly. You've just recycled paper!



IT'S NEWS TO ME

Eddie and Sally plan to answer questions about energy and the environment in the next edition of the school newspaper. Can you match the responses at the bottom of the page with the questions they received?



1

Dear Eddie,
What's the purpose
of a catalytic
converter?

Carla



2

Dear Sally,
What are "hazardous
wastes"?

Andy



3

Dear Eddie,
What's "resource
recovery"?

Dean



4

Dear Sally,
What's "ground-water
contamination"?

Arlene



A Good question. It's separating usable items (glass, aluminum, etc.) from trash, and sending them to a recycling plant. The trash may then be used for fuel.

☐

B It's the pollution of underground water sources. Contamination may be caused by landfills, septic systems, pesticides, fertilizers, leaking underground storage tanks, chemicals used on icy roads and more.

☐

C They can be bad news! They're substances that can harm our water supply, threaten public health, and damage the environment if they're not treated, stored and disposed of properly.

☐

D Glad you asked! It's a device attached to the exhaust system of cars, trucks and other motor vehicles. It uses a chemical to help cut down on the pollutants that are released into the air.

☐

There's a lot more to taking care of the environment than I thought. But, it sure is worth it!

You bet it is! Let's review what we've learned.

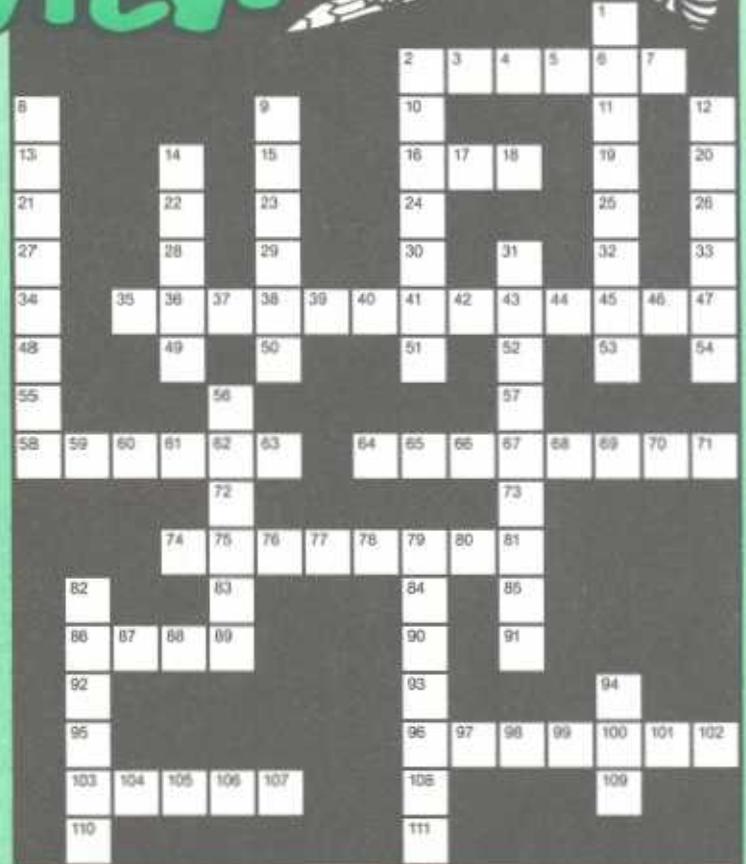
A CROSSWORD REVIEW

ACROSS

2. Using energy _____ helps reduce air pollution.
16. The source of solar energy.
35. Name of tank used in water treatment plants.
58. To help save water, take a _____ instead of a bath.
64. Added to water in treatment plant to kill disease-causing germs.
74. Where many forms of wildlife live and breed.
86. Type of rain that may damage paint on cars over time.
96. Recycling is _____ materials.
103. Protects us from the sun's harmful rays.

DOWN

1. Precipitators use an _____ field.
2. Coal _____ helps reduce air pollution.
8. It took _____ of years for fossil fuels to form.
9. Oil, coal and natural gas are _____ fuels.
12. Land reclamation repairs damage done by surface _____.
14. _____ is used to produce electricity at hydro-electric plants.
31. Work like giant vacuum cleaners to remove dust particles from air.
56. Plants and animals in our environment _____ on one another.
79. Air, land and water are _____ resources.
82. Activated _____ may be added to water to remove bad taste.
94. A catalytic converter reduces _____ pollution.



BONUS MESSAGE:

After you complete the crossword puzzle, find the box that has the same number as the one shown below each blank. Fill in the blank with the letter from the box.

42 86 1 22 90 106 86 25 17 63 108 6
49 11 32 48 93 109 64 107 4 74 100 76 24 53 10 92 75

ANSWERS

p.3 2. plants, earthworms, songbirds, hawks
3. plants, insects, mice, foxes



p.5 B. sun C. wind D. steam E. uranium
1. wind 2. sun 3. water 4. uranium
5. steam



p.7 1. water, acid, fish, statues, paint
2. increase, skin, cancer, crops, ocean
3. breeding, grounds, wildlife, flood, filtering, system

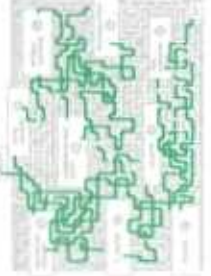
p.8 1. coal washing 2. baghouses
3. precipitators 4. scrubbing

p.10 1. g 2. f 3. b 4. d 5. a 6. e 7. c

p.11 1. Keep doors tightly closed when heat or air conditioning is on.
2. Turn off lights that aren't being used.
3. Know what you want before opening refrigerator.
4. Walk instead of asking for a ride.
5. Don't play TV to an empty room.

p.14 A. 3 B. 4 C. 2 D. 1

p.15 Bonus message: Treat natural resources with care.



Soo---

OUR ENVIRONMENT
IS FILLED WITH MANY
PRECIOUS NATURAL RESOURCES

It's up to us to:

- ✓ **USE**
our resources
wisely
- ✓ **DO ALL WE CAN**
to protect our
environment.



Put some of
your energy into
taking care of
the environment!



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