

Fossil Fuel Hunt

Grade: 3 – 5

Time: 2-3 class periods

Lesson #2C:

Where Does Energy Come From?

Overview:

Students use written and internet resources to find answers to ten questions about fossil fuels, followed by class discussion and a fun activity to find oil in a cupcake .

Essential Questions:

What are fossil fuels?

Content:

- Standards addressed
- Vocabulary
- Assessment
- Teacher Information and Procedure
 - Prior knowledge for students
 - Materials
 - What to do in advance
 - Teaching the lesson
 - Gear –up
 - Explore
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- Student and Teacher Background Information
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 - How Do We Find Oil?
- Teacher Instructions
 - Preparing Cupcakes and Exploring for “oil”
- Student Handouts
 - Finding Oil...in a Cupcake?
- Extensions, Adaptations, and more resources
- Background

Source: New

Cupcake activity adapted from <http://www.womeninmining.org/cupcak1.htm>
Oozing Oil extension activity Adapted from Mining, Minerals, & Me, a copyrighted program of the Mineral Information Institute for the Alaska Resources Kit: Minerals and Energy, Primary Adaptation, 6/97

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Overview:

Students use written and internet resources to find answers to ten questions about fossil fuels, followed by class discussion and a fun activity to find oil in a cupcake.

Essential Questions:

- What are fossil Fuels?

Assessment:

Can students

- Describe three kinds of fossil fuels?
- Explain how fossil fuels were formed?

Vocabulary

- Fossil fuel
- Petroleum
- Nonrenewable
- Porous

Alaska Standards Addressed:

Science GLEs

The student demonstrates an understanding of:

- the attitudes and approaches to scientific inquiry by [3]SA2.1 answering “how do you know?” questions with reasonable answers [4]SA2.1 supporting the students own ideas with observations and peer review [5]SA2.1 supporting the student’s own statements with facts from a variety of resources and by identifying their sources
- the processes of science by [3,4,5]SA1.1 asking questions, predicting, observing, describing, measuring, classifying, inferring, and communicating [3]SA1.2 observing and describing the student’s own world to answer simple questions, [4]SA1.2 observing, measuring, and collecting data from explorations and using this information to classify, predict, and communicate [5]SA1.2 using qualitative and quantitative observations to create inferences and predictions

