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FILM CANISTER EXPLOSIONS

EXPERIMENT GUIDE

as seen on YouTube™

POWERED BY Steve Spangler SCIENCE

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FILM CANISTER EXPLOSIONS

How do you fuel a film canister rocket with that famous bubbling tablet? When you have gas building-up in an enclosed space, what happens? Wait... don't answer that. More specifically, what happens when CO_2 builds up in a closed film canister? Simple – an explosion so fun you won't want the popping to stop. You'll create a simple chemical reaction within the closed film canister. As it builds carbon dioxide gas, you'll feel yourself prepping for the big launch!

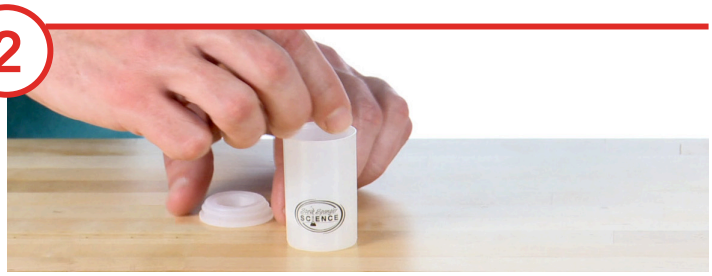
WHAT YOU NEED

- WATER
- FILM CANISTERS
- FLAT FIZZERS
- ADULT SUPERVISION
- SAFETY GLASSES

1

Fill the film canister approximately 1/4 full with water.

2



Put on your safety glasses, add a flat fizzer to the canister then place the cap on and flip it over. Stand Back!

!

3

Try setting off multiple reactions using more canisters.

THIS EXPERIMENT

SCAN TO WATCH

For step by step experiment instructions, the science behind it and ways to take it further, scan the code to the left.

Trouble scanning? Follow the URL below.
http://spanglersci.com/107wsks34tzofz3t8

HOW DOES IT WORK

When the flat fizzer hits water, a chemical reaction takes place very quickly. Drop a piece into a glass of water and see for yourself. The bubbles are carbon dioxide gas (CO_2) and there's a lot of it! In the closed canister, the CO_2 builds up so much pressure that the lid is forcibly removed from the inside. With an Alka-Seltzer tablet, the CO_2 (the same gas that's in a can of soda pop) is produced as a result of a chemical reaction with the water. With a can of soda, the CO_2 is released as a result of opening the can or giving it a vigorous shaking. That's a physical change and offers a good contrast between a physical and a chemical change.

Look at the ingredients of Alka-Seltzer. You will find that it contains citric acid and sodium bicarbonate (baking soda). When you drop the tablet in water, the acid and the baking soda react to rapidly produce CO_2 gas. Gas pressure keeps building until finally the lid pops off. The lid of the canister is the outlet of least resistance for the gas pressure inside. Instead of the stronger sides or bottom bursting open, the lid pops off.

TAKE IT FURTHER

WHAT YOU NEED

- FILM CANISTERS
- CANISTER SPACERS
- FLAT FIZZERS
- WATER
- PETRI DISH
- ADULT SUPERVISION

1. Fill the film canisters 1/4 full with water.
2. Drop one of the spacers into each film canister. This spacer was designed specifically for these canisters in order to prevent the Flat Fizzers from touching the water. Make sure the water level is below the top of the spacer.
3. Carefully place a Flat Fizzer on top of each of the spacers.
4. Securely attach the caps to the film canisters. Be careful not to shake up the canister while you do this! At this point you have a film canister explosion that will only work once you turn them over. You can prepare as many as you want in this fashion without the worry of them launching too soon.
5. Place the film canisters cap side up into the bottom piece of the 4" petri dish. Set the top piece of the dish on top of the canisters.
6. When you are ready, grab both pieces of the petri dish and turn the whole setup over. Remove the bottom part of the dish (it should be on top now since you turned it over) and prepare yourself for a frenzy of flying film canisters!

ADDITIONAL INFORMATION

Once you get the hang of the procedure, the goal is to determine the best combination (and there really is one) of water to tablet size to canister space to achieve higher and higher pops. Is it more water and less tablet? The other way around? Equal portions? Is right side up better or worse than upside down? Do you want to pop the cap or launch the canister? What happens if the water temperature is raised? So many questions...so much fun science to test and discover! It sounds like science fair data collection at its best.

SCIENCE FAIR CONNECTION

Launching a film canister is tons of fun, but it isn't a science fair project. You can create a science fair project by identifying a variable, or something that changes, in this experiment. Let's take a look at some of the variable options that might work:

- Once you've mastered the film canister technique above, it's time to figure out how to make it go farther. For each trial, record the amount of water you use in the film canister (the variable changes), the weight of the tablet (use a kitchen scale for accuracy because this cannot change – it is your control), and the distance the canister traveled as a result. What amount of water mixed with a specific size of Alka-Seltzer tablet produces the longest distance?

