

Film Canister Rocket

Overview

Science Concept	Try It Out	ZOOMon: Change One Variable	Share Results
Chemical reaction	Launch a rocket with a film canister, baking soda, and vinegar.	<ul style="list-style-type: none"> • Amount of baking soda • Amount of vinegar • Amount of toilet paper • Shape of rocket 	<ul style="list-style-type: none"> • How long did the rocket take to launch? • How high did the rocket go? • What happened when you changed the amount of baking soda or vinegar? • How does the shape of the rocket affect how the rocket flies?

Science Scoop



What makes the rocket move? The force of the gas that's produced by the chemical reaction inside the film canister. When you mix baking soda and vinegar, a **chemical reaction** occurs. In a chemical reaction, the molecules you mix break up into atoms, and these atoms recombine to form new molecules. In this activity, the atoms in the baking soda molecules and the atoms in the vinegar molecules break up and recombine to make carbon dioxide gas molecules. (Carbon dioxide gas, CO₂, is the same gas you exhale.) As the chemical reaction continues, more carbon dioxide gas is produced. This increases the pressure inside the film canister. Eventually the pressure is so great that the top pops off of the film canister, and the rocket is launched!

If you use **less baking soda** or **less vinegar**, less carbon dioxide gas is produced. This smaller amount of gas may not produce enough pressure to pop the top off the canister.



An atom is a very tiny particle. It is the basic building block of everything in the universe, including you. Atoms combine to form molecules. For example, a carbon dioxide molecule is made of two oxygen atoms and a carbon atom.

Film Canister Rocket

If you use **more vinegar** and **more baking soda**, a greater amount of carbon dioxide gas is produced. As a result, the pressure builds up faster, and the rocket will launch more quickly.

The **toilet paper** works as a “time-release” packet, slowing the chemical reaction and giving you more time to put the top on the canister. If you eliminate the toilet paper, the chemical reaction will happen faster. If you use more toilet paper, it will take longer for the vinegar to pass through the toilet paper and reach the baking soda. This slows the chemical reaction.

Set Up

- Watch the Film Canister Rocket video segment, and try the activity yourself before the meeting.
- Post the new ClubZOOM Board activities (see end of section).
- Set up a VCR and monitor to show the Film Canister Rocket video segment (optional).
- Collect materials for the ClubZOOM Box. For each kid make copies of the Film Canister Rocket activity handout and the Stay Tuned message (see end of section).



Materials		
For Each Pair <ul style="list-style-type: none"> • empty film canister with lid (clear or black plastic canister) • sheet of construction paper • markers • 2 squares of toilet paper • Film Canister Rocket handout (see end of section) • Stay Tuned (see end of section) 	To Share <ul style="list-style-type: none"> • baking soda • vinegar • scissors • spoons • clear tape • newspaper • ZOOM Challenge (see end of section) 	For Demonstration <ul style="list-style-type: none"> • zipper-lock plastic bag <p>Have extra materials available so the kids can test different variables.</p>

Find Out More



Eyewitness Books: Chemistry

Newmark, Ann. London: Dorling Kindersley Publishing, Inc., 1993.

Read about chemical reactions, rates of reaction, and other introductory chemistry topics.

Fun with Mixing and Chemistry

Dworkin, Heidi Gold. New York: McGraw-Hill, 2000.

An introduction to chemistry, this book provides a good background for the Film Canister Rocket activity and includes other similar experiments for ages five and older.



Baking Soda + Vinegar = Bubbles

kids.science.about.com/kids/kids/science/library/weekly/aa072697.htm

This site talks about the chemical reaction that occurs when vinegar is mixed with baking soda. It also provides links to other chemistry sites for kids.

Bubble Bomb

http://www.exploratorium.edu/science_explorer/bubblebomb.html

This site has a recipe for making a “bubble bomb” using baking soda and vinegar in a zipper-lock plastic bag.

Run the Meeting

1 Kick Off the Meeting (5 minutes)

Welcome the kids and ask for a volunteer to decipher the Stay Tuned. (*Answer: Make a rocket blast off!*)

Then have another volunteer read the ZOOM Challenge.

2 Try It Out (15 minutes)

◆ Ask the kids if they know what happens when you mix baking soda with vinegar. Then introduce them to the chemical reaction that happens inside the rocket by trying this: Wrap two squares of toilet paper around two teaspoons of baking soda. Put the packet inside a zipperlock plastic bag. Add about $\frac{1}{4}$ cup of vinegar and seal the bag as quickly as possible. (You might want to squeeze the packet to mix the ingredients and speed up the chemical reaction.) What happens? The bag expands as it fills with carbon dioxide gas, which is produced by the reaction between the vinegar and baking soda.

