

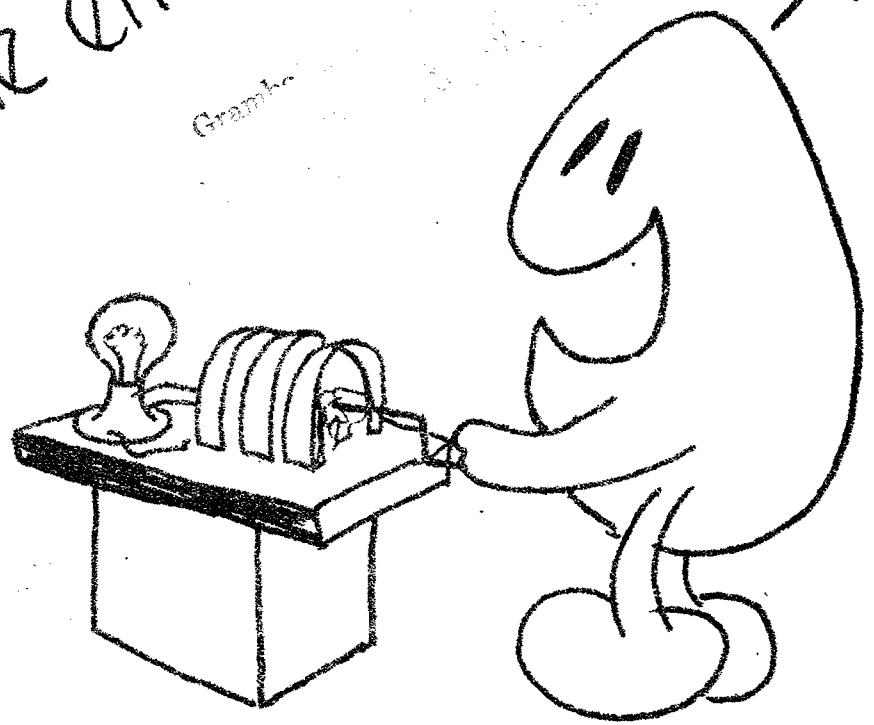
energy

and the environment

Grambo



G. Grambo



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The Louis Armstrong Middle School

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ENERGY AND THE ENVIRONMENT

GRADE 6

As part of the sixth grade environmental science curriculum, students will learn about energy and how it affects their environment. Experiments in this unit should be copied and placed in marked folders in a box. Allow students to get new sheets as needed. Students can be grouped in 2, 3, 4, 5, or 6 students. Each group of students should receive a box of equipment with a materials list, and a sheet which allows one child to be in charge of the box for the day. This sheet should also be signed by the student in charge that day. You may also wish to have the students use a log book. In a log book students write down what they did each day. The log book also gives the students a place to keep their experiment sheets. There is also a grading sheet included in this unit. You can put it in your marking book or hang it up. Hanging up the grading sheet allows students to check off what have done. Student work should be graded and handed back so that they will not make mistakes on future experiment sheets.

Gregory Grambo
The Louis Armstrong Middle
School

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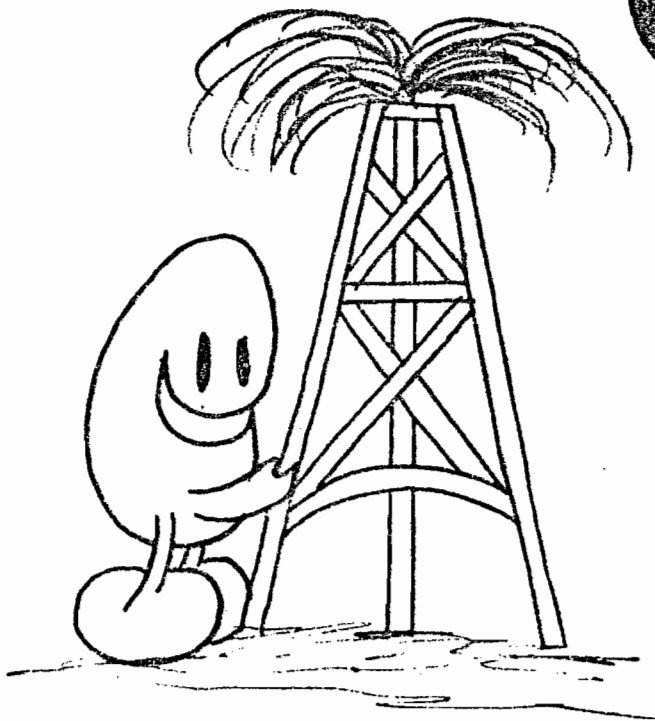
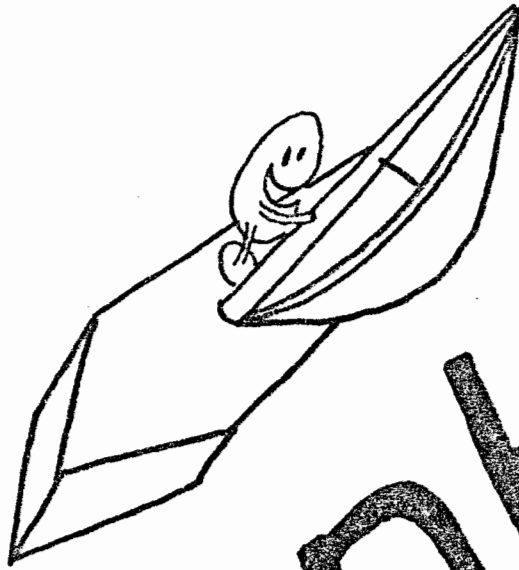
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Chapter one



What is energy?

experiment

1

Begin With -

This Sheet , hand Generator, Light bulb

Q- What do you think of when you hear the word energy?

Q- Look in a dictionary
Define ENERGY-



Q- How do you know when a light bulb is on?

Q- How could a blind person tell if the bulb were on?

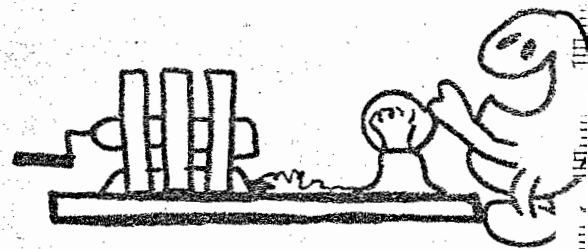
Q- How can you tell when there is an ambulance or fire truck behind you?