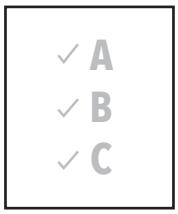
- After you've determined the best amount of water to use with this size of tablet, try changing the temperature of the water. How does temperature affect the speed of the reaction and the distance traveled?

That's just a couple of ideas, but you aren't limited to those! Try coming up with different ideas of variables and give them a try. Remember, you can only change one thing at a time. If you are testing different amounts of water, make sure that the other factors are remaining the same!

WHAT ARE THESE SYMBOLS ALL ABOUT?

LAB REPORT

In this section, you will learn to define and prepare your experiments like scientists do. You will ask big questions, develop hypotheses, list materials, write procedures, record results and make big discoveries.

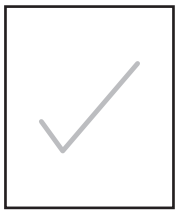


EXPERT VOCABULARY

In this section, you will learn to use the language scientists use to discuss and explain the concepts covered in this experiment.

CRITICAL THINKING

Follow the layers of critical thinking density with this icon. As the beakers fill from page to page, you will notice that the level at which the beaker is filled indicates the depth of critical thinking needed to complete the question(s), from least complex being the least full to most complex being the most full.



ASSESSMENT

In this section, you will find questions at a variety of levels which assess student understanding of the scientific content covered in the experiment.

A WORD ABOUT SAFETY

Everything we suggest using in this guide is safe when used with proper adult supervision. We guarantee young scientists will get a lot more from the experience if you're there to guide them. Remember, this is science, and science tends to get a bit messy. Stuff falls on the floor... so you'll need to clean it up. Don't put chemicals in your eyes or ears and don't eat your experiment. Trust us, they don't taste good and it's a bad thing to do. The bottom line is that this science experiment guide requires adult supervision and common sense. These simple concepts help ensure a fun and safe experience.

TEACHER NOTES:

SCIENCE CONCEPTS OVERVIEW ▸ Chemical Reaction

The learning experiences contained in the following Experiment Guide are designed to engage students and deepen understanding, not only of the underlying scientific concepts upon which these experiments/demonstrations are built, but also of critical thinking and problem solving skills. Teachers should allow students to actively participate in each activity as an investigation, where questions are being asked, hypotheses are developed and redeveloped, and where students own the discoveries. Vocabulary was included, assessments were created and critical thinking questions were designed with this underlying goal in mind.

The following are some suggested teaching points that could accompany this experiment/demonstration:

Sick Science Video: The Sick Science video can be used to introduce a scientific concept or in place of doing the demonstration/experiment if materials are unavailable. The video can also be used as a review or to help students complete the various learning experiences included in this guide.

Vocabulary: Students enhance their science-content related vocabulary. You may choose to introduce the vocabulary words and explicitly teach the meaning of each. You may also use the vocabulary words as an investigation, where students may research the meanings of the words. Finally, students may develop their own meaning for each word through their experience with the experiments and critical thinking work.

The Scientific Method: Students can complete a full lab report for the demonstration, including asking questions, identifying variables, forming a hypothesis, designing the experiment, collecting data, and drawing conclusions. Differentiation using the lab report is easy. For lower levels, complete the lab report as a class. As students are more independent, encourage students to work in partnerships or groups to complete the lab report. Eventually, students should be able to complete the lab report independently or design a new experiment using the form based on the demonstration completed in class.

Sequencing: Students will put the steps of the experiment/demonstration in the correct order. Older students should also include transitional phrases.

Summarize: Students will create a summary that includes the important ideas and details of the experiment/demonstration.

Synthesis: Students will create a new experiment using knowledge they have gained from the demonstration.

Literature Connection: Moonshot: The Flight of Apollo 11 by Brian Floca is a great text to engage students, especially if you refer to the film canisters as rockets. You can even decorate the film canister to look like a rocket and connect it to this text, which presents the facts about Apollo 11 in an engaging narrative style.

Informational Writing: Students will write a piece which explains the important safety protocols for this experiment/demonstration. They should remember to include safety materials and tips, and should support their ideas with facts and examples. Younger students should also use pictures and diagrams to explain their thinking. Students could also utilize available technology to create a safety video for fellow students or a neighboring class.

Lab Report

NAME

BIG QUESTION:
Scientists ask big questions to guide their experiment.

What big question are we answering in this experiment?

HYPOTHESIS:
Scientists make predictions about what they think will happen during the experiment.

What is your hypothesis for this experiment?

Lab Report

NAME

MATERIALS AND PROCEDURES:
Scientists make a list of materials they need and will use in their experiments. It is important other scientists are able to duplicate and test each other's experiments.

