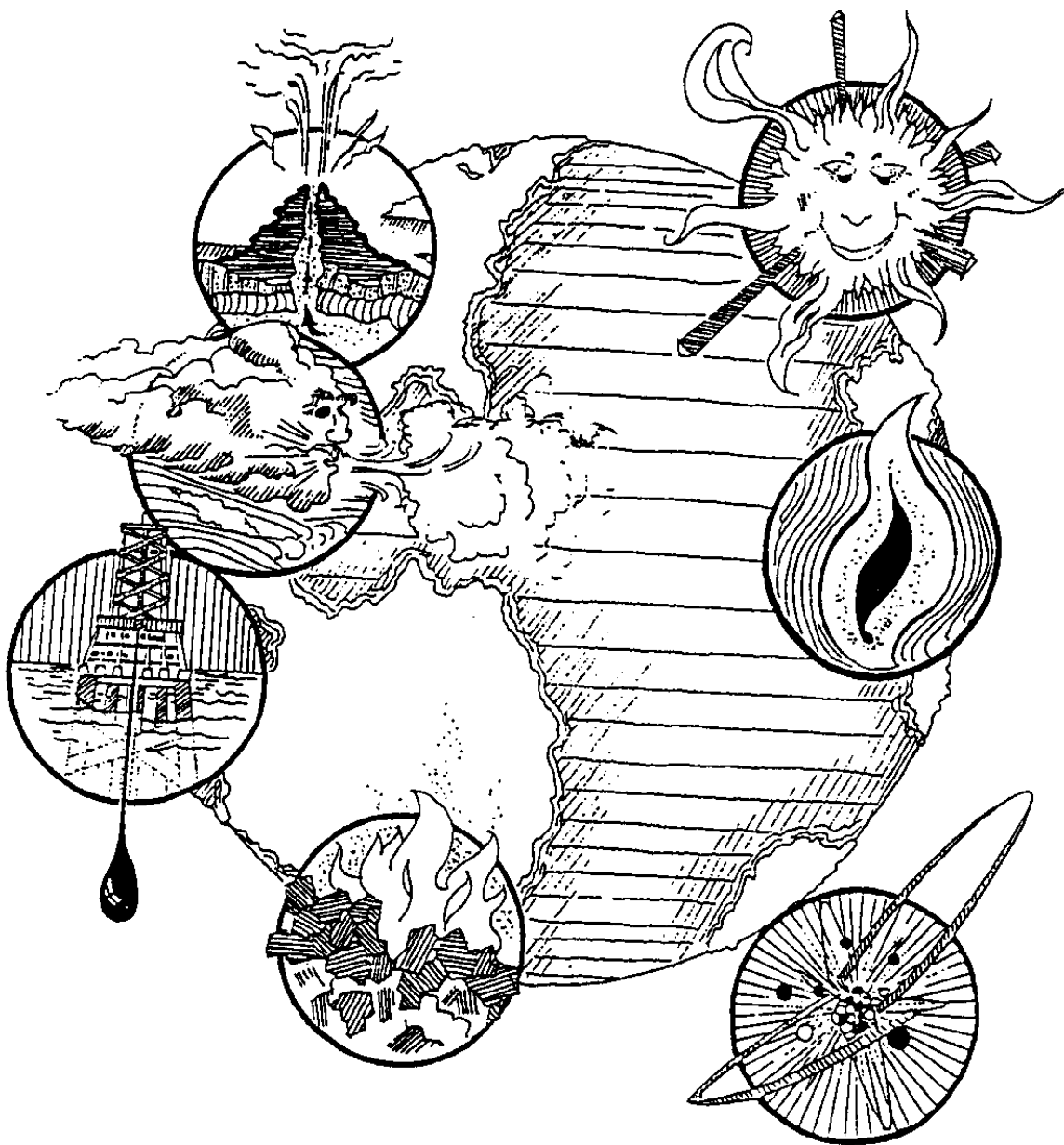


ENERGY ENCOUNTERS



**4-H ENERGY PROGRAM
WORKBOOK**

**Our
Natural
World**

ENERGY ENCOUNTERS

Youth will begin to develop a personal environmental ethic and understand each person's individual impact on energy's consumption and availability.

Energy commands a priority within environmental education. Knowledge about energy origins, uses, and conservation issues and their affect on the natural environment cannot be ignored now or in the future.