Light, heat and sound are all forms of energy. Energy can take on many forms and can change from one form to another. Light changing to heat and electricity changing to light are two examples of energy changing form.

Q- How can you make a light bulb go on?

Q- Where did the energy (to light the bulb) come from?

Q- Look at the hand generator in front of the room. Describe how energy changes form in the hand generator.



Homework

- 1- What is energy? what can it do?
- 2- What are 3 different kinds of energy?
- 3- Prove energy can change form.

What is mechanical or muscular energy? experiment 2

Begin With-

Activity Sheet (this Sheet), your hand

Q- After a ball game, why do your muscles ache (or hurt)?

Q- How does doing WORK affect your muscles?

Q- How do you know this?

Q- How can we make sure that doing work will make your muscles get tired?

Make a fist with your Right hand. Open fist and spread fingers out. Close fist, then open, then close. Do this over & over for 30

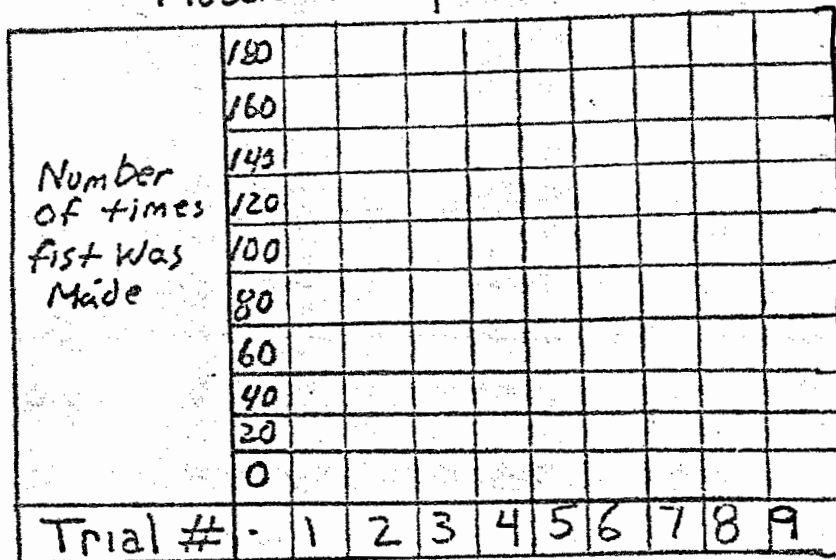
seconds. Rest 30 seconds and do it again (trial 2). Rest 30 seconds and do it again (trial 3).

times fist open
and close

Trial 1	
Trial 2	
Trial 3	
Trial 4	
Trial 5	
Trial 6	
Trial 7	
Trial 8	
Trial 9	

Table No 1

Muscle-Fatigue Test Graph.



Plot numbers on graph and then connect dots.

Homework

Q- Why did your hand slow down?

Q- Where does your body get the energy it needs?

Q- How did doing work make your hand get tired?

What is a fossil fuel?

experiment 3

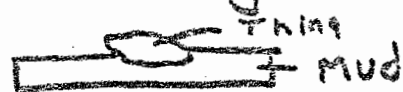
Begin With -
Milk container, Plaster, Clay, shells, leaves, Fossil

Examine fossil

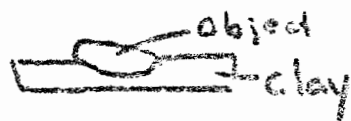
- How do you think the picture got onto the fossil?



Millions of years ago things fell into wet mud. The mud hardened and the things got stuck in the mud.



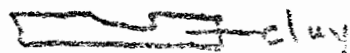
Put clay into the bottom of the milk container. Press shells, leaves, or other objects into the clay.



- The things disappeared and rotted leaving a hole in the mud.



Remove items from clay leaving holes and marks in the clay.



8. More mud filled up into the holes and hardened

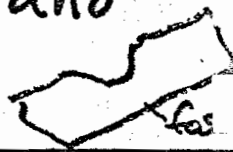


Call me when you are ready. I will pour wet plaster into your milk container.

Q- What does the wet plaster stand for?



9. When we dig into the ground we find these marks left by ancient animals and plants



When the plaster is hard, remove it from the container. Separate clay & plaster. You have a fossil.

Q- How do plants use the sun's energy?

Q- How has the sun's energy been stored in coal?

Q- How can we unlock the sun's energy from coal, oil or gas?

Begin With-

Oil, Coal, Magnifier, Drawing Paper, crayons, eye dropper, glass plate, other rocks

Examine Coal and Oil

Q- How are these two things different?

Q - How are the coal and oil samples different from the gas I can use to light my burner or your stove at home?

Q - How do the samples feel?

Q- How can we find out if they are soft or hard?

Q- Is coal the hardest thing you can think of? How do you know? How can you find out?

Q - Try to write with a piece of coal. Why does this happen?

Q - Tell me 3 things about each fossil fuel -

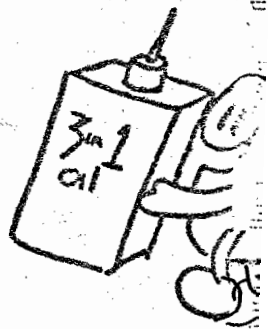
Q - Draw a picture of each.

Use the Drawing paper and Crayons

Q - Where in your house do you use oil?

Q - How is it different from "3 in 1" oil used for machines?

look at a drop of each & compare them.



Q - How are the fossil fuels different from the plants and animals they are made of?

look at the objects in the front of the room. All objects are made from oil

Q - How do you use these objects?

How can the wind
move things?

Name _____
Class _____ Group No _____

Experiment 5

Begin With -

One Plastic Lake, 2 wood boats - one with a small sail, one with a large sail, cardboard fan, ruler, one boat without sails



Q- Before engines were put on boats, how did a boat move?

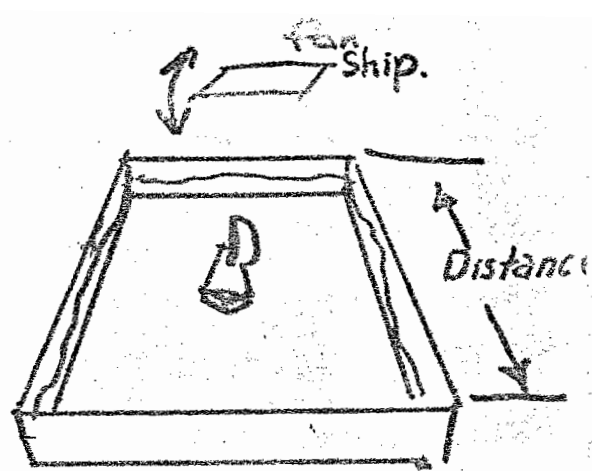
Q- What made Columbus' boats move? How can we find out?

