SUGGESTED REFERENCES

- *Beginning the Search for Natural Gas*
  http://www.sunmachinery.com/EXPLORATION.HTML
- *Gases*
  http://www.chemtutor.com/gases.htm
- *How Helium Balloons Work*
  http://www.howstuffworks.com
- *Science: How the World Works*
  http://www.brainpop.com/science/
- *The Hydrogen and Fuel Cell Investor*
  http://www.h2fc.com
- *Hydrogen and Fuel Cell Letter*
  http://www.hfcletter.com
- *Association for the Advancement of Science:*
  Benchmarks for Science Literacy
  http://www.project2061.org

NATIONAL SCIENCE EDUCATION STANDARDS

K - 4

Properties of objects and materials
Science in personal and social perspectives

5 - 8

Properties and changes of properties in matter
Transfer of energy

CREDITS

The producers thank Channel 4 Television Corporation/4 Learning for materials used in this program.

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SCIENCE SCREEN REPORT® FOR KIDS

VOLUME 13 ISSUE 6

THE PROPERTIES OF FUELS AND GASES

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Presidential Awards for Excellence in Mathematics and Science Teaching

Junior Engineering Technical Society
www.jets.org

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 edition of SCIENCE SCREEN REPORT FOR KIDS 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	RUNNING TIME
■ CHEMISTRY	17:48
■ EARTH SCIENCE	
■ GENERAL SCIENCE	
■ PHYSICAL SCIENCE	

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 edition looks at the properties of gases and fuels and explores the characteristics that make different gases useful for different tasks. The video 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 video 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 colorless and odorless. 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 odorous gas to spread out across a 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.

ADVANCED ORGANIZERS

Prior to showing the program:

1. Discuss the various ways we depend on gas. List and chart the results.
2. 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.
3. To help students better understand the science of fuels and gases, refer to the Association for the Advancement of Science: Benchmarks for Science Literacy http://www.project2061.org/tools

CRITICAL THINKING EXERCISES

1. After showing the video, ask your students the following:
   a| How do gases fill containers?
   b| What causes gases to move from high pressure to low pressure?
   c| Why do we use helium in blimps instead of hydrogen?
2. Discuss the different gases mentioned in the video. Using a venn diagram, compare and contrast two of the gases.
3. 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.
4. Explain what happens to a balloon filled with helium after you let it go.
5. Conduct an experiment with gases in class, perhaps mix baking soda and vinegar. Refer to a book such as *It's a Gas*, by Margaret Griffin.
6. Have students explore hydrogen as a fuel, and how else it can be used. Write an expository essay describing its various uses. The Hydrogen and Fuel Cell Investor website may be a useful resource: http://www.h2fc.com as well as The Hydrogen and Fuel Cell Letter, www.hfcletter.com

VOCABULARY

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
Combustible. . . . . Able to burn
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, tasteless gas
Molecule. . . . . The smallest particle into which a substance can be divided and not changed chemically
Odorant. . . . . Any substance capable of stimulating the sense of smell
Organic. . . . . In chemistry: of or 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

CAREER POSSIBILITIES

- CHEMIST
- ENGINEER
- SCIENCE TEACHER