What materials do you need to conduct this experiment?

Write out a step-by-step procedure for this experiment.

Lab Report

NAME

RESULTS AND OBSERVATIONS:
Scientists make observations and take notes as they conduct their experiments. Scientists are good observers and record all results of their experiments. It is important to measure your results using precise units and careful review.

What were the results of your experiment?

What did you observe as you conducted your experiment?

Lab Report

NAME

CONCLUSIONS AND DISCOVERY:
Scientists look critically at their results and think carefully about their observations, drawing conclusions about their experiment as they relate it to their big question and original hypothesis.

What conclusions and discoveries did you make after completing the experiment?

NEXT STEPS:
Sometimes after scientists conduct their experiments, they think of new questions they want to test in new experiments.

What new questions do you have after you have completed your experiment?

Expert Vocabulary

NAME _____

WORDS AND DEFINITIONS —
Match the word on the left with the correct definition on the right by filling in the blank with the correct letter.

VOCABULARY WORDS	DEFINITIONS
1 ____ **Chemical Reaction**	A. The scientific name for baking soda.
2 ____ **Pressure**	B. Fizzing or bubbling that occurs when gas escapes from a liquid.
3 ____ **Effervescence**	C. A process that leads to a change from one chemical substance to another.
4 ____ **Carbon Dioxide**	D. A force that builds to create movement.
5 ____ **Sodium Bicarbonate**	E. CO_2

Critical Thinking

NAME

SEQUENCE —
Students will put steps in the correct order. Older students should include transitional phrases.

Write a note to a friend in another class that explains how to create an exploding film canister. Be sure to include step by step instructions, put them in the correct order, and include clear details.

Critical Thinking

NAME

SUMMARIZE —
Students will create a summary that includes the important ideas and details of the experiment/demonstration.

In your own words, explain what happens inside of the film canister once you mix the Flat Fizzer and water, then close the lid. Also, explain why this causes the film canister to launch into the air. You may use words and diagrams to help you explain your thinking.

Critical Thinking

NAME

SYNTHESIS —
Students will design a new experiment using the knowledge that they have gained from the experiment/demonstration.

Design and try a new experiment that would allow you to test ways to make the explosion bigger. Include a big question, hypothesis, procedure, data, and conclusion. Be sure that you change only one variable such as amount of water, water temperature, amount of Flat Fizzers, or brand of Flat Fizzers.

BIG QUESTION:
Scientists ask big questions to guide their experiment.

What big question are you answering in this experiment?

HYPOTHESIS:
Scientists make predictions about what they think will happen during the experiment.

What is your hypothesis for this experiment?

Critical Thinking

NAME

PROCEDURE —
Create a detailed procedure describing for the steps of the experiment. It is important other scientists are able to duplicate and test each other's experiments.

Procedure:

Assessment

NAME _____

ASSESSMENT QUESTIONS —
Read each question, then circle the letter next to the correct answer or write your response on the lines.

1. Which gas is produced from the reaction between the Flat Fizzers and water?
   a. Carbon Dioxide
   b. Oxygen
   c. Helium
   d. Sodium Bicarbonate

2. What causes the film canister to shoot away from the lid?
   a. The Flat Fizzer makes the water expand and pushes the lid off.
   b. Gravity pulls the water towards the ground while the water pushes the Flat Fizzer out of the film canister.
   c. The Flat Fizzer and water produce CO_2 gas, which builds pressure to push the lid off.
   d. The Flat Fizzer and water mix to create a magnetic field that pushes off the lid.

3. When do you see effervescence occur in this experiment/demonstration?
   a. When the water is in the film canister by itself.
   b. When the Flat Fizzer is still dry.
   c. When the water is dissolving the Flat Fizzer.
   d. When the film canister is flying through the air.

4. What type of reaction is it when the Flat Fizzers dissolve in water? How do you know?

   _____

   _____

   _____

5. Predict what you think might happen if you repeated the experiment using only half of a Flat Fizzer. Explain your thinking.

   _____

   _____

   _____

Expert Vocabulary - Answer Key

WORDS AND DEFINITIONS —
Match the word on the left with the correct definition on the right by filling in the blank with the correct letter.

	VOCABULARY WORDS	DEFINITIONS
1	C Chemical Reaction	A The scientific name for baking soda.
2	D Pressure	B Fizzing or bubbling that occurs when gas escapes from a liquid.
3	B Effervescence	C A process that leads to a change from one chemical substance to another.
4	E Carbon Dioxide	D A force that builds to create movement.
5	A Sodium Bicarbonate	E CO_2

Critical Thinking- Answer Key

SEQUENCE —
Students will put steps in the correct order. Older students should include transitional phrases.

Write a note to a friend in another class that explains how to create an exploding film canister. Be sure to include step by step instructions, put them in the correct order, and include clear details.