SPECIAL THANKS...



The Florida Energy Extension Service receives funding from the Florida Energy Office, Department of Community Affairs and is operated by the University of Florida's Institute of Food and Agricultural Sciences through the Cooperative Extension Service. The information contained herein is the product of the Florida Energy Extension Service and does not necessarily reflect the views of the Florida Energy Office.

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ACKNOWLEDGEMENTS...

The following program was pilot-tested in Levy and Santa Rosa Counties.

RESOURCES..

Energy Encounters includes materials adapted from:

E Cubes, University of Florida, IFAS
Energy Bridges, Florida Middle School Energy Project
Energy Fact Sheets, National Energy Education Development Project
Energy Safari, Hillsborough County Extension
Harness Atom, U.S. Department of Energy
That Mysterious Source..The Sun, Palm Beach County Extension
Watt Watchers 4-H Energy Series, University of Florida, IFAS

ENERGY SOURCES: WHERE OUR ENERGY COMES FROM

Energy sources can be classified as renewable or nonrenewable resources.

Renewable resources are inexhaustible if managed correctly. Renewable sources of energy include: geothermal energy, steam from within the earth; hydropower, energy from the force of moving water; solar energy, energy created by the sun; wind power, energy of air in motion; and biomass, organic materials, such as plants, wood, and animal wastes, burned for energy.

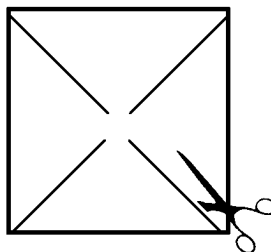
Nonrenewable resources are limited and will be depleted with continuous use. Nonrenewable sources of energy include: coal, carbon-rich deposits from the remains of 100 - 400 million year-old plants; natural gas, fossil fuels formed over millions of years from plants and tiny marine organisms; petroleum, rock remains of tiny sea plants and animals millions of years old; and nuclear power, energy from nuclear fission of uranium atoms.

DIRECTIONS: Circle the sources of energy in the picture.

POWER PINWHEELS

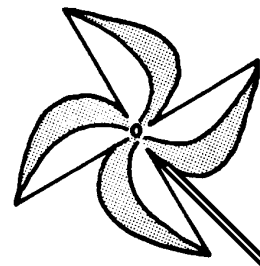
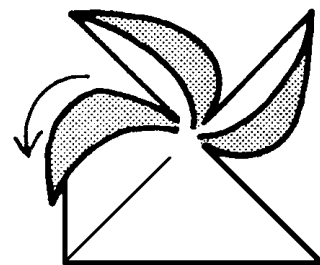
YOU NEED:

one sheet of heavy paper
scissors
thumbtack
stick (pencil)



BUILD YOUR PINWHEEL

- ◆ Cut paper into a square.
- ◆ Mark center of the paper.
- ◆ Cut lines diagonal from corner to within 1 inch of the center.
- ◆ You may wish to design your pinwheel with a variation of lines and colors.
- ◆ Fold alternate corners to the center of paper and thumbtack the corners together in the center to the stick.
- ◆ Blow on the pinwheel. Watch the blades turn. Notice that the more forceful the air movement, the faster the pinwheel turns.
- ◆ Hold the pinwheel in a breeze. Observe the speed of the rotation at different locations.



WHAT MIGHT WINDMILLS BE USED FOR? _____

WHERE MIGHT YOU FIND WINDMILLS? _____

ENERGY SOURCES WORDSEARCH

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

FIND THE HIDDEN WORDS/FROM THOSE LISTED BELOW

ENERGY SOURCES:

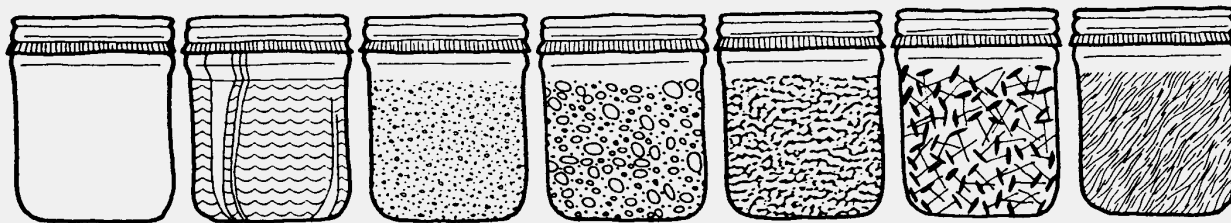
NON-RENEWABLE

GASOLINE
COAL
OIL
NATURAL GAS
PETROLEUM
OIL SHALE
NUCLEAR

RENEWABLE

WIND
WATER POWER
SUN
SOLAR
WOOD
TIDES

STORING THE SUN'S ENERGY



MATERIALS:

- ◆ 7 glass jars with lids
- ◆ Gravel, Nails, Sand, Salt, Water, Shredded Paper

DO THE EXPERIMENT:

1. Fill each jar 1/2 full with materials, put lid on.
2. Place in sunlight for 1 hour.
3. Rank coolest to hottest by touch or thermometer.
4. Remove jars from sunlight. Record coolest and hottest at 1 hour, 2 hours, 3 hours, next day.

Which material was the hottest after 1 hour in the direct sun?

1 hour? _____
2 hours? _____
3 hours? _____
The next morning? _____

Which material was the hottest after cooling for:

1 hour? _____
2 hours? _____
3 hours? _____
The next morning? _____

Which material stores heat energy the best? _____

Solar collectors are used to collect the sun's energy for home heat. What materials do you think are used to store solar heat?

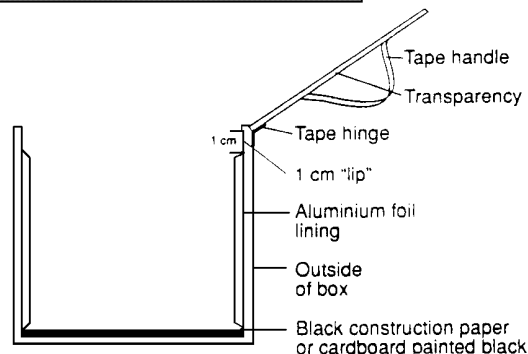
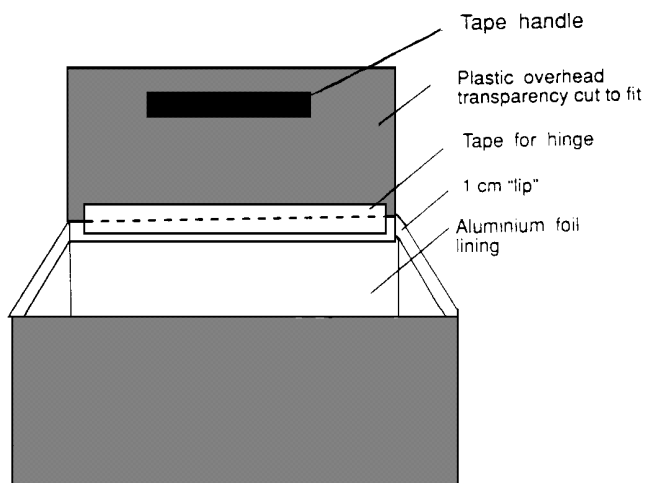
Why must heat energy be stored? _____

SHOE BOX COOKERS

YOU NEED: Shoe box, foam produce trays, sheet of transparency paper, sticks, black paint or black paper, glue, tape, aluminum foil, glass or plastic containers for food, food, plastic wrap

MAKE A SOLAR OVEN

- ◆ Paint or cover the box black.
- ◆ Line the bottom and sides of the box with one layer of foam. Stop 1 cm from top edge so the transparency sits in the box. Glue foam in place.
- ◆ Line the sides and bottom of the box with aluminum foil.
- ◆ Line the lid of the box with aluminum foil.
- ◆ Cut the transparency paper to fit the top of the box closely. Using masking tape, tape one long side down. Use a folded piece of tape to make a handle as in the diagram.
- ◆ Make sure the food container will fit with the transparency lid closed.



- ◆ Cut black construction paper to fit on the bottom and the sides of the food container.

