



Settling Tube

Grade Level: 4-8
Length: 30-60 (can be split into 2 days)
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NGSS Standards

4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.

MS-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Crosscutting Concepts

Scale, Proportion, & Quantity In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

Overview

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.

Materials

- Zooplankton Samples
- Test Tubes (1 per group)
- Sand
- Spoons (1 per group)
- Funnel
- Pipettes or Eye Droppers
- Microscopes
- Slides
- Cover Slips
- Journals or Sketching Paper
- Markers, Colored Pencils
- Optional: Watercolors & Watercolor Paper
- Pencils
- Lotion or Food that Contains a Petroleum Product
- Books/Magazines about Energy & Fuel Sources or Access to Internet

Notes

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.

Introducing the Lesson

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.

Activity

1. 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.
2. 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.

3. 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 to draw from the bottom of the sample to get the highest concentration of plankton. Wait for it to begin settling to the bottom.

>>Educator Tip: Depending on how abundant the phytoplankton is in the sample; it may settle in a matter of minutes or you may decide to let it sit overnight. If you aren't able to see much phytoplankton, you could also use fish food flakes or spirulina.

4. 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.
5. 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. Then that there are some energy sources that are renewable—that are produced quickly or available constantly. Things like solar energy, wind, wood, and even biofuels from plankton are renewable.

Ask students to use approved books, magazine, internet sources, or interviews with family members or experts in the community to identify at least one more fuel/energy source that is considered non-renewable and one fuel/energy source this is considered renewable. They can work on this project at home or you can provide class time. Have each student create a drawing, painting, comic strip or other visual piece for the nonrenewable fuel/energy source they learned about and for the renewable fuel/energy source they learned about. Instruct them that the visual piece should show the source of the fuel/energy and one potential impact on the environment.

Assessment

Have students create an explanatory caption about the two types of fuel/energy they have pictured to display alongside their images. Instruct them that the caption, should describe the natural resource that the energy/fuel source comes from and at least one impact using that fuel/energy source can have on the environment. Students who successfully meet the performance expectation will be able to describe how these two energy and fuels are derived from natural resources and that their uses affect the environment.