◆ Organize the kids into pairs. Distribute the activity materials and assist the kids as they build their rockets.

CAUTION: While this is not a dangerous activity, the kids should stand back when they launch their rockets, and they should not point them at anyone.

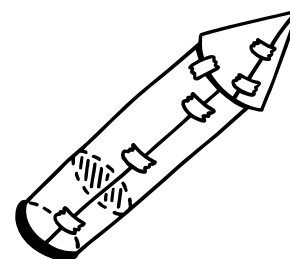
3 ZOOMon (10 minutes)

Ask the kids to think about variables they could change that might affect their rocket's launch. What happens if they change the amount of **baking soda**? What happens if they change the amount of **vinegar**? What happens if they change the amount of **toilet paper**? What happens if they change the **shape of the nose cone**? Make sure they change only one variable at a time. Ask them to predict what they think will happen before they test it out.

Activity Tips



- Kodak will donate film canisters for educational purposes. Contact the Plastic Business Unit Manager at Eastman-Kodak
- Since this can be a messy activity, have the kids cover their work areas with newspapers or do the activity outside.
- If the tops aren't put on completely or quickly enough, the carbon dioxide gas can escape and the rocket won't launch. Have pairs work together to put on the canister tops.



4 Share Results (10 minutes)

Have the kids draw conclusions about their rocket results.

- **How high did the rockets go?**
- **What changes did you make to get the rocket to travel higher?**
- **What happened when you changed the amount of baking soda or vinegar?**
- **What happened when you changed the shape of the rocket's nose cone?**
- **Why do you think some rockets launched differently than others?**

Have the kids write or draw their results on the back of their activity handouts. If they have difficulty, use the questions above to guide them. Then have the kids post their results on the ClubZOOM Board.

Send It to ZOOM!

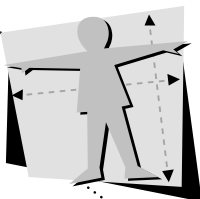
Remind the kids to send their results and ideas about **film canister rockets** to ZOOM. They can do this by mailing their activity handouts to ZOOM or by visiting the ZOOM Web site at pbskids.org/zoom/sendit/sci-exp.html

**5 Wrap Up** (5 minutes)

Hand out the activity stickers and the Stay Tuned coded message for the next meeting.

Don't Forget Square or Rectangle!

Remind the kids to keep collecting data to add to the Data Chart. Have they measured **family members** yet?

**ZOOM Links**

Visit the Zoom Web site and keep exploring how you can use **chemical reactions** to make things go:

Film Canister Rocket

pbskids.org/zoom/sci/filmcanrocket.html

Visit the online version of Film Canister Rocket to see the results posted by other kids.

Soda Bottle Boat

pbskids.org/zoom/sci/sodabottleboat.html

Make a boat that's powered by vinegar and baking soda.

Submarine Race

pbskids.org/zoom/sci/subrace.html

Build a submarine that will sink and come back to the surface.



Challenge

Dear ClubZOOMers,

Try out this challenge from Meghan S.

and Lee M. of College Station, Arkansas:

Launch a rocket by mixing baking soda and vinegar. How **high** can you make your rocket go?

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Film Canister Rocket

- What You Need:**
- empty film canister with lid
 - construction paper
 - tape
 - scissors
 - baking soda
 - vinegar
 - some toilet paper
 - spoon



Science Scoop

When you mix baking soda and vinegar, a **chemical reaction** happens. In a chemical reaction, the molecules you mix **break up** into atoms, and these atoms **recombine** to form new molecules. In this activity, the atoms in the baking soda molecules and the atoms in the vinegar molecules recombine to make **carbon dioxide gas molecules**. (Carbon dioxide gas, CO_2 , is the same gas you **exhale**.) As the chemical reaction continues, **more** carbon dioxide gas is produced. This makes the **pressure** inside the film canister greater. Eventually the pressure is so great that the top **pops off** of the film canister, and the rocket is **launched!**

1 Roll a piece of paper around the film canister once so that it makes a long tube.

2 Make sure that the **cover** of the film canister **sticks out** of one end of the tube. **Tape** the paper in place.

3 Make a **nose cone** by cutting a circle out of paper.

4 Cut a line from the edge of the circle to the middle of the circle, and **twist** the paper into a cone shape.

5 Tape the cone together. Then tape it on the **open end** of the paper tube.

6 Pour some **vinegar** into the film canister.

7 Put some **baking soda** in the center of two squares of toilet paper. **Fold** the toilet paper to make a "**fuel packet**."

