

SYNOPSIS:

We use gases in a variety of ways: to fill up inflatable toys, to lift blimps into the air, to put fizz into soda pop, and to provide power to fuel our engines. How a gas is used depends on its properties. Helium and hydrogen are both lighter than air, but hydrogen is explosive and helium is not. So helium is used to fill balloons, and hydrogen can be used as a fuel.

This program looks at the properties of different gases and questions why some of them make good fuels and others don't. All gases spread out to fill the containers they are in, and can be compressed. These and other gaseous characteristics are explored in various experiments.

CURRICULUM UNITS:

Chemistry
Earth Science
General Science
Physical Science

CAREER OPPORTUNITIES:

Chemist
Engineer
Science Teacher

BACKGROUND:

We use gases every day to help us with our daily tasks. The type of gas we use, and how we use a gas, depends on its properties. Helium and hydrogen, for example, are both lighter than air, but one is explosive and the other is not. So helium is used to fill balloons and hydrogen can be used as a fuel.

This program looks at the properties of gases and fuels and explores the characteristics that make different gases useful for different tasks. It explains that all gases, even those that are lighter than air, have weight. An

experiment with an empty balloon and a full one measures the difference. An animation illustrates how the spread out particles in gases can be compressed, and we see how this is applied in the real world.

Carbon dioxide gas is very useful under compression, and the DVD demonstrates how it can be used to inflate a ten-man rubber raft in under a minute, or to put the fizz into soda pop. The camera explores a behind-the-scenes trip to a soda-bottling factory.

Like many gases, carbon dioxide is odorless and colorless. Anything that smells does so because some of its molecules have been released as a gas. They diffuse through the air. When they reach the nose, smell messages are sent to the brain. An experiment with several children shows how long it takes for an odorless gas to spread out across the room. One gas that is odorless shouldn't be. Natural gas is a fuel and burns easily, so it can be very dangerous unless odorant is added to it.

A brief animation explains the history of fuels from the first fire lit by lightning to today's fossil fuels, and we look into a coal mine to see where some of our fuel comes from. We also look at natural gas and discuss a few of its properties. A possible fuel for the future is hydrogen. When it reacts with air it produces energy and water. Today, scientists are exploring new ways to use hydrogen and other gases as fuels to meet our future needs.

ISSUES AND CRITICAL THINKING:

PRIOR TO SHOWING THE PROGRAM:

Discuss the various ways we depend on gas. List and chart the results.

Read a book such as *Kinetic Theory of Gases: Gases are Atoms Shooting About*, by Professor Irma Kook, a journey into the world of understanding gases.

CRITICAL THINKING CATEGORIES:

After showing the DVD, ask your students the following:

How do gases fill containers?

What causes gases to move from high pressure to low pressure?

Why do we use helium in blimps instead of hydrogen?

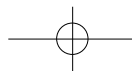
Discuss the different gases used in the DVD. Using a Venn diagram, compare and contrast two of the gases.

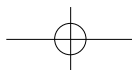
Divide the students into cooperative groups. Have each group brainstorm ideas for using compressed gases. Students should prepare a visual aid and a summary to present to the class.

Explain what happens to a balloon filled with helium after you let it go.

Conduct an experiment with gases in class, perhaps mix baking soda with vinegar. Refer to a book such as *It's a Gas*, by Margaret Griffin.

Have students explore hydrogen as a fuel, and how else it could be used. Write an expository essay describing its various uses.





GLOSSARY:

ACID- A compound whose water solutions are identified by common characteristics, such as a sour or biting taste.

ATOM- The smallest unit of an element that still retains the properties of that element.

CARBON DIOXIDE- A colorless, odorless, noncombustible gas that is heavier than air.

DIFFUSE- To spread out.

FATAL- Deadly.

FOSSIL- All or part of a plant or animal that has been preserved from a past geological age.

HELIUM- Colorless, odorless, tasteless, and noncombustible gas that is lighter than air.

HYDROGEN- A colorless, odorless, and highly flammable gas that is lighter than air.

METHANE- A flammable, explosive, colorless, odorless, and tasteless gas.

MOLECULE- The smallest particle into which a substance can be divided and not change chemically.

ODORANT- Any substance capable of stimulating the sense of smell.

ORGANIC- In chemistry, relating to some compounds containing carbon atoms.

PRESSURE- The force that is exerted per unit area.

SEDIMENT- Solid material that is deposited from suspension in a liquid.

VOLUME- The amount of space that is enclosed by a closed surface.

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