

Methane: Heating Up Fast!



IMPOSSIBLE
SCIENCE

Objective: After learning about methane, including its sources and how it creates heat, students will research various contributors to methane in the atmosphere.



Preparation

1. Set up stations with computers and printed information on the various contributors to methane emissions and ways we can directly help reduce methane emissions: A) energy-natural gas and coal mines B) agriculture and livestock C) waste management D) industry (production of iron and steel)
2. Print and distribute research information and articles from appropriate websites such as:
[Methane Report](#)
[Greenhouse Gases](#)
[Methane, Cows, and Seaweed](#)

Materials:

- Poster board or paper for brochures
- Markers
- Computers and printers

Procedure

2. **Ask:** *What are some of the major causes of global warming? What is a greenhouse gas? What is a fossil fuel?* Tell students to turn and talk, then share a few answers.
3. **Ask** students: *Why is some fire reddish yellow, and other fire, such as the flame on a stove burner, blue?*
4. **Review** background information and vocabulary, printing to hand out to students if needed (see below).
5. **Tell** students that they will be learning about a greenhouse gas called methane, and they will find out how it can create different temperatures of flame, and how it contributes to global warming.
6. **Show** students [Impossible Science video](#), pausing for them to take notes on fossil fuels and flammability limit.

Assessment

Students will **recreate the experiment** at home (alone or with a partner/small group), **film it**, and **submit their video**.

Group: Each group should create a poster, slide show, or brochures (challenge option) to present to the class. The other groups should take notes on the source of methane emissions and actions they can take to help reduce those emissions.

Individual: Each student should write a short persuasive speech describing the four main sources of methane emissions, the impact of methane emissions on the Earth, as well as specific actions the public can take to help reduce methane emissions.

Challenge: Perform the speech and present the poster, slide show, or brochures at a school assembly.

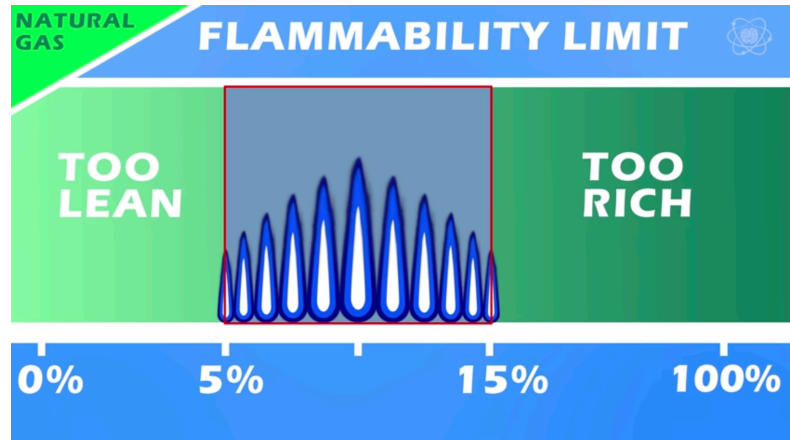
7. **Break** students into groups and have them visit stations researching the various causes of methane emissions and what can be done to reduce emissions to help reduce global warming.
8. **Assign** a group to each station to read about the source, take notes, and research an action plan (raising awareness, writing to representatives and companies, changing daily habits). The four stations should be:
 1. energy-natural gas and coal mines
 2. agriculture and livestock
 3. waste management
 4. industry (production of iron and steel)

Vocabulary and Background Information

Fossil Fuels: Millions of years ago the remains of plants and animals made up a thick layer of debris beneath the Earth's surface. Sand, silt, and calcium carbonate combined with the heat and pressure deep below the Earth to form fossil fuels including coal, petroleum, and natural gas. There are different forms of natural gas including propane, butane, ethane, and methane. Methane is the one we use most in our homes. Burning fossil fuels (to create electricity or aid in transportation) contributes to air pollution and global warming.

Methane: on its own is invisible and odorless, which is why we add mercaptan (which smells like rotten eggs) to it so that we can smell it in case of a gas leak. Methane is lighter than air, so it rises. Methane is a natural gas released from wetlands, termites, landfills, mining coal, growing rice, raising cattle (responsible for about 1/3 of methane released into the atmosphere), and using natural gas. It is a combination of carbon and hydrogen and it is at least twenty-two times more potent than carbon dioxide, making it a large contributor to global warming. In California, landfills are required to capture their methane, but producers of oil and natural gas are not required to capture methane, so they are responsible for much of the methane released into the atmosphere.

Greenhouse gasses: gasses in the Earth's atmosphere that trap heat. Carbon dioxide and methane are two examples of greenhouse gasses. They act like a greenhouse because they let sunlight and heat pass into the atmosphere, but they prevent it from escaping which contributes to global warming.



Flammability limit:

- under 5% methane to oxygen- flammability limit is too lean and won't even be flammable.
- 5 - 15% methane will cause methane to burn the hottest- around 1960 degrees Celsius.
- Above 15% it is too rich and will burn less hot - around 1000 degrees Celsius

Watch the companion video here:



Lesson Plan by Whitney Gallagher based on the "Impossible Science" series.

Find more at impossiblescience.com