Q- Put Boat without sail into water and blow on it. Why doesn't it move? How can we make it move?

Q- look at the Niña and the Piñta. Which will move across the lake faster? Why do you say this?

How can we prove it?

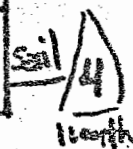
Ship	Time	Distance
Niña		
Piñta		



Q- Which ship moved faster? Why?

Q- What was different about the ships?

	Boat			Sail	
	Length	width	thickness	Height	length
Niña					
Piñta					



Q- What causes one ship to move faster?

Q- How did the ships use the wind's energy?

Q- What other ways can we use the wind as a source of energy?

Homework

1- When will the wind not be a good source of energy?

2- Name another source of energy?

Stop

How can the wind be used as an energy source?

experiment 6

Begin with-

Hand Generator (To share with all groups), Savonius Rotor, Helix Rotor, Windmill, wind source

Q- Turn handle on Generator. Why does it light the bulb?

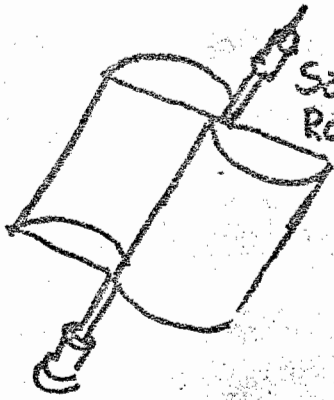
Q- How can we use the wind to turn the turbine in the Generator?

Q- We have three different windmills. How can we find out which will turn with the least wind?

Q- Why would we want to find out this kind of information?

Q- Why are windmills important?

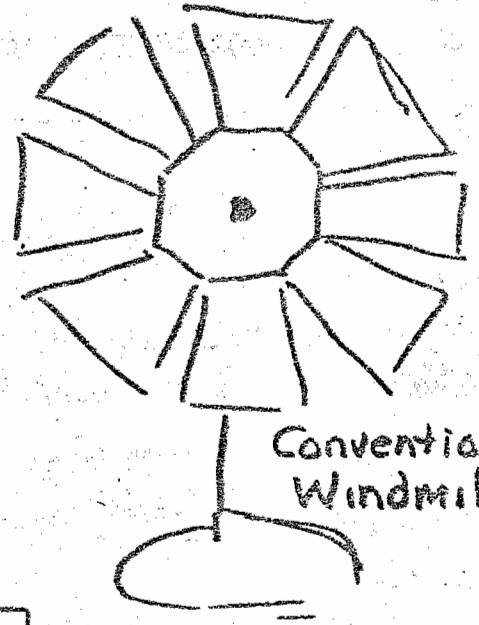
Face each wind machine into the wind and count how many times it turns in 30 seconds.



Savonius Rotor



Helix Rotor



Conventional Windmill

Turns in 30 sec.	Savonius Rotor	Helix Rotor	Conventional Windmill
Trial 1			
Trial 2			
Trial 3			
Average			

Q- Which would get the most energy from the wind? How do you know?

Q- Why isn't the wind a reliable source of energy?

Q- How else can we move the turbine in a generator?

Homework

On a separate sheet of paper Define Generator, Turbine, Rotor, Windmill

How can we use moving water as a source of energy?

Begin With -

Rotor, Sink (with running Water), Hand Generator (to share with all groups), Voltmeter, 1/2 Volt Motor

Q- Turn Handle on generator. What caused the bulb to light?

Q- How can I use moving water to turn the turbine? How do you know this?

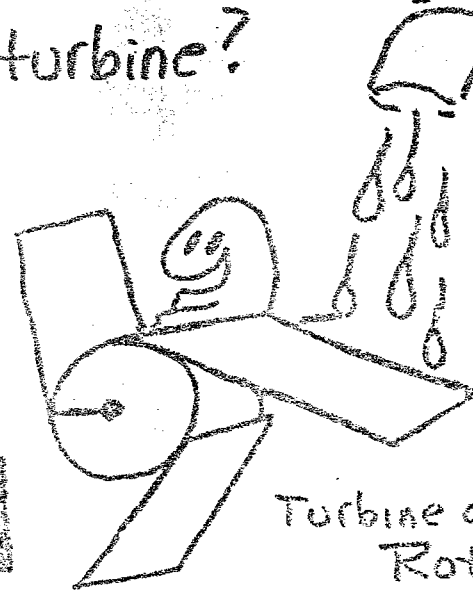
Q- How can I test to see how moving water will effect the turbine?

Hold turbine under water and count the number of turns in 30 seconds.

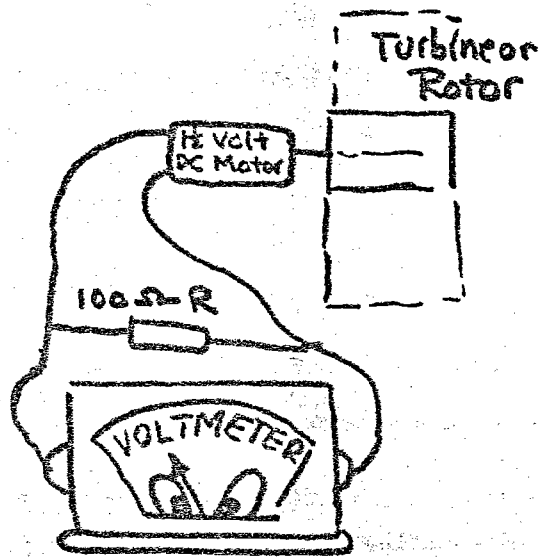
	Trial 1	Trial 2	Trial 3
Slow Water			
Fast Water			

Average	Fast	Slow

Turns in 30 seconds



electricity?



Q- How many volts are produced by slow moving water? _____

Q- How many volts are produced by fast moving water? _____

Q- Which will produce the most electricity fast or slow moving water? do you know? _____

Q- look up Hydroelectric Power in the Dictionary. How can we use a waterfall to produce electrical energy?

Homework

Define -

Generator -

Turbine -

Rotor -

How can we tap the Earth for energy?

