

Exploration
 **TEACHER**
guide

An Ancient Recipe

Exploration Summary

Students will test conditions (environment, time, and heat/pressure) necessary for the formation of fossil fuels to discover how they came to be.

Student Learning Objectives

- Describe the formation of fossil fuels using correct time frames (many millions of years) and the required conditions—dead plants and animals, swamp/ocean environment, intense heat, intense pressure.
- Explain why fossil fuels are considered to be *nonrenewable* natural resources.

Student Worksheet

The student worksheet includes questions to check understanding, instructions for how to use the Exploration, and a section for recording Exploration data. Why do the questions come first? In following best practices for teaching science, students are asked to review questions before participating in an activity. When the questions come first, students are more focused on the intended content of the activity. Then they can respond to the questions during the activity or after completion of the activity.

Exploration Procedure

Explain that the purpose of this Exploration is to learn how fossil fuels were formed. Follow the appropriate procedure below.

Student Performs Exploration

1. Tell students how much time they will have to complete the Exploration and the student worksheet.
2. Explain how students should proceed:
 - Read the questions before starting the Exploration.
 - Follow the instructions on the worksheet to perform the Exploration.
 - Take notes or record data as necessary.
 - Respond to the questions in writing.
3. Explain that you will be available to help any students who raise their hands.
4. Tell students to begin the Exploration.
5. When time is up, ask students to share their answers.
6. Talk about the Discussion Question below.



Teacher Performs Exploration

1. Display the questions from the student worksheet and ask students to tell you what they think they will learn from the Exploration based on its questions. Highlight key words.
2. Read the Introduction and click the Continue button.
3. Ask the class to think over the Introduction before giving their input for an environment, time, and heat and pressure. Click on the Play button.
4. Read and discuss the results.
5. Considering the results, make other choices.
6. Pose each of the questions below and ask for answers from the class. Replay parts of the Exploration as necessary to illustrate the answers.
7. Talk about the Discussion Question below.

Optional: Use this Exploration as a small-group activity at a computer station. Assign it to students who need specific reinforcement of the concept.

Questions

1. Explain how fossil fuels were formed millions of years ago.
Answer: Organisms died and fell to the bottom of the swamps or oceans. Over many years thick layers of sediment on top pushed the organic material farther and farther beneath Earth's surface where intense pressure and heat turned it into fossil fuels.
2. Which combination of conditions "cooked up" anthracite coal?
Answer: swamp/100+ million years/very high heat and pressure
3. Which fossil fuel accounts for almost 40% of all energy use in U.S.? What combination of conditions was necessary for its formation?
Answer: Crude oil, ocean/millions to 100+ millions of years/very high heat/pressure

Discussion Questions

Why are fossil fuels considered to be nonrenewable? Discuss the implications of this on our continually growing demand for fossil fuels.

Answer: Fossil fuels formed under very special conditions over many millions of years—once they're gone, they cannot be replaced.

Discussion points:

- Many uses for oil include gasoline and other fuels for vehicles, petrochemicals used for plastics and other products like fertilizers.
- Competition with other countries to obtain oil.
- Instability in parts of the world that produce the most oil.
- Need to use alternative energy.