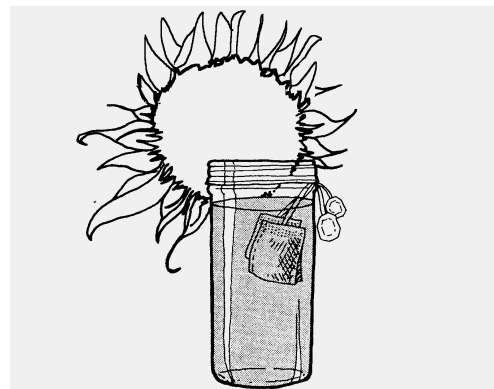
USE YOUR SHOE BOX COOKER

- ◆ Place the shoe box cooker in a sunny location so the sun shines directly into the box. Adjust the lid to reflect light into the box using sticks to prop it in place.
- ◆ Preheat for 15 minutes. Check the temperature if a thermometer is available.
- ◆ Put the container with the food inside. Make sure the food is covered with a plastic wrap. Close the lid. Tape it shut. Be patient!
- ◆ When the estimated cooking time is up, carefully open the lid, remove the hot cookware with tongs or potholders and sample the food. If the food is not yet done, cook it a bit longer. Be patient!

TEA TIME

MATERIALS:

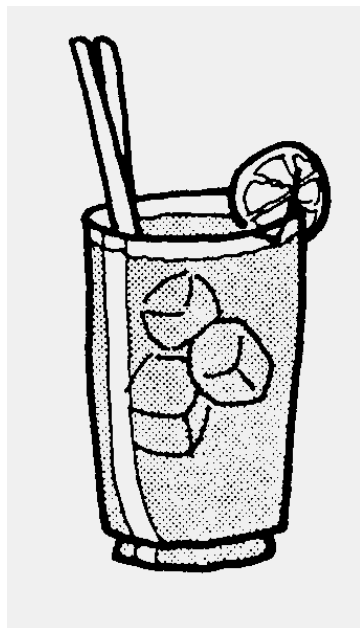
- ◆ Clear glass jar with lid
- ◆ 1 regular-size tea bag per two cups of water
- ◆ Thermometer



TEATIME

1. Fill your jar with cold tap water and put in tea bags. A quart jar will need 2 tea bags. A gallon jar will need 8 tea bags.
2. Screw the lid tightly on the jar and place in a sunny location for 4 hours. Be careful not to let a tree or building shade the jar.
3. Check the water temperature five times as the tea brews and record on the chart.

	TEMPERATURE
At Start	
After 1 Hour	
After 2 Hours	
After 3 Hours	
After 4 Hours	



How hot did the tea get after four hours? _____

Did the sun provide that heat? _____

If yes, how did it do that? _____

Can we save fossil fuels when we let the sun brew the tea?

What time of year (season) would the sun brew the tea the fastest? _____

Why? _____

READ THESE METERS

The image shows five analog clocks arranged horizontally. Each clock has a black frame and a white face with black numbers 1 through 12. The hands are black. The sequence of times shown is as follows:

- Clock 1: 9:00 (Hour hand at 9, Minute hand at 12)
- Clock 2: 9:15 (Hour hand slightly past 9, Minute hand at 3)
- Clock 3: 9:30 (Hour hand between 9 and 10, Minute hand at 6)
- Clock 4: 9:45 (Hour hand closer to 10, Minute hand at 9)
- Clock 5: 10:00 (Hour hand at 10, Minute hand at 12)

7

HOW DID WE DO IT?

Directions: Ask your parents or grandparents how they did the following:

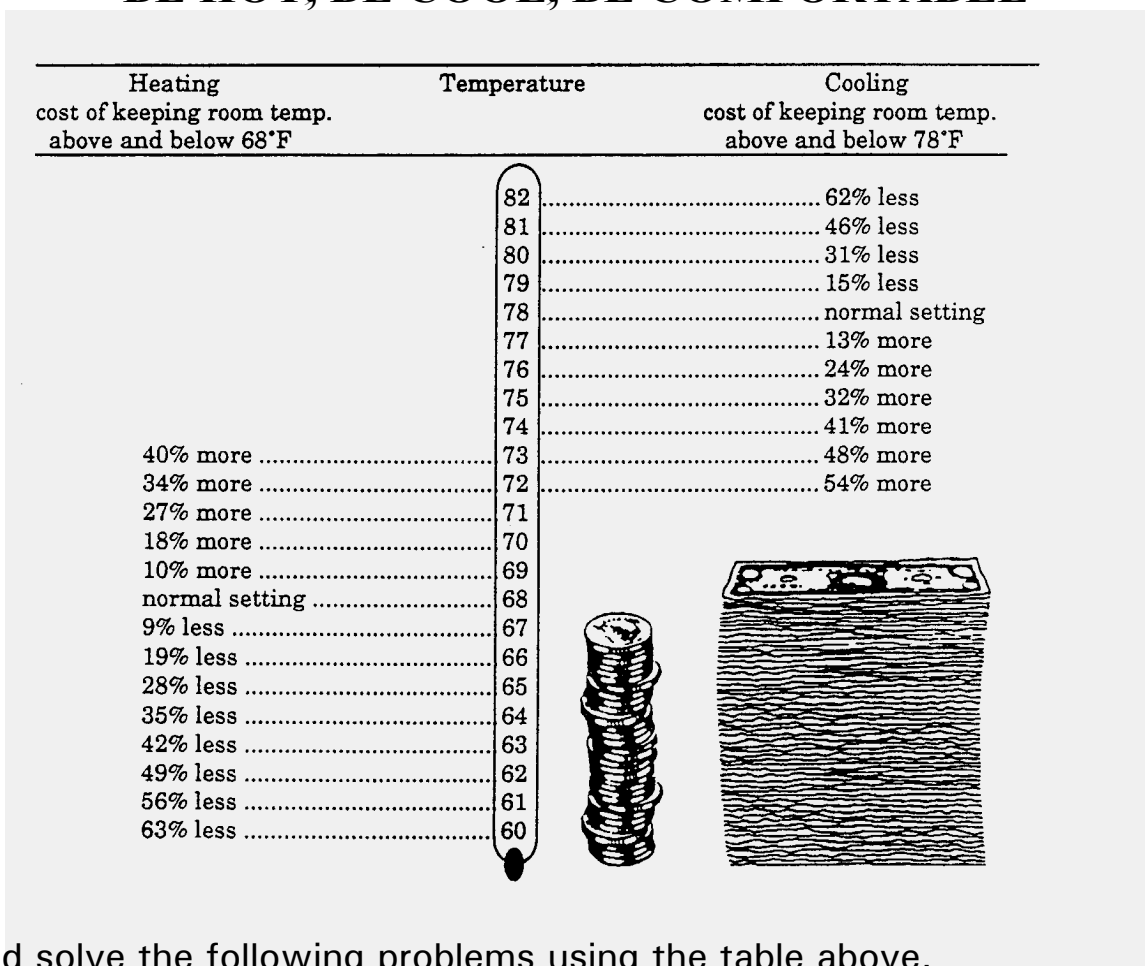
<u>Duties/activities</u>	<u>Methods used before electricity</u>	<u>Method used after electricity</u>
Cooking food	_____	Electric range
Heating water	_____	Water heater
Storing food	_____	Refrigerator/freezer
Washing clothes	_____	Electric clothes washer
Drying clothes	_____	Electric clothes dryer
Ironing clothes	_____	Electric iron
Cleaning house	_____	Vacuum cleaner
Hair drying	_____	Electric hair dryer
Heating	_____	Electric heating system
Cooling	_____	Air conditioner/electric fan
Entertainment	_____	Television/radio/stereo
Hair curling/styling	_____	Electric curler/curling iron
Lighting	_____	Electric light bulb
Getting water	_____	Running water, electric pump
Brushing teeth	_____	Electric tooth brush
Carving turkey	_____	Electric carving knife
Popping popcorn	_____	Microwave Popcorn
Garbage disposal	_____	Electric grinder in sink