Geography

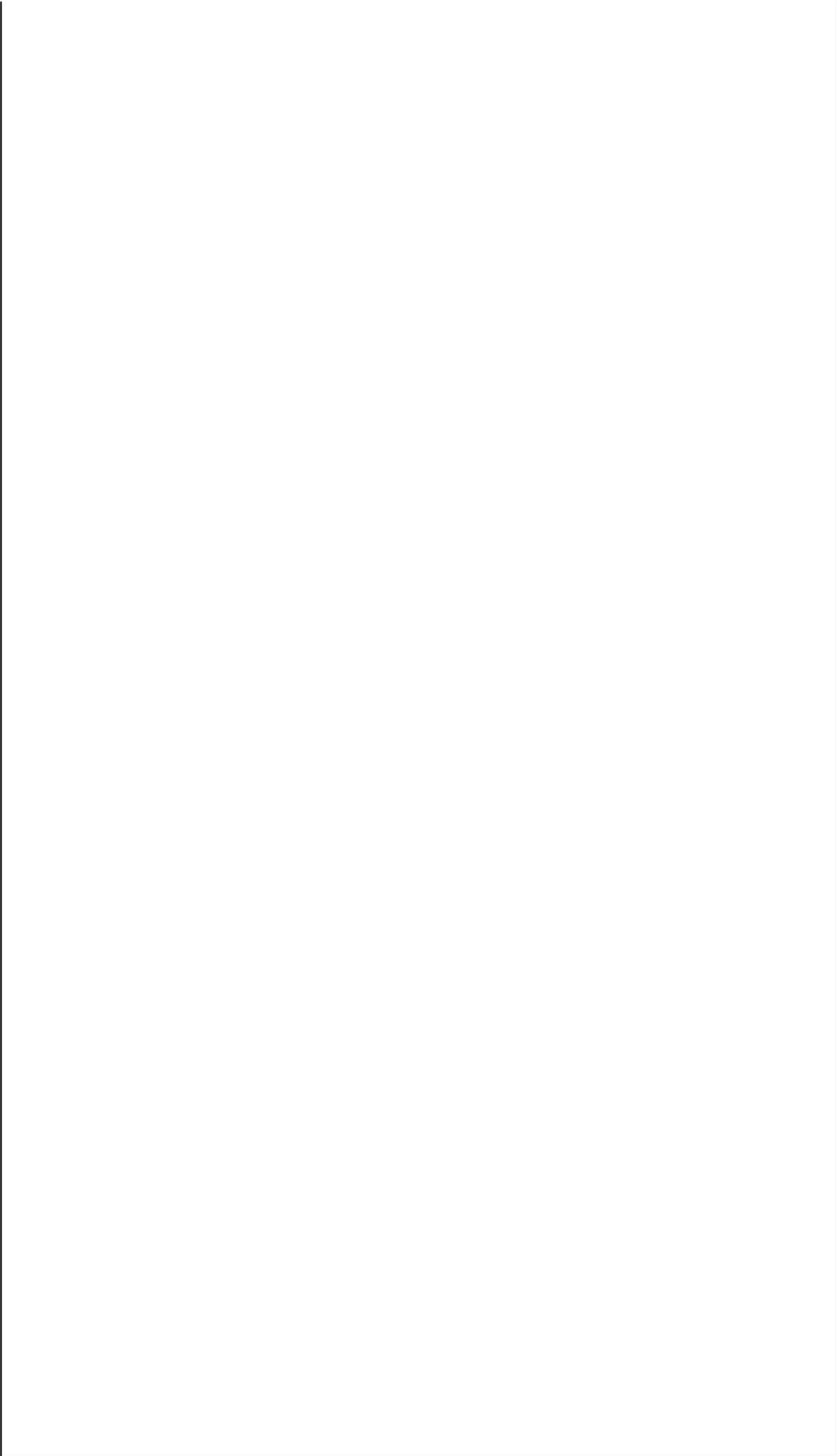
A 1) use maps and globes to locate places and regions;

Library/Information Literacy GLEs

B1) state a problem, question, or information need; 2) consider the variety of available resources and determine which are most likely to be useful; 3) access information; 4) evaluate the validity, relevancy, currency, and accuracy of information

Writing GLEs

The student writes about a topic by [3] 1.1.1 Writing complete sentences with a subject and a predicate [3] 1.1.2 Writing a paragraph on a single topic with two or more supporting details [4] 2.1.1 Writing a paragraph that maintains a focused idea and includes details that support the main idea [4] 2.1.2 Organizing ideas logically (L) [5] 2.1.1 Writing more than one paragraph stating and maintaining a focused idea and including details that support the main idea of each paragraph [5] 2.1.3 Organizing ideas logically to establish clear relationships within and between paragraphs (e.g., using transition words or phrases that reveal order or chronology) (L) [5] 2.1.4 Writing a concluding statement



Teacher Information and Procedure

Prior knowledge for students: Students should have some experience using written resources to find information.

Materials needed:

Books, Handouts, Posters, and Internet Sites with information about fossil fuels.

- Handout: What are Fossil Fuels?
- Cupcakes, 1 per student (See Teacher Information on “Preparing Cupcakes”)
- Clear plastic straws
- Student Handout “Finding Oil...In a Cupcake?”
- Colored Pencils
- Plastic Knife

What to do in advance:

- Collect books and resources, and bookmark useful internet sites for students.
- Make copies of “Information Scavenger Hunt” Worksheet

Teaching the lesson:

Gear- up:

Watch a film, read a story, or view a poster about the age of dinosaurs. Introduce the idea that we use some resources today that are as old as dinosaurs.

Explore:

Provide resources and send students on an “Information Scavenger Hunt” to look for the answers to these questions:

Why are natural or “crude” oil, natural gas, and coal called “fossil fuels”

Why did some plants from long ago turn into oil, gas, or coal instead of just decaying?

What is natural or “crude” oil like? (How does it look, smell, and feel?)

