

If I am a petroleum geologist...
 I search for crude oil and natural gas.

Experiment 7

Hot Topic

You will need the fossil fuel model (F).



Things To Know:

Fossil fuels such as natural gas, gasoline, and candle wax are composed of hydrocarbons. Hydrocarbons are compounds that only contain two types of atoms, hydrogen and carbon. Many of the fuels that we use are hydrocarbons such as methane, propane, butane, and octane.

What To Do:

1. The black models represent carbon atoms. The white models represent hydrogen atoms. Use the bonds (red) to connect the atoms together to form a molecule.
2. Construct the fossil fuel molecules shown in the table below.
3. Research and build an additional fossil fuel molecule. Complete the table and answer the questions on the student sheet.

Petroleum Geologists Search For These Fossil Fuel Molecules					
Name	Formula	# of Carbon Atoms	# of Hydrogen Atoms	Structure	Use
Methane	CH ₄	1	4	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$	Methane, natural gas, is a fuel for homes.
Propane	C ₃ H ₈	3	8	$\begin{array}{c} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H}-\text{C} & -\text{C} & -\text{C}-\text{H} \\ & & \\ \text{H} & \text{H} & \text{H} \end{array}$	Propane is a fuel used in barbecue grills.

When a fossil fuel such as methane burns in the presence of oxygen molecules, chemical energy is released as heat and light. The atoms in the methane and oxygen molecules are rearranged to form carbon dioxide and water molecules.

The law of conservation of mass says that atoms cannot be created or destroyed during a chemical reaction. You can demonstrate the law of conservation of mass by doing steps 4-9.

4. Build a methane molecule and 2 oxygen molecules. An oxygen molecule, O_2 , is made of two red oxygen atoms bonded together with a double bond. The structural formula for the oxygen molecule is $O = O$. To build molecular models containing double bonds, use two 51 mm gray links. Bend the links and slide the links over two of the poles on the oxygen models.
5. The methane molecule and the 2 oxygen molecules are called reactants. Count the number of each type of reactant atom and record the numbers in the table on student sheet.
6. Carbon dioxide, CO_2 , has two double bonds. The structural formula is $O = C = O$. Water has only single bonds. The structural formula for water is $H-O$. These molecules are called products.
$$\begin{array}{c} H-O \\ | \\ H \end{array}$$
7. Using only the atoms in the reactants, 1 methane molecule and 2 oxygen molecules, rearrange the atoms to build as many carbon dioxide, CO_2 , and water, H_2O , molecules as possible.
8. Count the number of each type of product atom and record the numbers in the table on student sheet.
9. Complete the questions on the student sheet.

The Petroleum Geologist and Climate Change

As a petroleum geologist, you search for fossil fuels which are used as transportation fuels and as fuel oils for heating and electricity generation. Fossil fuels are also used for asphalt to make roads and in the synthesis of plastics, pesticides, and pharmaceuticals. Synthetic materials from petroleum products are in nearly everything we use.

Unexpected Products Made From Petroleum

Ink ☆ Clothing ☆ Putty ☆ Music Instruments ☆ Heart Valves
Water Bottles ☆ Toilet Seats ☆ Crayons ☆ Pillows ☆ Deodorant
Lipstick ☆ Hair Coloring ☆ Aspirin ☆ Carpet

The burning of fossil fuels, however, increases the amount of CO_2 in our air. This happens because the burning process combines hydrocarbons with oxygen in the air to make CO_2 and H_2O . Extra greenhouse gases in our atmosphere are the main reason that Earth is getting warmer. Greenhouse gases, such as carbon dioxide (CO_2) and methane (CH_4), trap the Sun's heat in Earth's atmosphere.

Scientists can't take Earth's temperature directly, but they have been observing Earth for a long time. They use NASA (National Aeronautics and Space Administration) satellites and other instruments to collect many types of information about Earth's land, atmosphere, ocean, and ice.

Explore the NASA Interactive: Climate Time Machine to assess the current and future climate impacts.

https://climate.nasa.gov/climate_resources/25/interactive-climate-time-machine/

Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. Analyze and interpret data to forecast future events and make suggestions to mitigate (to reduce the severity of) their effects.

Name _____

Date _____

Experiment 7: What Are Fossil Fuels?

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Propane	C ₃ H ₈	3	8	$ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array} $	Propane is a fuel used in barbecue grills.

1. How are these fossil fuels alike?

2. Explain how methane and propane are different.



Atoms	Number of Atoms in the Reactants	Number of Atoms in the Products
Carbon (black)		
Hydrogen (white)		
Oxygen (red)		

- How many carbon dioxide molecules did you build?
- How many water molecules did you build?



A balanced chemical equation can be written to describe the reaction of methane with oxygen shown in the picture. Coefficients are the numbers placed before the molecules in the chemical equation. When the coefficients are correct, the equation is balanced and the number of atoms of each element is the same on the left and the right of the arrow.

- Write the number of each type of molecule in the blanks.