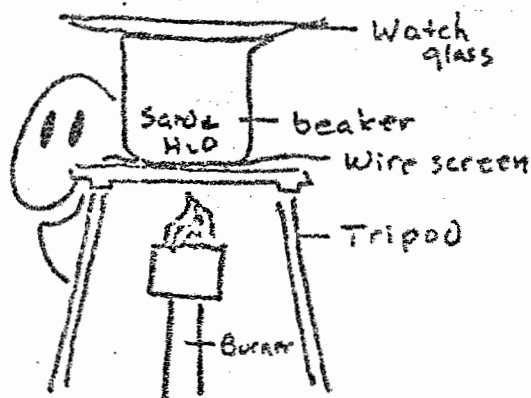
Begin With-

Beaker, Sand, Tripod, Bunsen Burner, wire screen, Drawing of underground water, thermometer, watch glass

Examine Drawing of underground water: - water flows through rocks that have holes in them (Rocks like sandstone:

Q- How did water get from the sky or a lake down to these rocks?

Set up experiment - Let me check it



Q- Why is watch glass getting wet?

Q- Why is steam rising?

Q- How do you know water & dirt are getting hot?

Q- Check temperature of Dirt & Water with thermometer?

Temperature _____ °C



How do we use this tool?

Q- Why can't skin divers go to the bottom of the ocean?

Q- Why does pressure increase as you go down in the ocean?

Press on your desk for 30 seconds

Q- Why is your hand getting hot? } Desk |

Q- How can pressure cause things to get heated up?

Q- Why are things (like rock) near the center of the earth very hot?

Q- How can the pressure from dirt cause the center of the earth to get hot?

Q- Where might Lava come from?

Q- How can we use this heat from the earth as a source of energy

Homework

Define { Lava } Geothermal energy } pressure.
{ thermometer

How can the Sun's energy help heat the Earth?

experiment 9

Begin With

lamp, 2 cans (black, silver), dirt, sand, 2 thermometers.

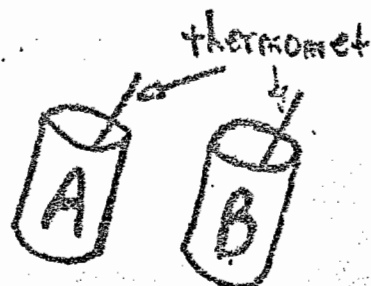
Turn on bulb. Place hand in front of bulb

Q- How does your hand feel?

Q- Why does your hand feel this way?

Examine cans

	A	B
Color of can		
Color of soil		



Q- If you put these two cans under the lamp, which do you think will heat up faster?

Q- Why do you say this?

Q- How can you find out if your guess is correct?



Take temperature readings every 5 minutes.

	Can A	Can B
temp at start		
one minute		
two minutes		
5 minutes		
10 minutes		

Q- Which can heated up the fastest?

Q- Why do you think this happened?

Q- How did the color of the can and dirt effect how fast it heated up?

Q- Why would you wear light colored clothes in the summer or in a desert?

Q- How does the color of an object effect how much heat and light that object will collect?

Homework

1. How can light be used as an energy source?

Why is energy important? experiment 10

Begin with-

This sheet, your other experiment sheets

Q- Name 5 different kinds of energy.

Q- Why must you eat food each day?

Q- Why does your body need food (chemical) - energy?

Q- How is energy helpful to you?

Q- Name two (2) types of energy. Explain how they help you.

1- How does electrical and chemical (gasoline) energy help a car go?

1- How does heat energy help in a toaster?

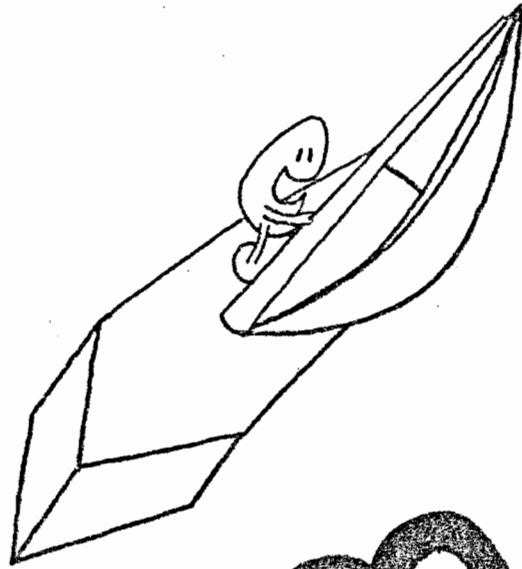
2- How does light energy help a plant?

2- How does mechanical energy help you walk?

Q- Why is energy important to you?