What fuels are made from crude oil?

What is natural gas like?

What is coal like?

Where does the word petroleum come from?

When did human beings first use petroleum?

Why are fossil fuels non-renewable?

Where is crude oil and gas found in Alaska?

Where is coal found in Alaska?

Students should be prepared to defend their answers when asked “How do you know”. They should be able to give sources.

When students have had time to research, go through the questions one by one:
Select a student to give his/her answer.
Ask “how do you know” and hear the explanation.
Ask for “challengers” who might have different answers or who might not be convinced.
Discuss the evidence, the answer to the question, and the sources of information that students used.
For the last two questions, have students take turns putting colored pins on the map of Alaska to show where oil, gas, and coal resources are found.

Invite students to ask more questions about fossil fuels.

Further explore one question about fossil fuels – “How can we find them?” by completing the activity, “Finding Oil In a Cupcake?”
See teacher instruction sheet and student handout.
See also the Extension Activity: “Oozing Oil”

Generalize:

Discuss with students the idea that fossil fuels formed under special conditions, and that the amounts available are limited. Talk about how we use fossil fuels and how we might sometimes waste them. Brainstorm conservation ideas for fossil fuels.

Assess:

Have students write in their journals or on paper to describe what they know and what they have learned about fossil fuels.

Extensions, adaptations, and more resources:

Do the “Oozing Oil” activity (included) to further explore how we find oil.

Do additional research to answer students’ new questions.

More background information: Energy Sources and Natural Fuels Volume 2
NSTA/API Monograph by Aldridge et al.

Children’s Books about Fossil Fuels:

Energy Essentials: Fossil Fuel Saunders, Nigel and Steven Chapman, Raintree, Chicago, Illinois, 2004. ISBN 1-41090-501-2

Future Energy: Fossil Fuels Richards, Julie, Smart Apple Media, North Mankato, Minnesota, 2004. ISBN 1-58340-334-5

What Are **Fossil Fuels**?

Coal, oil, and natural gas are considered **fossil fuels** because they were formed from things that were alive many millions of years ago. Oil and gas come from both plants and animals, and coal comes from plants. Much of the world's coal and oil was formed about 250 million years ago during the **carboniferous period** or the Coal Age. Swamps were very extensive during the carboniferous period and when plants died; their remains accumulated in the swamps and eventually were covered by sand and mud. Through time, they became buried more deeply. Pressure and heat slowly changed the plant material into coal.

Oil was formed in the same way but comes from plankton and other plants and animals that lived in the sea. The dead plants and animals settled on the sea bottom, and were covered with mud and sand. Heat and pressure slowly changed them into oil. Oil is a liquid and can move under ground. It is trapped in **porous** rocks deep underground.

We use energy from fossil fuels for heat, transportation, and electricity. Almost all of the energy we use comes from oil, gas, and coal. Many things that we use every day also are made from fossil fuels. For example, nylon, and manmade rubber are made from coal. Waxes, cosmetics, plastics, asphalt, fertilizers, and many other things are made from oil.

When oil and coal are burned in engines or power plants, they can cause air pollution problems. Scientists are finding ways to reduce the amount of air pollution that comes from burning fossil fuels.

There is a lot of oil, gas, and coal in Alaska. Most of it is shipped to other places, and Alaska gets money in return. The biggest coal mine is in Healy. Some of the coal from the mine is used in Fairbanks for heat and electricity. Because it takes so long to make fossil fuels, they are considered a non-renewable resource.

How Do We Find Oil?

Trying to “see” what is beneath the surface of the Earth is one of the jobs of a geologist. Rather than digging up vast tracts of land to expose an oil field, drills can collect samples from underground that can be analyzed to determine the composition of the Earth’s interior. You will work as a geologist to discover if there is oil beneath the surface of a cupcake representing the earth’s crust.

Where is oil found?