HOW TO SET YOUR ENERGY BUDGET

DIRECTIONS: CHECK THE ENERGY PRODUCTS YOUR FAMILY USES AND ADD UP THE TOTAL MONTHLY COST

ELECTRIC PRODUCT	EST. KWH USED MONTHLY*	MONTHLY OPERATING COST		ELECTRIC PRODUCT	EST. KWH USED MONTHLY*	MONTHLY OPERATING COST	
Blender	.1	\$.007	_____	Refrigerator (12 cu. ft.)	52	\$ 3.64	_____
Clock	7	\$.07	_____	Refrigerator (frostless, 12 cu. ft.)	90	\$ 6.30	_____
Clothes dryer, 1 Load/Day	90	\$ 6.30	_____	Refrigerator/Freezer (17 cu. ft.)	79	\$ 5.53	_____
Coffee Maker	7	\$.49	_____	Refrigerator/Freezer (frostless, 17 cu. ft.)	152	\$ 10.64	_____
Curling Iron	.3	\$.02	_____	Roaster	5	\$.35	_____
Dishwasher, 1 Load/Day	30	\$ 2.10	_____	Sewing Machine	1	\$.07	_____
Electric Blanket	9	\$.63	_____	Shaver	.05	\$.003	_____
Freezer (15 cu. ft.)	99	\$ 6.93	_____	Television (black & white) (6 hrs./day)	29	\$ 2.03	_____
Freezer (frostless, 15 cu. ft.)	160	\$ 11.20	_____	Television (color) (6 hrs./day)	54	\$ 3.78	_____
Frying Pan	8	\$.56	_____	Toaster	3	\$.21	_____
Hair Dryer	4	\$.28	_____	Trash Compactor	4	\$.28	_____
Heating Pad	.3	\$.021	_____	Vacuum Cleaner	4	\$.28	_____
Iron (hand)	5	\$.35	_____	Washing Machine, 1 Load/Day	9	\$.63	_____
Total Lighting	95	\$ 6.65	_____	Garbage Disposal	3	\$.21	_____
Microwave Oven	19	\$ 1.33	_____	Water Heating (bathing, clothes washing, dish washing, misc.)	470	\$ 32.90	_____
Mixer	.2	\$.014	_____				
Radio (3 hrs./day)	7	\$.49	_____				
Radio/Record Player (3 hrs./day)	11	\$.77	_____				
Range with Oven	85	\$ 5.95	_____	Total KWH USE _____			
Range with Self-Cleaning Oven	59	\$ 4.13	_____	Total MONTHLY COST \$ _____			

BE HOT, BE COOL, BE COMFORTABLE



Read and solve the following problems using the table above.

- a. Bill's family's power bill was \$160 last August. Bill's mom remembered the house had been air conditioned all month and estimated that 40% of the bill was just for the AC. What was the estimated cost for running the AC?

$$\$160 \times 0.40 = \$ \underline{\hspace{2cm}}$$

The thermostat was set at 75 degrees. How much would the family have saved if the thermostat had been set at 78 degrees?

$$\text{answer to first part} \times 0.32 = \$ \underline{\hspace{2cm}}$$

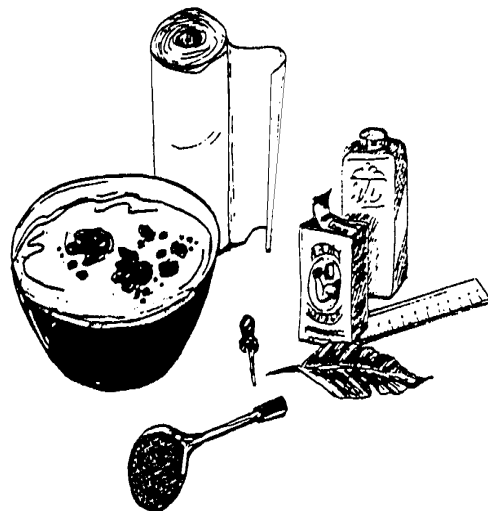
- b. January and February are the two coolest months in Florida. Tina's family had company and they kept the heat set at 72 degrees for weeks! The power bill for January was \$120 and for February it was \$86. If 55% of the power went for heating the house, how much did it cost to heat Tina's house for the two months?

a) $(\$120 + \$86) \times 0.55 = \$ \underline{\hspace{2cm}}$

b) What about the savings part? $\underline{\hspace{2cm}}$

OIL SPILL EXPERIMENT

- ◆ Fill a large pan with water.
- ◆ Add a few drops of food coloring to the water and stir.
- ◆ Add a small amount of dirty oil.
- ◆ Place a feather and/or fake animal fur in oily water. Take out and observe.



- ◆ Use different materials to try to clean up the oil. Measure the time each effort takes.
 1. Use a paper towel.
 2. Use a medicine dropper.
 3. Try moving the oil to side with a ruler and scooping it up.
 4. Use baking soda.
 5. Use talcum powder.
 6. Use other materials that you think might clean up the oil.
 7. Very carefully place cat litter on the oil. Allow time for the cat litter to soak up the oil.
- ◆ Collect the cat litter with a strainer or net and properly discard.