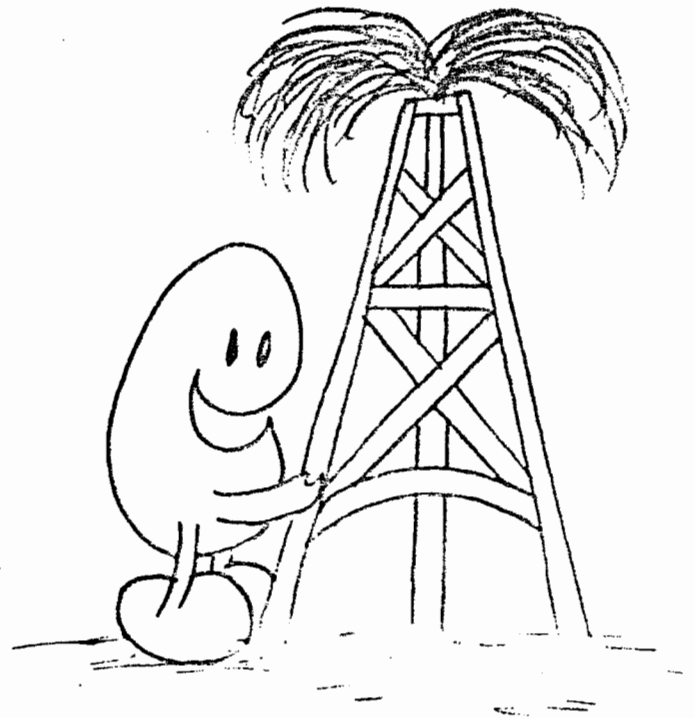
Homework

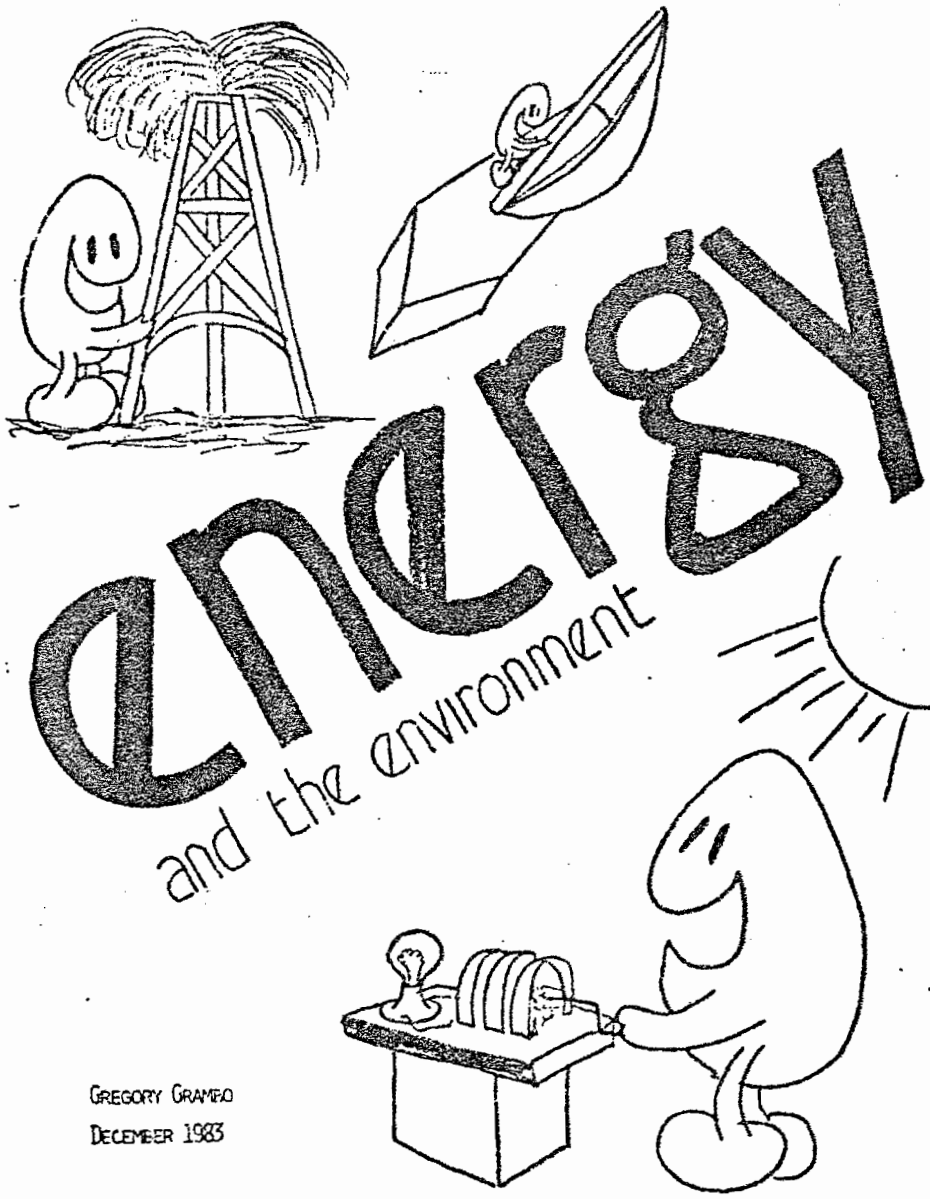
1- Draw a picture, about the size of this page, showing a form of energy and how it is useful to you.



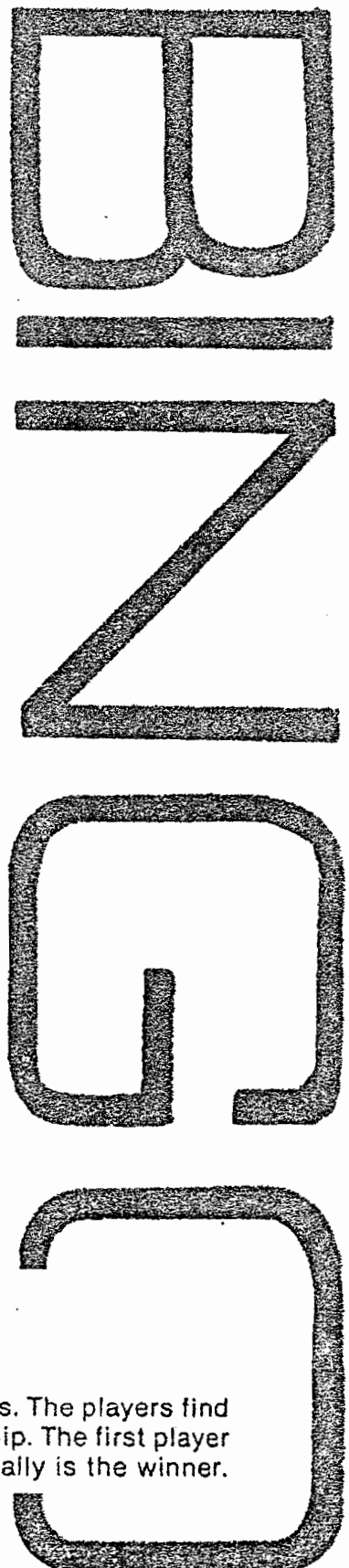
games

chapter 2





GREGORY GRAMEO
DECEMBER 1983



BINGO

INSTRUCTIONS

The caller takes a small card and asks one of the two questions. The players find the answer on their bingo card, which is then covered with a chip. The first player to cover five spaces in a row horizontally, vertically or diagonally is the winner.