Because oil and gas are lighter than water, they float on top of water. Oil and gas that formed in the source rock deep within the earth floated up through tiny open spaces called pores in the rock. Some seeped out at the surface of the earth. Some was trapped by dense, non-porous rock, called shale. These underground traps of oil and gas are called reservoirs. Reservoirs contain porous rocks that allow fluids to flow through the pore spaces, that is, that are permeable. Often discovered in dome-shaped structures called anticlines, oil does not reside in underground lakes as is commonly supposed. Instead, it is trapped in rocks with holes (pores) like sponges. Natural gas is dissolved in the oil or separates and is trapped on top of the oil as a separate layer.

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

How do you know where to drill?

At first, people drilled wells near spots where oil seeped naturally to the surface. Or they made haphazard guesses about where to drill, often with disappointing results. Even with the modern technology, the search for oil is fraught with uncertainty. The odds are against discovering oil in a new location. And when oil is found, rarely is there enough to make production commercially viable.

Core Samples

When oil wells are drilled, sometimes a coring tool is used to obtain samples of the reservoir rock for study. Geologists study these core samples to learn about the reservoir and help decide how to produce the oil and gas from it. A rotary tool with a tough diamond bit drills through the rock. Drilling proceeds at a rate of 30 to 60 feet per hour. In the United States, the average well is more than a mile deep; the deepest is nearly seven miles.

By studying the core samples and by interpreting other subsurface data, scientists and engineers can reasonably predict how big the reservoir is and how much oil it contains, and how easy or difficult it will be to produce the oil. Economic studies are then done to assess production methods and the equipment needed to develop the oil field.

Teacher Information – Preparing Cupcakes and Exploring for “Oil”

You'll need:

- Enough white cupcake mix to make one cupcake each for students
- Foil baking cups
- 2 or 3 colors of food coloring
- Frosting
- Clear straws

Divide the batter into several bowls and add food coloring to the bowls. Make them dark. Leave some of the batter white. Choose one color to be “oil” and use it in a smaller amount of batter. Layer the different colors of batter into the baking cups and make sure that the “oil” is hidden near the bottom and **does not extend all the way across the cupcake.**

The foil and the frosting prevent students from being able to see inside the cupcake. Cupcakes taste better when fresh, but the “sampling” works better if they are a little dry, so bake them a day or so ahead.

A quicker way to do this is to use purchased, filled cupcakes....but it doesn't work as well since students probably already know where the filling will be!

Conduct the Activity:

Pass out cupcakes with instructions to the students not to eat them until you give the go-ahead. Tell students there are several colors of cake inside their cupcake, and that there might be “oil” (tell them which color the oil is!).

Pass out the handouts and have students draw what they imagine the inside of their cupcake might look like. Ask students how they might discover what's inside without removing the frosting or the foil, or cutting the cupcake.

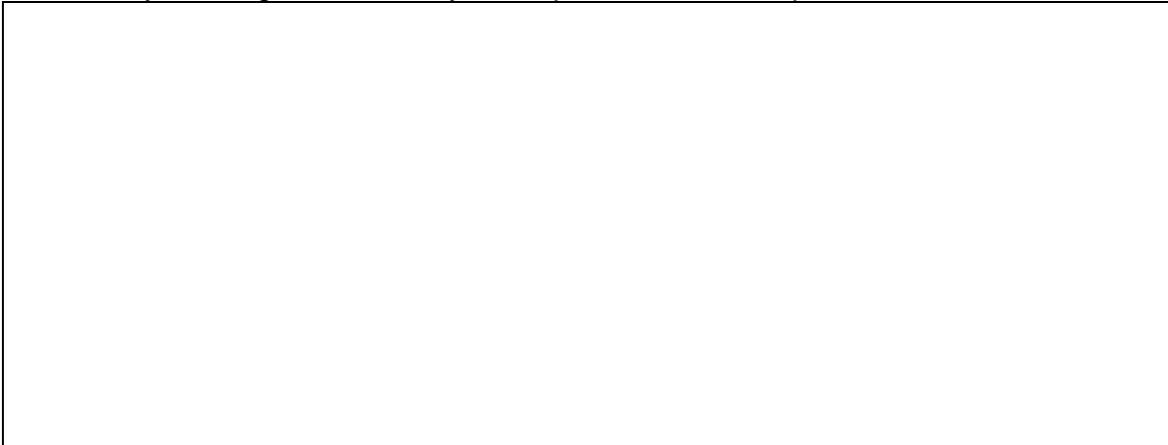
Pass out straws and have students “drill” their cupcake three times, making a new drawing each time to illustrate what the “core” looks like and what the inside of the cupcake looks like. As they do it, discuss how their activity is like the work that geologists do to find oil.

