It's a Gas - Natural Gas

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Lesson Plan - Page 1

PRIMARY STUDENTS

Topic

Natural gas

Source

Oil and Natural Gas, pages 20-21, 22-23

Objective

Students will learn that natural gas is a substance formed over millions of years from decaying ocean plants and animals.

Lesson Preparations

1. Collect materials from the list provided
2. Make copies of the lab packets, one for each group
3. Make copies of the exit questions, one for each student
4. Read through the "Teacher Information" section

Vocabulary Word

Natural gas - a colorless, odorless gas formed over millions of years from decaying ocean plants and animals.

National Science Education Standards

Process Standards
(Grades 3-6)

Earth/Space Science Content Standards
(Grades 4-5)

Life Science Content Standards
(Grade 5)

Physical Science Content Standards
(Grade 6)

Life Science
(Grades K-4)

Materials

- One of the following:
  20g raw ground beef
  20g tuna
  1 hard cooked egg with shell
- 2 lettuce leaves (or equal amount of shredded lettuce)
- Clear plastic bottle (1 liter)
- 1 balloon
- Graduated Cylinder
- 50g sand
- 25ml aquarium or pond water
- Masking tape
- Balance scale/weights

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Engagement

The teacher demonstrates the following Pressure Bottle Activity reproduced from Energy4me Kit.

Materials

Empty plastic bottle with cap

Water

Condiment packet (soy sauce, ketchup, etc.)

Glass or cup

Activity

1. Fill the glass with water and drop in your packet. Choose the best packets to use for the activity. The best ones are those that barely float.

2. Fill the bottle to the top with water, slip in your unopened condiment packet, and close the lid tightly.

3. Squeeze the bottle to make the condiment packet sink, and release to make it rise. Vary how hard you squeeze the bottle. You will find that the harder you squeeze, the faster the packet will dive to the bottom.

Explanation

The experiment illustrates that compression reduces the surface area of a compressible material while increasing the material's density (gas molecules in our industry), and, therefore, its buoyancy. When pressure is released, the gas molecules expand, producing more surface area and reducing gas density. The result is that they become more buoyant and rise to the top of the fluid. This is what happens in a solution gas drive reservoir as the pressure declines and a gas cap is created. It also applies to oil and gas separation technology.

The best illustration is what happens when you open a carbonated soft drink and the gas fizzes out as the pressure is released.

Exploration

Day 1

1. Split the students into groups of four. Assign each student a job from the list below.

   Recorder: the student who writes down the information from the experiment

   Reporter: the student who presents their group's findings to the class

   Material Getter: the student who gathers and puts away the materials for the experiment

   Facilitator: the student who oversees the experiment and ensures their group stays on task.

2. Pass out one "It's a Gas" lab packet to each group. Have students read through the lab instructions once.
3. Teacher says: "Today we are going to learn about the formation of natural gas. Over millions of years decaying ocean plants and animals form natural gas."
4. Have the students collect the materials from a work stations set up in the room.
5. Give a short demonstrate on measuring with a graduated cylinder and using a balance scale before having the students begin the experiment. This lab requires a lot of monitoring. Make sure you are able to walk around and keep the students on task.
6. After you have reviewed how to properly measure, have the students begin the experiment. The students should be able to start and complete the experiment without any further explanations.
7. Once the students are finished drawing their charts for observations, they should turn in their packets.
8. Every day for the next four days, have the students record their observation of the balloon and substances on the charts that they have made.
9. On day 5, have the members of the group cooperatively summarize their data and draw **c**onclusions. Their conclusions will be shared with the class.
10. After the group presentations, have the students complete the exit questionnaire found in the lab packet. Each member of the group will fill in a questionnaire individually.

Explanation

Teacher Information

Natural gas is a colorless, odorless gas. From the well site, natural gas is sent by pipelines to a refinery. There it is cleaned, and for safety reasons, an odor is added. This enables people to smell natural gas. It is dangerous to breath and highly flammable. From the refinery, natural gas is piped to storage facilities until needed by consumers. Public utility companies sell most natural gas to consumers. Public utilities buy their natural gas supplies from the private companies that produce it.

NOTE: In this model, lettuce represents the plant material while the meat represents the animal material. The sand represents the layers of the earth and sediment that provided the pressure necessary for oil and natural gas formation.