Bingo

1

Light	Chemical	Oil	Water	Wind
Fossil Fuel	Geothermal Energy	Ships	Solar	Potential
Gas	Kinetic	Mechanical	Electrical	Nuclear
Coal	Energy	Change Form	Heat	Sound
Turbine	Fossils	Thermometer	Dark Colors	Wind mill

Bingo

2

Kinetic	Potential	Chemical	Light	Fossil Fuel
Wind	Oil	Geothermal Energy	Ships	Solar
Mechanical	Gas	Thermometer	Nuclear	Coal
Heat	Electrical	Energy	Sound	Change Form
Fossils	Turbine	Dark Colors	Water	Wind mill

Bingo

3

Dark colors	Heat	Fossils	Electrical	Geothermal Energy
Oil	Wind	Fossil Fuel	Solar	Water
Wind mill	Change Form	Mechanical	Chemical	Energy
Coal	Gas	Turbine	Ships	Light
Thermometer	Sound	Nuclear	Kinetic	Potential

Bingo

4

Electrical	Fossils	Heat	Solar	Dark Colors
Geothermal Energy	Fossil Fuel	Wind	Oil	Chemical
Change Form	Water	Thermometer	Wind mill	Mechanical
Turbine	Gas	Energy	Coal	Ships
Sound	Nuclear	Light	Potential	Kinetic

Bingo

5

Oil	Wind	Solar	Mechanical	Potential
Coal	Ships	Turbine	Fossil Fuel	Geothermal Energy
Kinetic	Chemical	Dark Colors	Wind mill	Sound
Gas	Light	Fossils	Water	Electrical
Nuclear	Heat	Thermometer	Change form	Energy

Bingo

6

Solar	Oil	Mechanical	Wind	Ships
Turbine	Wind mill	Coal	Geothermal Energy	Fossil Fuel
Sound	Dark Colors	Energy	Light	Chemical
Water	Fossils	Gas	Potential	Kinetic
Heat	Nuclear	Change form	Electrical	Thermometer

Bingo

7

Wind	Solar	Turbine	Oil	Water
Fossils	Heat	Electrical	Sound	Mechanical
Fossil Fuel	Dark Colors	Geothermal Energy	Change form	Thermometer
Coal	Gas	Energy	Nuclear	Wind mill
Kinetic	Light	Chemical	Ships	Potential

Bingo

Solar	Turbine	Wind	Light	Oil
Sound	Fossils	Dark Colors	Mechanical	Potential
Electrical	Fossil Fuel	Thermometer	Geothermal Energy	Change form
Heat	Wind mill	Gas	Energy	Water
Ships	Nuclear	Coal	Chemical	Kinetic

Energy and the Environment

Bingo

Created by
11-9

Fossil fuel	Nuclear	Geothermal Energy	Wind mill	Energy
Mechanic	Potential	Wind	Sound	Oil
Gas	Heat	Fossils	Water	Thermometer
Coal	Ships	Change Form	Solar	Dark Colors
Light	Turbine	Mechanical	Chemical	Electrical

Energy and the Environment

Bingo

10

Energy	Fossil Fuel	Wind mill	Geothermal Energy	Nuclear
Sound	Gas	Wind	Light	Kinetic
Oil	Fossils	Ships	Heat	Potential
Solar	Change Form	Thermometer	Dark Colors	Chemical
Water	Electrical	Turbine	Coal	Mechanics

Energy and the Environment

Bingo

11

Geothermal Energy	Change Form	Fossil Fuel	Heat	Water
Fossils	Mechanical	Oil	Gas	Turbine
Wind	Energy	Thermometer	Chemical	Wind mill
Light	Nuclear	Electrical	Sound	Ships
Kinetic	Dark Colors	Coal	Solar	Potential

Energy and the Environment

Bingo

12

Heat	Geothermal Energy	Change Form	Fossil Fuel	Mechanics
Water	Fossils	Turbine	Light	Wind
Thermometer	Oil	Chemical	Gas	Energy
Electrical	Wind mill	Ships	Sound	Coal
Solar	Nuclear	Kinetic	Potential	Dark Colors

... help produce electricity.

Wind

The ocean contains a lot of _____.
Dams produce energy from moving _____.

Water

Energy used in your car.
In turning the hand crank, you are using _____ energy to produce electricity.

Mechanical

Absorb the most heat.
Near _____ in the winter.

Dark Colors

Energy from Uranium.
Three mile Island was a _____ power plant.

Nuclear

natural gas decreases of this.
Energy from ancient plants and animals.

Fossil Fuel

The kind of energy a light bulb uses.
Radios, TVs and your video games all use _____ energy.

Electrical

Animal remains left from millions of years ago.
Rocks with imprints of leaves and animals.

Fossils

_____ energy is found in food.
Food have _____ in them that give you energy to do things.

Chemical

Made from million year old plants.
It is black. It can be burned to make heat.

Coal

millions of years turn into this.
Your car gets energy from this.

Oil

Type of energy we get from a fire.
Energy from a radiator.

Heat

Hydroland produces a lot of electricity by using _____.

Wind mills

_____ energy used in most stoves.
Natural _____ is used in burners and to heat most homes.

Gas

Besides heat and radiation energy, the sun gives off _____.
When a bulb is on we get _____ energy.

Light

Energy from hot springs and volcanoes.

Geothermal Energy

Energy we get from a radio.
When things vibrate they produce _____ energy.

Sound

The part of a generator that turns.
Generators have a _____ which spins in a magnetic field to make electricity.

Turbine

There are many forms of _____ used by man.
_____ helps us move things.

Energy

Energy of motion.
Moving things show us _____ energy.

Kinetic

is called _____ energy.
Cells produce electricity from light.

Solar

Energy can _____ in a hand generator.
Energy can't be made or destroyed it can only _____.

Change Form

Instrument that measures temperature.
58 degrees is measured on a _____.

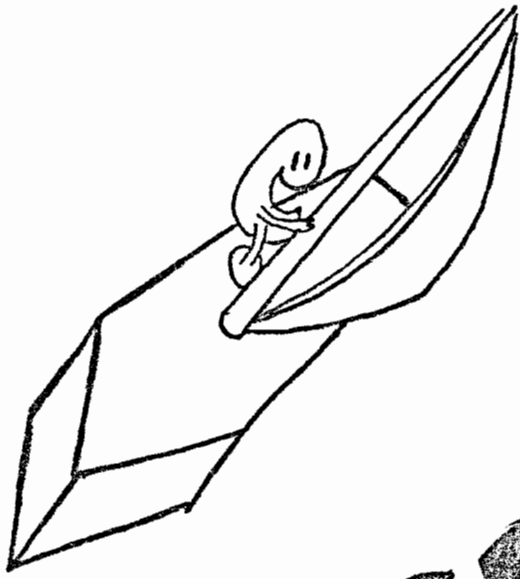
Thermometer

Make use of wind energy.
Moving water helps make them move.