Let students cut the cupcakes open and make a final drawing, then eat the cupcakes!

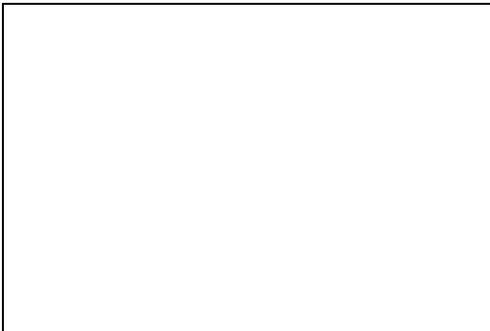
Finding Oil...In a Cupcake?

Geologist's Name _____

What do you imagine is inside your cupcake? Draw a picture here:



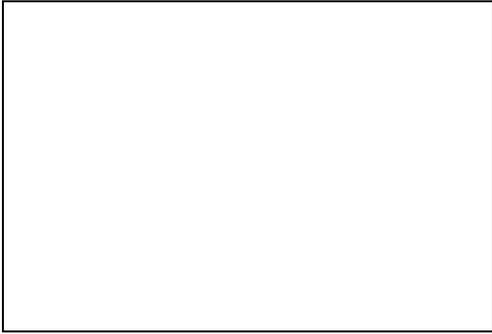
Draw "Core Sample 1" here: Try drawing your cupcake after you have seen the first sample.



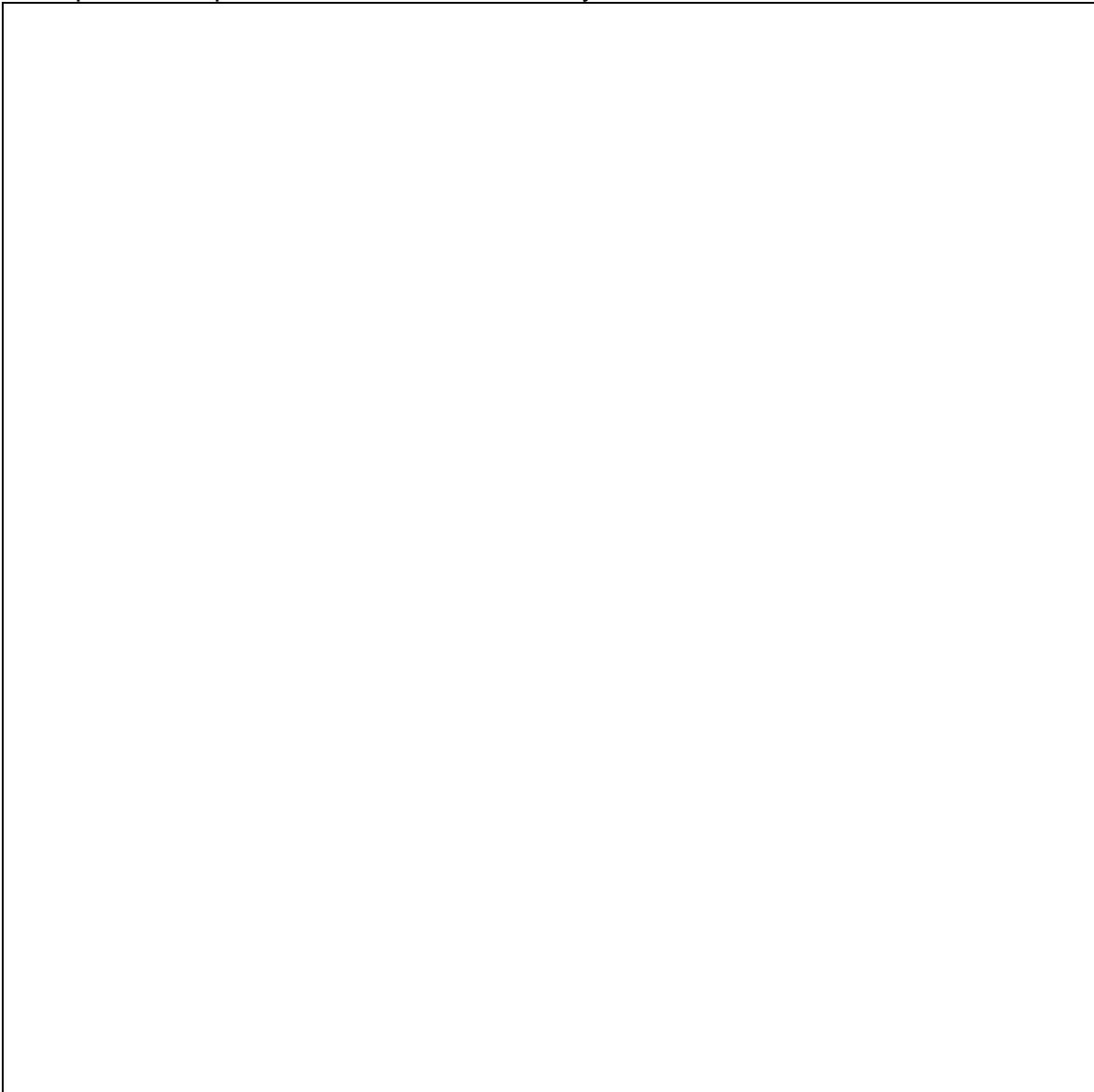
Draw "Core Sample 2" here: Try drawing your cupcake after you have seen the second sample.