8 Place the fuel packet in the canister and **put** the cover on quickly.

9 Set the rocket down so that the nose cone points up, and stand back. **Blast-off!**

Sent in by Megan S. and Lee M. of College Station, AR

CAUTION:
Be careful when launching your rocket. Stand back and don't point it at anyone.



Try It Out!



Think about one thing you can change about the rocket.

What happens if you use different amounts of **baking soda**?

How about if you launch a rocket without a **nose cone**? What if you don't use **toilet paper**? Choose **one thing** to change (that's the variable).

Then **predict** what you think will happen, and **test** it. Send your results to ZOOM.

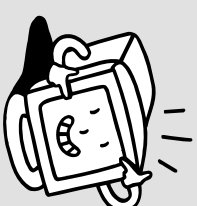
Send your ideas to ZOOM!

Dear ZOOM,

Here's what happened when I made a film canister rocket:



Write or draw here.



Send an e-mail:

pbskids.org/zoom/sendit

Then instantly print out a copy of ZOOMerang—a news-letter-filled with cast trivia and lots of fun ZOOM activities.



Or, send a letter:

ZOOM
Box 350
Boston, MA 02134

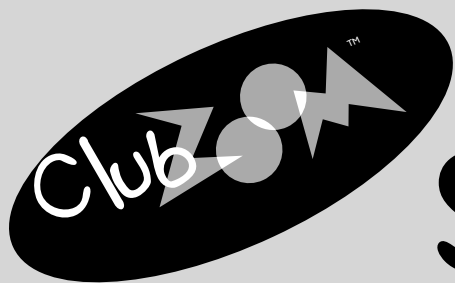
Don't forget to include your name and return address so we can send you a copy of ZOOMerang.

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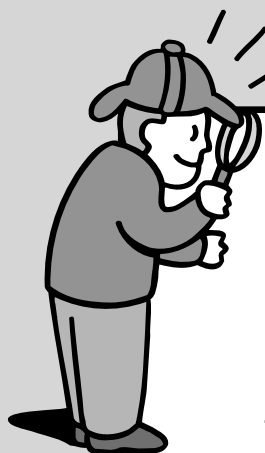
pbskids.org/zoom



Stay Tuned

At the next meeting,
you'll be challenged to:

--.. .-. --- .-.-.
 .- -.
 . ---. ---.
 .-.- .. - --- ..- -
 -... .-. . .- -.- .. - - -
 .. -



Crack the Code

Read the message by learning the **Morse Code**.

Here's how it works:

Each letter of the alphabet is represented by a symbol that is made up of dots and dashes. The letters of the message are replaced with the symbols. For example, here's how "SEND IT TO ZOOM" looks in Morse Code:

...	. - . - .	SEND
..	-	IT
-	---	TO
- - .	--- - - -	ZOOM

To translate a message in Morse Code, find the letters that match the symbols.

A .-	G ---.	M --	T -
B -...	H	N --.	U ...-
C -.-.	I ..	O ---	V ...-
D -..	J .- - -	P .- - .	W .- -
E .	K -.-	Q - - . -	X - . .
F .. - .	L . - . .	R . - .	Y - . - -
		S ...	Z - - . .

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Hand-Foot Coordination

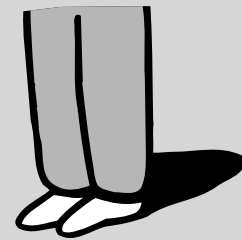
Try It Out!

Do most **right-handed people** start to **walk** with their **right feet**?

Do most **left-handed people** start to **walk** with their **left feet**?

Take a **survey** and find out!

Sent in by Megan L. of Reading, MA



Invert Circle

Try It Out!

Hold hands with a group of people in a **circle**. Can you **turn yourselves around** without letting go of your hands?

Sent in by Carter and Kyra O. of Charlotte, NC



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Zoe K. and Caroline V. of Richmond, Virginia, are members of the ZOOMteam. They **cleaned their local park** last spring.

When the snow melted, Zoe K. and Caroline V. collected broken sleds and other trash. They got muddy, but it was worth it!

The park looks beautiful again.



pbskids.org/zoom



Join the ZOOMteam!

Visit the ZOOM Web site for ideas on how you can volunteer. Then tell us what you did, and we'll send you a **free** ZOOM Into Action wristband and iron-on T-shirt decal.

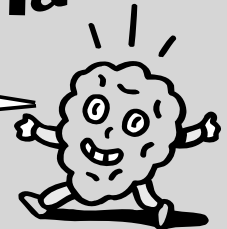
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What do you get when you cross a skunk and a police officer?

Ha-Ha-Ha-Ha-Ha!

Law and odor!



Hee-Hee-Hee-Hee

Sent in by Keldi S. of Ellinwood, KS

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