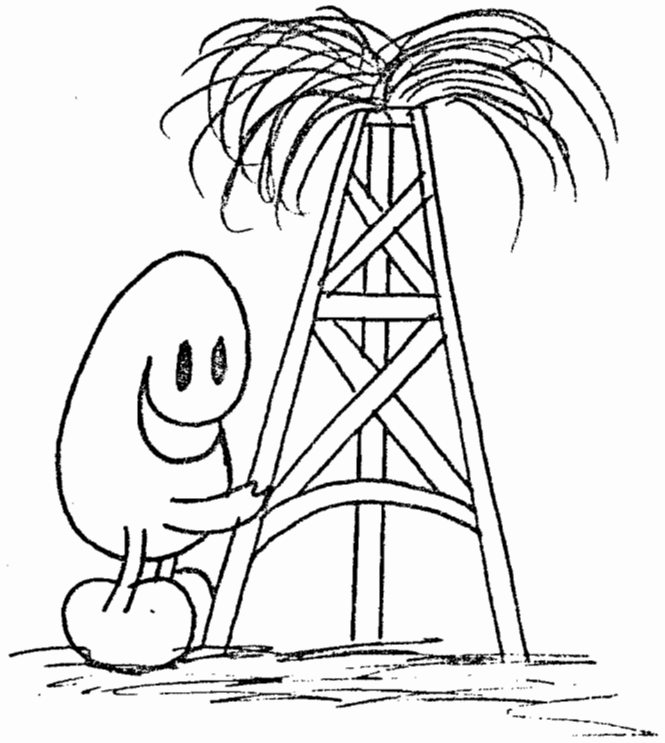
Ships

Stored energy is called _____ energy.
All things have _____ energy stored inside them.

Potential



appendix



quiz grade

experiment 1-5

- 1- Define Energy -
- 2- Describe how energy can change form -
- 3- Why does your body get tired after you play alot
- 4- What is a fossil fuel?
- 5- How was it formed?
- 6- How can the wind help move things?
- 7- Why do you feel energy is important to the environment?

81

quiz grade

Name _____

Class _____ Group No _____

experiment 7-10

- 1- How can we make a hand generator produce electricity?
- 2- How can the wind help produce electricity?
- 3- How can moving water help produce electricity?
- 4- What is geothermal energy?
- 5- How can we use the sun as a source of energy?
- 6- Name 5 different forms of energy

Energy and the environment

© Grambo

Materials List

Your group is responsible for all materials in your box. Keep them neat and clean. Report all missing materials to your teacher.

Small milk container
clay
shells
leaves
a fossil
oil sample
Coal sample
magnifier
eye dropper
glass plate
rock samples
ruler
Crayons

On hand Materials From the teachers desk

hand generator
heat lamp
Silver and black can - sand, dirt
beaker, tripod, burner,
watch glass, wire screen
Voltmeter -
water rotor
Wind rotors - helix, savonius,
windmill
fan
plastic basin - boats
drawing paper

Group clean up sheet

One person in your group must sign this sheet after your box is cleaned up. It is that persons responsibility to make sure the box is neat and clean. Take turns with other people in your group.

Date Name Class Period

Mon

Tues

Wed

Thurs

Fri

grading sheet instructions-

In the teacher's marking book, this sheet can serve as a place to grade or check off the experiment sheets that the students have completed. There is a space provided for quiz grades. This chart can be mounted on construction paper and hung on a wall in your classroom. Students can mark off all sheets you have corrected and handed back to them. By seeing other students test grades and experiment check offs, they may try to do better and work faster so the rest of the class will be proud of them.

Log book — What is it?

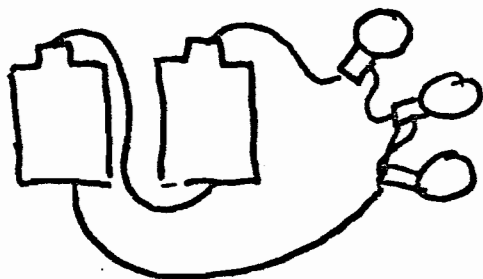
A log book is a place where a scientist writes his/her ideas, writes observations to experiments he/she is working on and draws conclusions to those experiments. Everything that happens good or bad should be reported in the log. Things not wanted should be crossed out not ripped out. Things you may not want now may become important later on. If information is torn out it may be lost forever.

log-book pages should contain

Topic — Simple circuits.

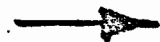
Date or Week

Ideas or Hypothesis — I tried to connect 3 bulbs, 2 batteries and some wire together so all bulbs go out when I remove one wire from the batteries. This is what I did.