Draw "Core Sample 3" here: Try drawing your cupcake after you have seen the third sample.



Cut open the cupcake and draw what it really looks like inside:



Oozing Oil

In this activity, students build a model of an oil well and demonstrate how to get oil out of the ground.

Key Words:

Oil Trap: A place underground where oil is absorbed in a rock and trapped between two layers of rock that do not absorb oil.

Cap Rock: A rock that is on top of oil and won't allow the oil to pass through.

Oil Well: An area where oil is trapped underground and can be extracted.

Advanced Preparation:

Cover an area for possible spills.

Materials:

Per group:

- Oozing Oil Instructions (3 pages)
- 1 cup measurer
- Large clear plastic tub
- 3 sticks of modeling clay
- Gravel or marbles
- Sand
- 1 medium container of cooking oil
- 1 bending straw
- Small funnel (to fit on straw)
- Pitcher of water
- Cup to collect oil

Procedure:

To introduce this activity to the class, read and discuss the following: In addition to all the big animals in the oceans and lakes, there are billions of tiny one-celled animals and plants. After dying, these bodies sink down to the bottom of the ocean. In each tiny body there are also tiny bits of fats and oils. Over hundreds of thousands of years, they pile up as layers of mud and ooze. After being buried by thick layers of sand and mud, these layers get squeezed and the drops of oil are squished out. The oil moves upward through porous layers to high points, where there is a cap rock that won't let the oil go through it.

