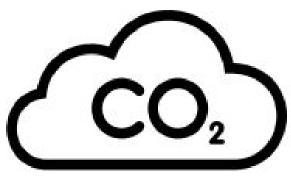


The Cave of Dogs!

PDQ1 - Catch That Gas!

Grades: 5-8 Time: 5 -15 minutes Subject: Chemistry Topics: Properties of Gasses, Chemical Reactions



Overview

Using simple tools and materials Carbon Dioxide (CO2) is generated and captured in a spectacular example of a chemical reaction! Once we know how to generate and capture CO2 we will put it to work in our grand Cave of Dogs simulation.

Background



Mixing baking soda and vinegar is an exciting demonstration of a chemical reaction and a great way to see physical and chemical changes. Work with CO2 to learn how it behaves like a gas, in what ways it can be harmful, how to control it, and how to measure it. Ready for some chemical fun? Let's explore further with databot[™]!

Objectives

Understand and Recognize:

- Different types of substances can "react" with one another to create a chemical change in the substances.
- Chemical reactions can cause physical and chemical changes in substances even creating gas where there was none before.
- CO2 can be generated through a chemical reaction of baking soda and vinegar.

What You'll Need

- 2 Liter Plastic Bottle
- 12" Round Balloons (3 or more recommended)
- White Vinegar (Acetic Acid)
- Baking Soda (Sodium Bicarbonate
- Measuring Cups
- Small funnels to help control the pouring of the reactants.
- Small binder clip or paper clip to pinch off the balloon.

Important Terms

Carbon Dioxide (CO2): A colorless, odorless gas naturally present in the air you breathe and is absorbed by plants in photosynthesis. *There would be no animal life or green plants without carbon dioxide. Green plants use energy from the sun plus carbon dioxide and water to produce carbohydrates and oxygen.*

Volume: The amount of space a substance takes up.

Chemical Reaction: This occurs when substances combine to produce one or more new substances.

Reactant: The starting substance that enters into a chemical reaction.

Product: The substance created in a chemical reaction.

Prep (5 mins)

- Use the QR code to Watch the Cave of Dogs PDQ1 video:
- Organize your reactants and materials for quick and easy access.
- Be aware that you don't want to accidentally combine your reactants before you are ready, so keep the baking soda (sodium bicarbonate) and vinegar (acetic acid) separate!
- Think about the order of your procedure in advance so you are prepared to execute smoothly!
- Be tidy and keep your workspace clean.



PDQ 1 (10 mins)

- Pour 1 cup of acetic acid (vinegar) into your 2 liter bottle using a funnel (Metric: use 250 ml of vinegar).
- Add 1/4 cup of sodium bicarbonate to your balloon (Metric: use 50 ml of baking soda). Use a separate funnel or carefully clean the one used for the vinegar to prevent an early reaction.
- Fix the balloon around the opening of your bottle.
- Carefully shake the sodium bicarbonate into the bottle and watch the reaction take place!
- Your balloon will fill with CO2. If you are planning on doing PDQ 2 in the same session, use your small binder clips from that activity to pinch off the balloon opening and preserve the CO2 for what's coming next!

Now that you know how to generate and capture CO2 in this fashion, additional experiments can be done!

Great Work!

PDQ 2 coming up! Ready. Set. Go.

Another PDQ!

Educator Resources

Prep

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NGSS _

• 5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Misconceptions _

Gases such as air and CO2 are invisible and as such, pose an interesting challenge for students to develop understanding. Activities in the Cave of Dogs module provide clear demonstrations about gases such as air and CO2 that will help students form a deeper understanding of the characteristics of gases.

- Air is weightless and floats.
- All gases are weightless

Guiding Questions

The following questions may or may not be appropriate for the age group you are working with so use your discretion.

- What are the states of matter?
- What states of matter do we see in our experiment here?
- What are the reactants in our experiment?
- What is the product?
- Is this a physical change or a chemical change?
- Does it appear we have created new substances in our experiment?
- How could we get our baking soda and vinegar back to normal?
- Do you suppose this experiment could be dangerous if we were careless? How?

Additional Resources:

How should the reaction between vinegar and baking soda be classified?

https://antoine.frostburg.edu/chem/senese/101/reactions/faq/classify-vinegar-bakingsoda.shtml

Misconceptions about science

http://modeling.asu.edu/modeling/KindVanessaBarkerchem.pdf

Why Does Vinegar and Baking Soda React?

https://www.stemmayhem.com/why-does-vinegar-baking-soda-react/

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