It worked

It could have tables — Salt and liquids

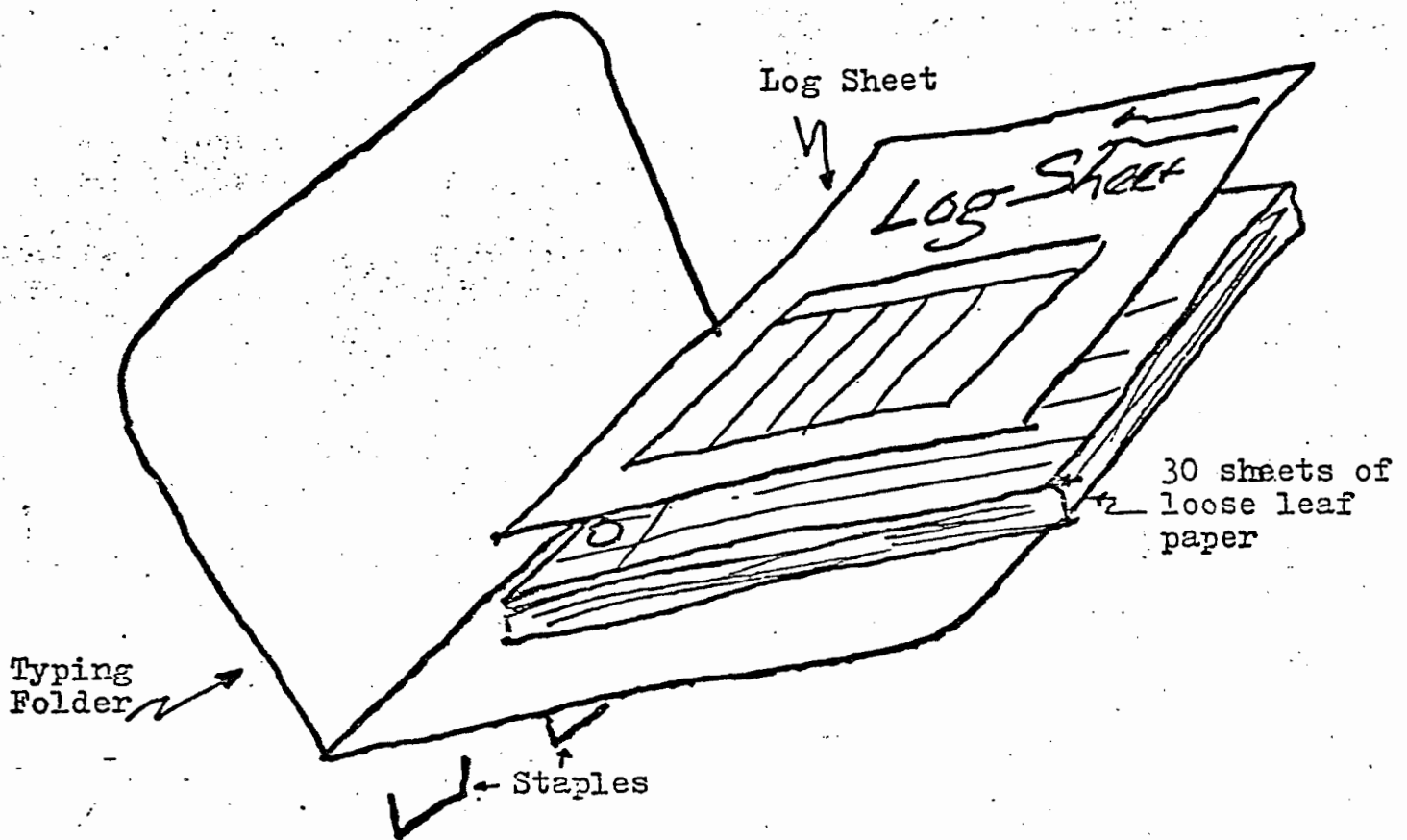


Liquid	Result
Water	Dissolves
Milk	_____
_____	_____

Conclusions - It worked or didn't work. We made a mess today. We had fun, we played a game I learned.

log books should tell you what the child learned that day.

How To Set Up A Log Book



Bind 30 sheets of paper along with the log sheet into a typing folder. Staple folder closed so papers will not fall out. Place students name and class at the top of the folder. Students may wish to decorate their folders. Pass out folders at the beginning of the period, and collect them at the end. Store folders in a milk crate or in a box. Students will write a summary of each days experiment into the log book. Periodically check log books.

Name _____

Class _____

Science Log Book

Dates From To		Pages	Teacher's Comments	Checked By

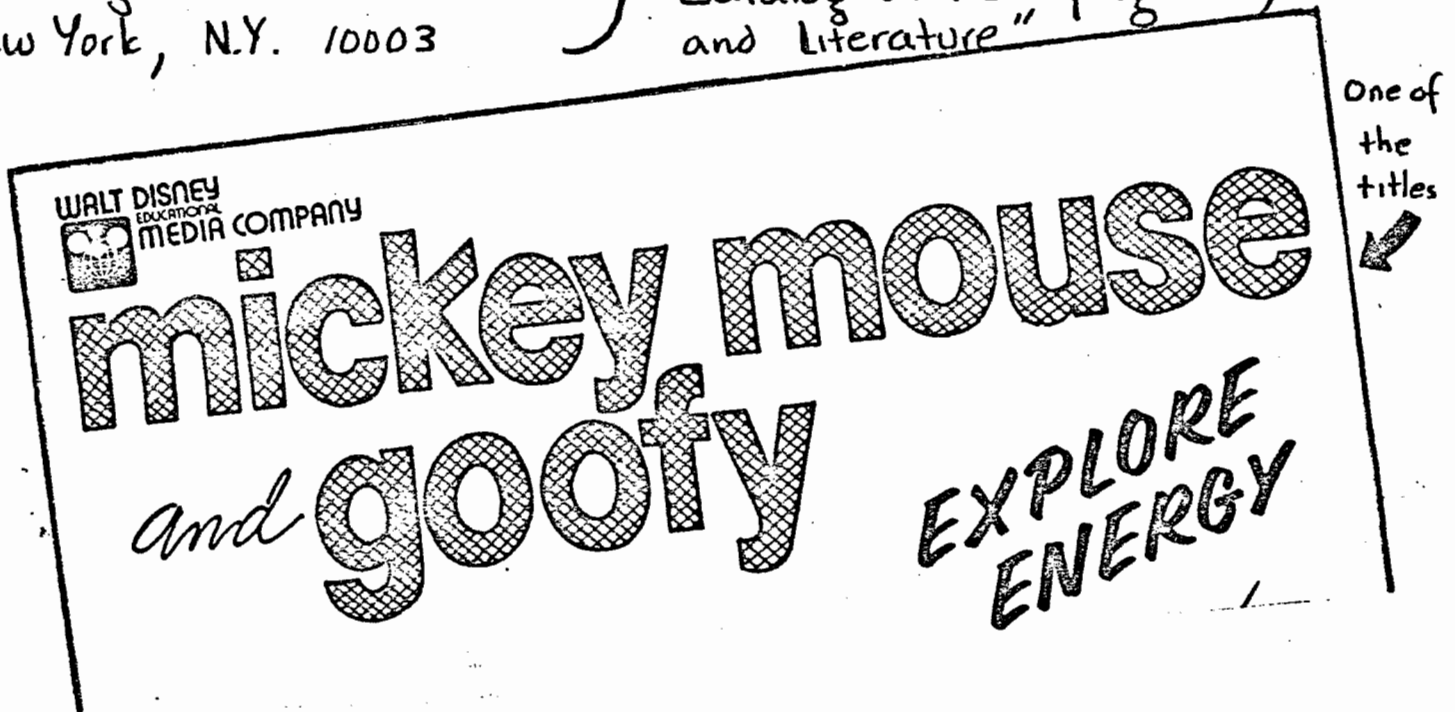
Free materials on energy - put requests on school stationary

Amoco Oil Company
Mail Code 3705
200 E. Randolph Dr.
Chicago, Ill. 60601

} "Living with Energy" also
"The energy crisis: What you can do about it"
Rexo Masters and Teachers Guide

Con Edison
Consumer Education
4 Irving Place Room 1625-S
New York, N.Y. 10003

} Various Games, pamphlets, books
activity (Rexo) Masters, and comics
"Catalog of free programs, Exhibits
and Literature"



Union Oil Co.
Corporate Communications Dept.
P.O. Box 7600
Los Angeles, Calif
90051

} Wall Chart -
"The Story of Oil"