



Title: Settling Tube

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Theme: Oil is a non-renewable resource that comes from plankton (and other plants and animals) that have been transformed over millions of years of heat and pressure.

Objectives:

- Students will understand that oil is mostly fossilized plankton.
- Students will recognize the difference between renewable and nonrenewable energy sources.

Duration: 30-60 minutes (can be split into 2 days)

Age Range: 4th-8th Grade

Materials:

- Zooplankton samples
- Test tubes (1 per group)
- Sand
- Spoons (1 per group)
- Funnel
- Pipettes or eye droppers
- Microscopes
- Slides
- Cover Slips
- Notebooks or sketching paper
- Pencils
- Lotion or food that contains a petroleum product

Background:

There are two theories about the origin of oil:

1. It formed when the planet was formed from elemental atoms under conditions of immense heat and pressure in the lower layers of earth's crust. Problem: This theory has no proof, because the process could never be done in laboratory experiments!
2. It is the result from large deposits of organic matter (mostly plankton) millions of years ago, which was trapped **without oxygen** or bacteria and under great pressure and heat turned into oil.

This lesson explores the latter theory, which is generally well-accepted.

Preparation:

Obtain a zooplankton sample, or take your class out to do a plankton tow with a plankton net. Set up microscope lab area.

Introduction:

Ask students to brainstorm where oil comes from. Explain that it is a fossil fuel, composed of organic matter that has been transformed over millions of years through heat and pressure. Make a list of all of the potential “fossils” in fossil fuel.

Activities & Procedures:

Have students taste a bit of food that contains a petroleum product or put on lotion with petroleum product in it. Tell them they may have just eaten/used a fossilized dinosaur or million year-old plant! Then, explain that in reality petroleum probably comes primarily from an often-overlooked group of living things: plankton. Pull out your plankton sample and let students take a look. Note that there are different small animals and plants in large numbers in seawater. Ask students to describe plankton. Most students will say that plankton are microscopic, but that need not be the case. Plankton is defined as a living creature that cannot swim against the currents or tides. Thus, sea jellies and mola-mola sunfish, which can be multiple feet in length, are considered plankton because of their poor swimming abilities. This is an excellent time to conduct your own plankton tow with the net if you are located close to the ocean.

Take a moment to look at the phyto- and zooplankton under the microscopes. Break students into groups of 2-4 and have them prepare a slide by pipetting a small amount of the plankton onto the slide and then placing cover slip on top. Each student should make a drawing of one phytoplankton and one zooplankton. If there are no microscopes available, show pictures of different types of plankton.

Demonstrate to students how to set up their own model of how plankton could be transformed into petroleum. Carefully transfer some of the plankton into the test tube using a pipette – draw from the bottom of the sample to get the highest concentration of plankton. Wait for it to begin settling to the bottom. Explain to students that this is what happens to plankton when it dies in the ocean – it settles down to the bottom. Sometimes this is called “marine snow.” Pour off some of the water, if necessary. Carefully spoon some sand/mud over the plankton. Try to layer the sand on top of the plankton! Pass out test tubes, plankton samples, spoons, pipettes, and sand to each group and have them create their own settling tube.

Have students make a drawing of their test tube and label the two layers. As they do this, explain that heat and pressure are key to transforming the plankton to petroleum. Ask students where the pressure comes from (*sand and ocean layered above*) and where the heat comes from (*Earth's core.*)

Wrap-Up:

Place the layered test tubes near a heater or other warm spot. Ask students what other ingredients you need to transform plankton into petroleum. Will the test tubes contain oil the next day? What is missing? The answer, of course is time. Millions of years, in fact! Ask students to meet you back in the classroom in 10 million years to check on the process.

Explain that because it takes millions of years to produce, oil is considered a non-renewable resource. Make a list of other non-renewable energy sources. Then ask students to think about energy sources that are renewable – that are produced quickly or available constantly. Things like solar energy, wind, wood, and even bio-fuels from plankton are renewable.

Evaluation:

Assess student comprehension and following of directions based on their success with construction of a settling tube. Review student sketches for accuracy and neatness.

Settling Tube

Concepts of Physical Science: Students develop an understanding of the concepts, models, theories, universal principles, and facts that explain the physical world.

SB2

Students develop an understanding that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one place or system to another, may be unavailable for use, and is ultimately conserved.

The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by:

[6] SB2.1 recognizing that energy can exist in many forms (i.e., heat, light, chemical, electrical, mechanical)

[7] SB2.1 explaining that energy (i.e., heat, light, chemical, electrical, mechanical) can changeform

[8] SB2.1 identifying the initial source and resulting change in forms of energy in common phenomena (e.g., sun to tree to wood to stove to cabin heat)

Concepts of Life Science: Students develop an understanding of the concepts, models, theories, facts, evidence, systems, and processes of life science.

SC2

Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.

The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by:

[3] SC2.1 sorting animals and plants into groups based on appearance and behaviors *

[4] SC2.1 choosing appropriate tools (i.e., hand lens, microscopes, ruler, balance) to examine the basic structural components (e.g., stems, leaves, fish scales, wings) of living things *

[5] SC2.1 identifying and sorting animals into groups using basic external and internal features *

** if you examine, sort, and identify phytoplankton and zooplankton with a microscope*

Concepts of Earth Science: Students develop an understanding of the concepts, processes, theories, models, evidence, and systems of earth and space sciences.

SD1

Students develop an understanding of Earth's geochemical cycles.

The student demonstrates an understanding of geochemical cycles by:

[3] SD1.1 recognizing that most rocks are composed of combinations of different substances