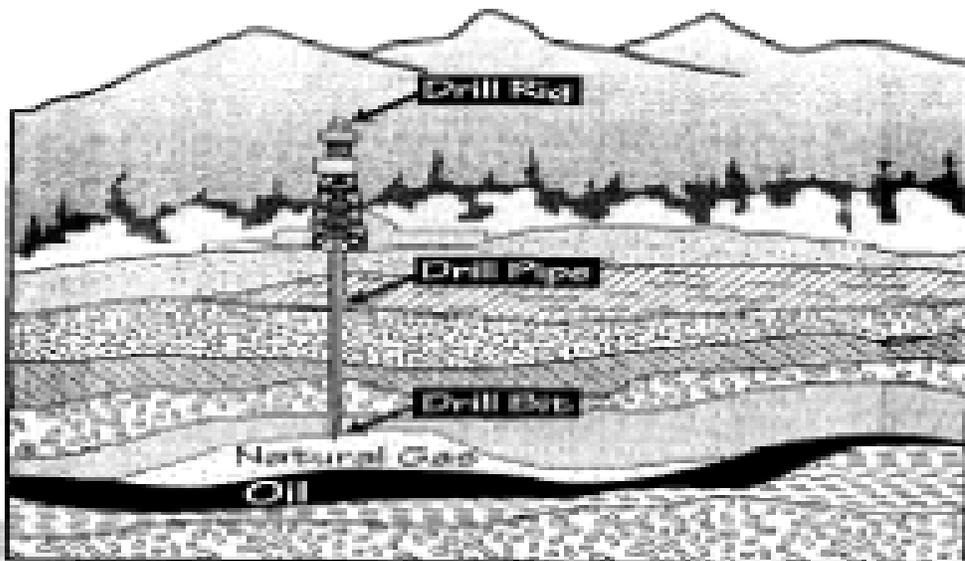
Build the model by following the instructions. Make sure the oil is between the bottom of the container and the clay. Make sure the straw goes through the clay, into the gravel and that it is sealed tight around the straws. The bending tip of the straw should tip to lead the oil into the empty cup. See diagram. (It will not work if you don't have a good enough seal between the clay and the edges of the can and the straws). Show the students the homemade oil well. Ask them how you

could get the oil out of the container? Show the students a glass of oil and water. Ask if the oil and water can be mixed. Ask which one is on top. Ask if it is always on top. Tell students “If the oil is in the well and water is poured in something will come out of the straw. Do you think it will be the water or the oil? Why do you think so?”

After students explore with the well ask them to share their observations. Did it work? Why or why not?

Ask students to explain how the oil comes out and why it comes out instead of the water. (Refer back to a jar with oil and water where the oil floats on top of the water.)

Adapted from Mining, Minerals, & Me, a copyrighted program of the Mineral Information Institute for the Alaska Resources Kit: Minerals and Energy, Primary Adaptation, 6/97



OOZING OIL

Put 2 cups of sand in the bottom of the tub.

Put 2 cups of rocks on top of the sand.

Pour 1/2 cup of cooking oil onto the rocks.

Roll the clay into a big, flat sheet. Make it big enough to cover the rocks all the way to the edge of the tub.

Put the clay over the rocks and seal it on the edge of the tub.