WHAT HAPPENED? _____

WHAT HAPPENED TO THE FEATHER? _____

WHAT WOULD AN OIL SPILL DO TO FLORIDA'S COASTS? _____

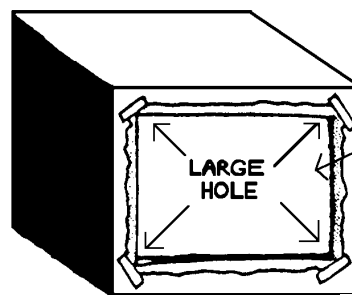
HOW MUCH HOTTER WILL IT GET?

YOU WILL NEED:

3 cardboard boxes about the same size
white paint or paper
thermometers
plastic wrap, tape

BUILD IT

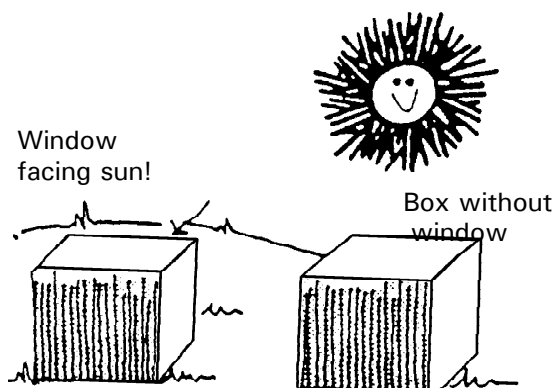
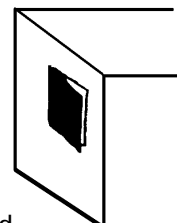
- ◆ Cut a large hole in 1 side of 2 of the boxes and cover them with plastic wrap. Tape it tightly all the way around.
- ◆ Paint all three boxes white, or cover them both with white paper. Cut a small hole in the third box so the thermometer can be read.
(Tip: Cut a little door in the 2nd box so you can read the thermometer.)
- ◆ Place a thermometer in each box and put them in the sun. Place one of the boxes with the large whole facing the sun. (Note the direction the box is facing). Place the second box with the large opening facing south.
- ◆ Record the temperatures after 10 minutes, 20 minutes, and 30 minutes. What do you find?
- ◆ Try this experiment at different times during the day.



Cut a large hole in 1 side of box and cover it with plastic wrap - Tape tightly all the way around.

Cover box with white paper or paint it white.

(Tip: Cut a little door in the 2nd box so you can read the thermometer.)



Place thermometers in both boxes!

WHICH BOX GOT HOTTER? _____

DID THE TIME OF DAY AFFECT THE TEMPERATURE? HOW? _____

WHAT DIFFERENCE DID THE DIRECTION OF THE BOX MAKE ON THE TEMPERATURE? _____

WHAT IMPACT DO WINDOWS ON THE SOUTH SIDE OF A HOUSE HAVE ON YOUR SUMMER COOLING BILLS? WINTER HEATING BILL? _____

WHAT DO YOU WANT TO PLANT ON THE SOUTHSIDE OF YOUR HOUSE? WHY? _____

4-H ENERGY ENCOUNTERS

SOLVE THE CROSSWORD PUZZLE

WORD LIST:

Atom

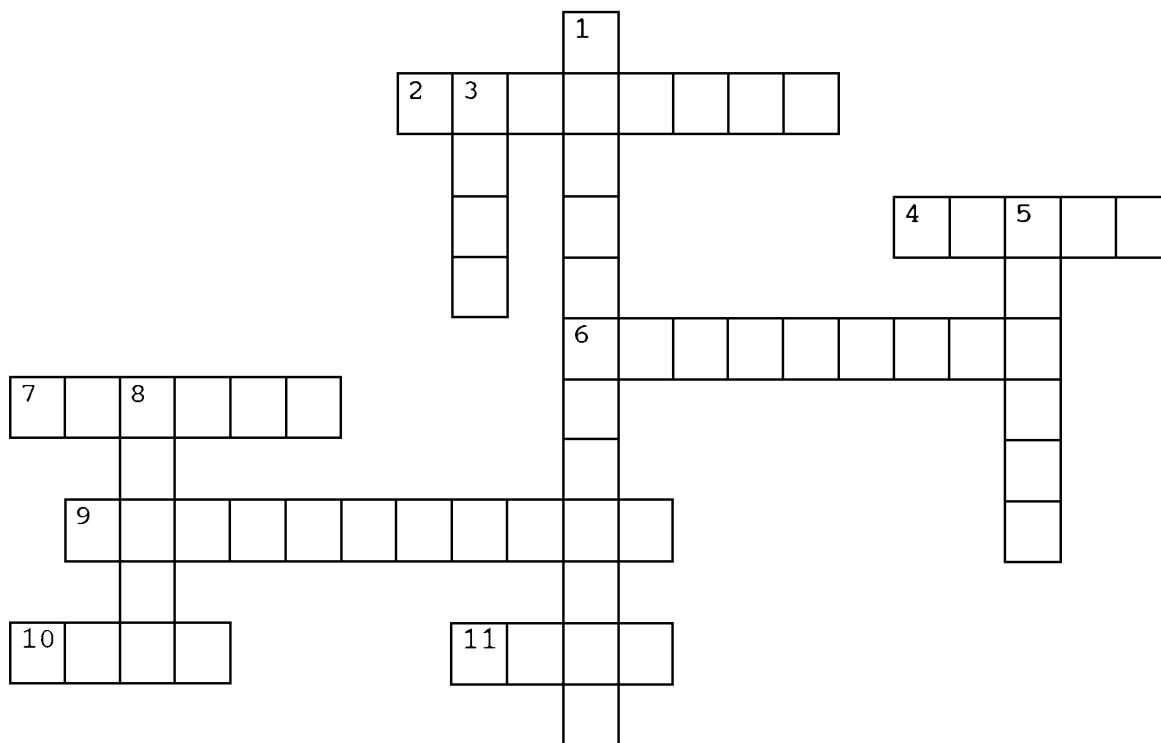
Conversation

Electricity

Energy
Gasoline

Food
Renewable
Work

Fossil
Steam
Solar



ACROSS

2. Fuel for our automobiles. _____
4. When water boils, _____ is released to do work for us.
6. Sun, wind, wood, and water are all forms of _____ energy.
7. Coal, natural gas, and oil are called _____ fuels.
9. Energy used in our homes is in the form of _____.
10. Running, jumping, walking are what? _____.
11. People fuel. _____

DOWN

1. Practice _____ to save energy.
3. Nuclear Energy is energy released when an _____ is split.
5. _____ is the ability to do work.
8. Energy from the sun. _____

University of Florida Cooperative Extension
ENVIRONMENT, Activity #6

4-H Club Motto

"To make the best better"

Name

4-H Pledge

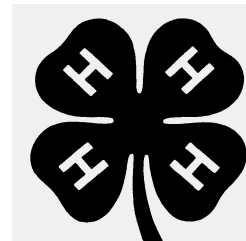
I Pledge:
My head to clearer thinking
My heart to greater loyalty
My hands to larger service, and
My health to better living
for my club, my community,
my country, and my world.

Address

Name of Club/School

Leader/Teacher's Name

**4-H Colors
Green and White**



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Authors: Linda Barber, 4-H Agent-Santa Rosa County, Marilyn Simmons, 4-H/Home Economics Agent-Levy County, Craig R. Miller, Educational Materials Coordinator, Department of 4-H and Other Youth Programs, University of Florida Institute of Food and Agricultural Sciences.

Artists: Bennie Brasington

Cover Design: Bennie Brasington

Word Processing & Computer Graphics: Jeneen Drake, Connette Williams, Nancy Stuart, Angela Frampton, Trey Killingsworth, Department of 4-H and Other Youth Programs.

Technical review and assistance was provided by the following members of the Cooperative Extension Service Environmental Education - Energy Design Team (FL610): Nancy P. Army, Associate Professor and Extension Specialist, Department of Forestry, University of Florida, Institute of Food and Agricultural Sciences, M. Joy Cantrell, Associate Professor and 4-H Youth Development Curriculum Specialist, Department of 4-H and Other Youth Programs, University of Florida Institute of Food and Agricultural Sciences, Paula Donaldson, Florida Energy Office, Vicki Mullins, Teacher-Santa Rosa County, Sylvia Scheck, Project Assistant-Levy County, Helen Whiffen, Energy Extension Specialist-University of Florida, Institute of Food and Agricultural Sciences, and Deborah J. Glauer, Educational Resource Coordinator, Department of 4-H and Other Youth Programs, University of Florida, Institute of Food and Agricultural Sciences.



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