Read to students from *Oil and Natural Gas*, pages 20-21

Thousands of years ago, people in parts of Greece, Persia, and India noticed a gas seeping from the ground that caught fire very easily. These natural gas flames sometimes became the focus of myths or religious beliefs. Natural gas is a mixture of gases, but it contains mostly methane, the smallest and lightest hydrocarbon. Like oil, natural gas formed underground from the remains of tiny marine organisms, and it is often brought up at the same wells as crude oil. It can also come from wells that contain only gas and condensate, or from "natural" wells that provide natural gas alone. Little use was made of natural gas until fairly recently. In the early 20th century, oil wells burned it off as waste. Today, natural gas is highly valued as a clean fuel that supplies a quarter of the world's energy.

Read to students from *Oil and Natural Gas*, pages 22-23

Natural Gas is the cleanest burning of the fossil fuels, and natural gas has become a preferred fuel for electricity generation. Demand is rising so quickly that producers are struggling to keep up. In the future, more and more natural gas will come from unconventional sources. Unconventional natural gas is more difficult and less economical to extract than conventional natural gas. At the same time, unconventional wells are productive longer than conventional wells and can contribute to sustaining supply over a longer period. The gas is essentially the same substance as conventional natural gas, and has the same uses, such as electricity generation, heating, cooking, transportation, and products for industrial and domestic use. New technologies are continually being developed to provide more accurate estimations of the amount of gas in these unconventional reservoirs and to stimulate the reservoirs to produce the gas. What are unconventional today may be conventional tomorrow through advances in technology or new innovative processes.

Evaluation

1. Students should complete the exit questionnaire worksheet.

Elaboration

1. Use the pressure bottle experiment at home. Try different packets of condiments. What happens with different condiment packets? How do you explain the difference?

It's a Gas - Natural Gas Experiment
Lab Packet

Reporter_____

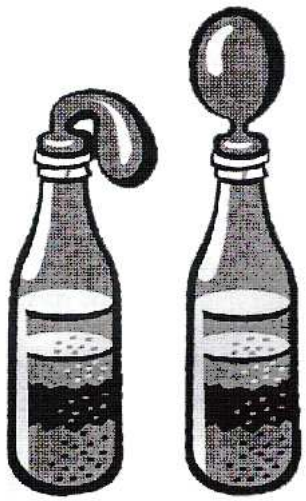
Recorder_____

Material Getter_____

Facilitator_____

It's a Gas - Natural Gas Experiment

Materials



- ❑ 20g raw ground beef, 20g tuna, or 1 hard cooked egg with shell
- ❑ 2 lettuce leaves
- ❑ 1 clear plastic bottle
- ❑ 1 balloon
- ❑ Graduated cylinder
- ❑ 50g of sand
- ❑ 25ml aquarium or pond water
- ❑ Masking tape
- ❑ Balance scale/weights

Instructions

1. Collect all of the material listed above.
2. Using the graduated cylinder measure 20g of the organic substance (ground beef, tuna, or cooked egg) you chose. After measuring the correct amount of one of the organic substance pour it into you bottle.
3. Tear the leaves of lettuce into small pieces and place them into the bottle on top of the organic substance.
4. Using the balance scale, carefully measure 50g of sand into your graduated cylinder. Remember to take into consideration the weight of the cylinder first. Then pour the sand into the bottle so that the sand covers the organic substance and lettuce. Do not shake the bottle.
5. Measure 25ml of water. Slowly pour the water into the bottle. Try to make the water run down the inside of the bottle instead of pouring the water directly onto the sand.
6. Next, stretch the opening of the balloon over the opening of the bottle. Seal with masking tape
7. Carefully move the bottle to a warm place. Try to not shake the bottle while moving it.

Lab Questions

1. Predict what will happen over the next few days._____
   _____
   _____
2. Individually design a chart to record your daily observations (changes in the balloon, etc.). Attach each members chart to the back of the lab packet before turning it in for the day.

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Exit Questionnaire

PRIMARY STUDENTS

Name:_____

Questions

1. What do you think caused the changes in the balloon?

_____

_____

_____

2. What happened to the materials in the bottle as time passed? What name could we give this newly formed substance?

_____

_____

_____

3. How did the substance change?

_____

_____

_____