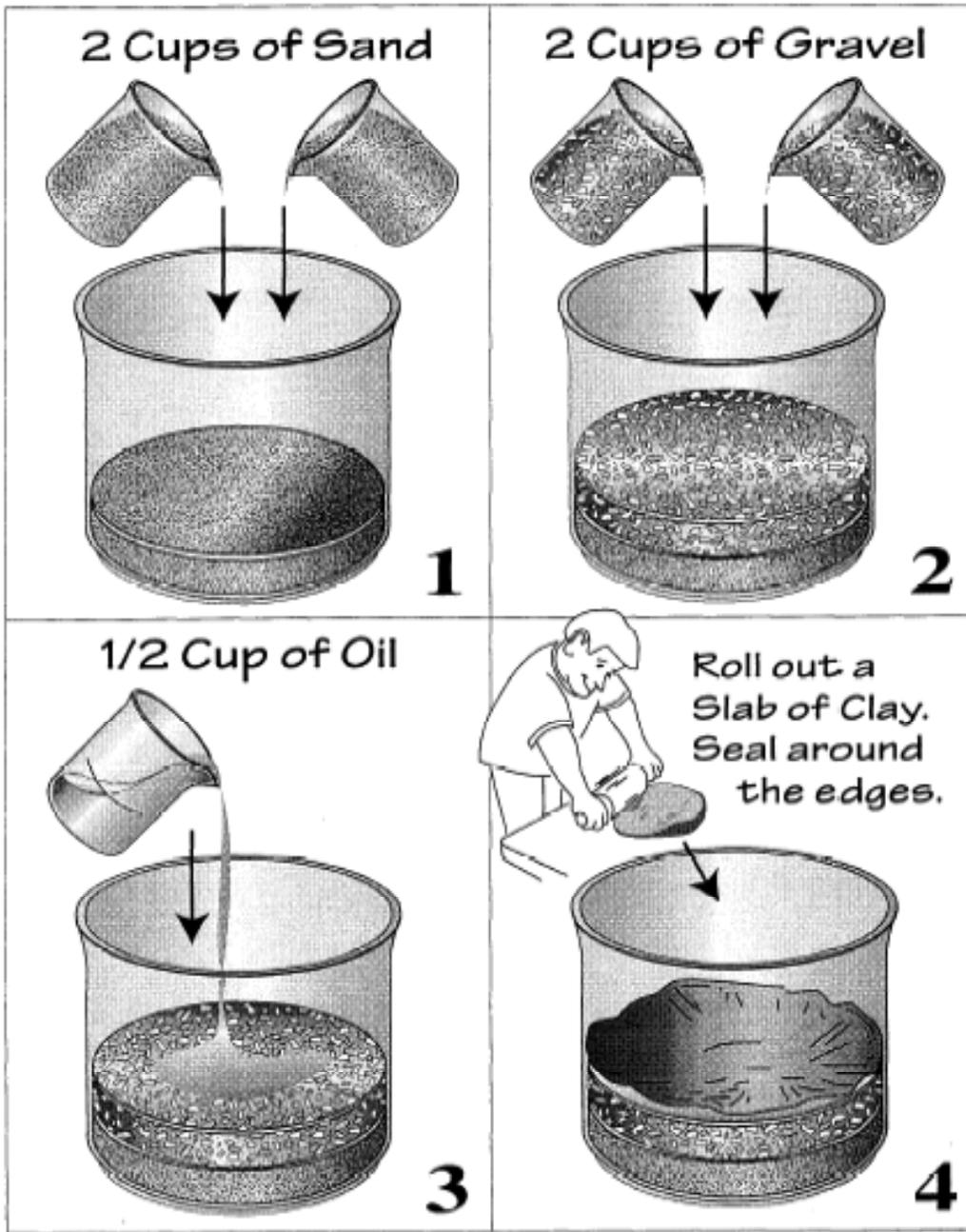
Put 2 straws into the clay until they reach the sand. Push the clay around the straws.

Tip one straw into a cup.

Put the small funnel on top of the other straw.

SLOWLY, pour water into the straw with the funnel. Watch as the oil comes out into the cup.

Oozing Oil



Oozing Oil

Put 2 straws into the clay until it reaches the sand. Seal clay around straw.



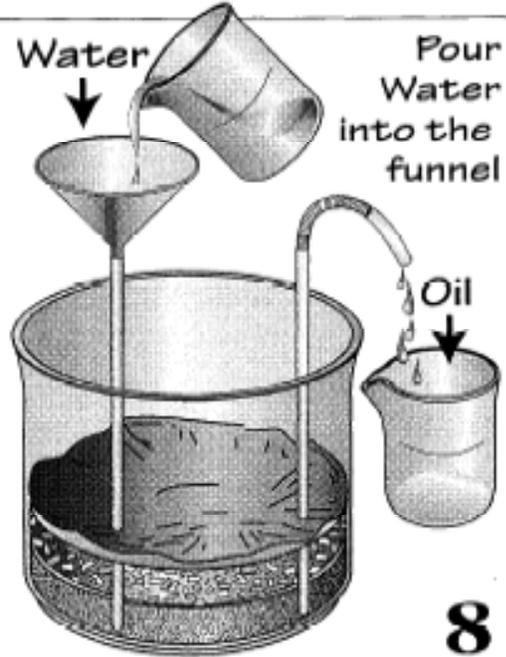
Tip one straw into a cup.



Put small funnel into other straw.



Water



Name _____

Information Scavenger Hunt

- 1) Why are natural or “crude” oil, natural gas, and coal called “fossil fuels”?
- 2) Why did some plants from long ago turn into oil, gas, or coal instead of just decaying?
- 3) What is natural or “crude” oil like? (How does it look, smell, and feel?)
- 4) What fuels are made from crude oil?
- 5) What is natural gas like?
- 6) What is coal like?
- 7) Where does the word petroleum come from?
- 8) When did human beings first use petroleum?
- 9) Why are fossil fuels non-renewable?
- 10) Where is crude oil and gas found in Alaska?
- 11) Where is coal found in Alaska?