Safety Sniffing

Objective
Students will understand that the sense of smell plays an important role in using natural gas safely as a fuel source.

Curriculum Focus
Science
Language Arts
Art

Materials
- Assorted scratch and sniff stickers including natural gas (mercaptan) stickers
- Assorted extracts or flavorings
- Dropper
- Blindfolds
- Cotton balls
- Small baggies

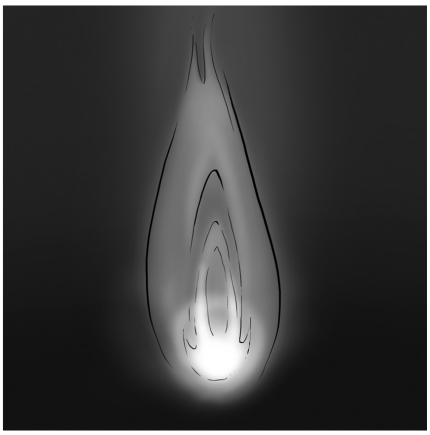
Key Vocabulary
Mercaptan
Natural gas

Next Generation Science Correlations
4-LS1 - 2
4-LS1.D
4-ESS3 - 1
4-ESS3.A
4-ETS1 - 1
4-ETS1.A
5-ETS1 - 1
5-ETS1.A
MS-LS1 - 8
MS-LS1.D
MS-ETS1 - 2
MS-ETS1.B

Introduction

Because natural gas provides a reliable energy source that is used by residential and industrial customers, safety is one of the natural gas industry's top priorities. The industry makes a great effort to develop efficient and safe appliances, equipment and delivery systems, spending quite a large sum of money each year on safety related programs.

These efforts have helped the industry achieve an outstanding safety record. As with any energy source, however, consumers need to do their part for safety and to follow recommended safety and operating practices.



Natural gas is a colorless, odorless, simple hydrocarbon, primarily composed of methane. Its principle combustion byproducts are harmless carbon dioxide and water vapor. Natural gas is lighter than air, and if released, tends to dissipate into the air. Since natural gas has no odor of its own, an odorant called mercaptan is added to the gas so that it can be detected in the event of a leak.

Many people describe the odor as that of rotten eggs or a sulfur smell. Your sense of smell is probably your most vivid sense. It is a sense, however, that many people take for granted. Inside your nose, in each nostril, you have millions of olfactory receptors, which make you acknowledge smells.

It is possible for a person to smell just one drop of perfume in a three-room home. People can identify thousands of different odors. Some can detect minute differences, while others have less sensory ability. Our sense of smell plays a great role in our ability to remember.

Many smells have strong connections to experiences, places or meaning. Some believe we could enhance our brain's ability to connect memory and experience if we could refine our ability to smell and sense odors.

Scratch N' Sniff Stickers® are generally a paper type sticker that has been filled (infused) with a particular scent. Scratch and sniff stickers usually have a picture to help you anticipate the scent they will release. To infuse the sticker, a process called microencapsulation is used. A substance, fragrance or ester is injected into microscopic capsules, which can be broken mechanically, electrically or chemically.

Gelatin is usually used as an encapsulating agent. Using a fingernail to scratch the sticker breaks the microcapsule and releases the scent. Most fragrances and esters are created in a laboratory using a variety of chemicals to recreate smells.

A few of the common esters and their smells are:

Ester	Smells like	Prepared from
Mercaptan	Rotten eggs	Mercury and captans (thiol compounds) substituting sulfur for oxygen
Isoamyl acetate	Bananas	Isoamyl alcohol and acetic acid
Ethyl butyrate	Pineapples	Ethanol and butanoic acid
Benzyl acetate	Peaches	Benzyl alcohol and acetic acid
Methyl butyrate	Apples	Methanol and butanoic acid
Octyl acetate	Oranges	Octanol and acetic acid
Methyl	Grapes	Methanol and anthranilate 2-aminobenzoic acid
Benzyl butyrate	Flowers	Benzyl alcohol and butanoic acid

Procedure

Teach students to use the "safety sniff" when smelling something unfamiliar. Use the steps below to explore smells of scratch and sniff stickers, extracts or flavorings.

- Select a student to assist you with the experiment and blindfold them.
- Select a scratch and sniff sticker or extract. With your assistant blindfolded, wave the "activated" sticker or extract gently below the person's nose. Ask if the blindfolded person can tell what the scent is. Do this with as many scents as you have. Keep record of your assistant's responses.
- Wave two or three different scents below your assistant's nose at the same time. Ask if the assistant can now distinguish more than one scent. List all responses.
- Try this with other students in your class. You may also wish to have students form small groups and work together. Who seems to have the best olfactory discrimination? Can you list reasons why this might be true?
- Your natural gas company may have mercaptan stickers to use in class, or you can order stickers from *nef1.org/store*. It is a scent you will not forget.

Discussion

Conduct a class survey. Determine what your class thinks are the best scents and the worst scents. Why?

What memories or recollections come to mind when you smell a particular scent? Why do you think your brain stores "smell memory?"

To Know and Do More

Research how the odorant mercaptan is added to natural gas.