Possible Answer:

1. Fill a film canister half full with room temperature water.
2. Drop a full Flat Fizzer into the water and quickly put the cap on the film canister.
3. Shake the canister once and turn it upside down.
3. Step back and watch the film canister explode!

Critical Thinking- Answer Key

SUMMARIZE —
Students will create a summary that includes the important ideas and details of the experiment/demonstration.

In your own words, explain what happens inside of the film canister once you mix the Flat Fizzer and water, then close the lid. Also, explain why this causes the film canister to launch into the air. You may use words and diagrams to help you explain your thinking.

Possible Answer:
Once the Flat Fizzer hits the water, a chemical reaction takes place. The reaction releases carbon dioxide gas. When the lid is placed on the film canister, the carbon dioxide starts to build up and create a pressure. Eventually, the pressure builds up enough that it is able to push the cap off of the film canister which causes it to shoot in the air.

Critical Thinking- Answer Key

SYNTHESIS —
Students will design a new experiment using the knowledge that they have gained from the experiment/demonstration.

Design and try a new experiment that would allow you to test ways to make the explosion bigger. Include a big question, hypothesis, procedure, data, and conclusion. Be sure that you change only one variable such as amount of water, water temperature, amount of Flat Fizzers, or brand of Flat Fizzers.

BIG QUESTION:
Scientists ask big questions to guide their experiment.

What big question are you answering in this experiment?

Possible Answer:
How does the temperature of the water change the amount of time that it takes the film canister to explode?

HYPOTHESIS:
Scientists make predictions about what they think will happen during the experiment.

What is your hypothesis for this experiment?

Possible Answer:
I think that the film canister with hot water will explode the fastest because water molecules move faster when they are warmer.

Critical Thinking- Answer Key

PROCEDURE —
Create a detailed procedure describing for the steps of the experiment. It is important other scientists are able to duplicate and test each other's experiments.

Procedure:

Possible Answer:
Fill three film canisters half full with water. Use cold water in one canister, room temperature water in another, and hot water in the third. One at a time, drop the Flat Fizzers into the canisters, shake once, and put the lid on. Time how long it takes for each explosion to occur and record results.

Assessment - Answer Key

ASSESSMENT QUESTIONS —
Read each question, then circle the letter next to the correct answer or write your response on the lines.

1. Which gas is produced from the reaction between the Flat Fizzers and water?

   a. Carbon Dioxide
   b. Oxygen
   c. Helium
   d. Sodium Bicarbonate

2. What causes the film canister to shoot away from the lid?

   a. The Flat Fizzer makes the water expand and pushes the lid off.
   b. Gravity pulls the water towards the ground while the water pushes the Flat Fizzer out of the film canister.
   c. The Flat Fizzer and water produce CO_2 gas, which builds pressure to push the lid off.
   d. The Flat Fizzer and water mix to create a magnetic field that pushes off the lid.

3. When do you see effervescence occur in this experiment/demonstration?

   a. When the water is in the film canister by itself.
   b. When the Flat Fizzer is still dry.
   c. When the water is dissolving the Flat Fizzer.
   d. When the film canister is flying through the air.

4. What type of reaction is it when the Flat Fizzers dissolve in water? How do you know?

   Possible Answer: *The reaction between the Flat Fizzers and water is a chemical reaction. I know this because a chemical reaction cannot be reversed and there is no way to get the Flat Fizzer out of the water.*

5. Predict what you think might happen if you repeated the experiment using only half of a Flat Fizzer. Explain your thinking.

   Possible Answer: *I think the film canister would not go as high if I only used half a flat fizzer. I think this because there would be a smaller reaction happening which would produce less carbon dioxide. With less carbon dioxide, there would be less pressure and the film canister would not shoot up so high.*

Common Core State Standards

Student Outcomes	Standards
Students will be able to ask and answer questions about key details about their observations and discussion to demonstrate their understanding of the scientific concepts presented through the experiment.	RI.K.1, RI.1.1, RI.2.1, RI.3.1, RI.4.1
Students will be able to explain the connection between scientific ideas/interactions presented in the experiment.	RI.1.3, RI.2.3, RI.3.3, RI.4.3, RI.5.3
Students will be able to ask and answer questions to help determine the meaning of vocabulary presented as part of an experiment.	RI.K.4, RI.1.4, RI.2.4, RI.3.4, RI.4.4, RI.5.4
Students will be able to use information gained from observations of the experiment to demonstrate understanding of the concepts presented.	RI.3.7
Students will participate in shared writing projects and record scientific observations.	W.2.7
Students will be able to recall information from experiences to answer a question.	W.K.8, W.1.8, W.2.8
Students will be able to write an informative/ explanatory text that includes facts.	W.K.2, W.1.2, W.2.2, W.3.2, W.4.2, W.5.2