

GIVE SPARK · HANDS-ON SCIENCE LAB

Fizzy Potions

Which ingredients make a potion fizz, and where do the bubbles come from?

Teacher Guide

Grades 2–5 · A Halloween chemistry lab · 50 minutes

FREE LAB

OVERVIEW

The lab at a glance

One lesson, one driving question and four quick tests that children help to choose.

THE DRIVING QUESTION

Which ingredients make a potion fizz, and where do the bubbles come from?

Children see the fizz first. The tests let them work out what caused it.

What children do

You open with a potion that fizzes when a liquid meets a hidden white powder. You tell the class it was one of two powders and one of two liquids. Children work out which pairs they would need to test to be sure, then run those four tests. They use the results to name your ingredients, and they brew a colored potion of their own.

What children learn

Mixing two substances can make a new substance. Baking soda and vinegar react and produce a gas called carbon dioxide, and the bubbles are that gas escaping. Other pairs only mix or dissolve, so no gas forms. Children learn that ruling a pair out takes a test, and that tests can only be compared when they are run the same way.

Success looks like

1. I tested each pair with the same amounts.
2. I recorded what I saw, including the tests where nothing fizzed.
3. I can explain that the bubbles are a gas that formed when two ingredients reacted.

Why four tests

Two powders and two liquids make four possible pairs. Testing all four combinations lets children compare every possible pair and identify which one produces the fizz.

TEST	POWDER	LIQUID	WHAT YOU SHOULD SEE	WHAT IT TELLS YOU
1	Baking soda	Water	Some powder dissolves. No fizzing.	Baking soda alone is not enough.
2	Baking soda	Vinegar	Fast fizzing and foam.	This pair makes a gas.
3	Salt	Water	The salt dissolves. No fizzing.	Not every powder and liquid fizz.
4	Salt	Vinegar	The salt slowly dissolves. No fizzing.	Vinegar alone is not enough.

AT A GLANCE

Time: 50 minutes.

Grouping: pairs or groups of three, each with a tray.

Standards link: supports NGSS 5-PS1-4, investigating whether mixing substances makes new substances. Younger classes can focus on observing and comparing.

SESSION PLAN

STAGE	MIN
The teacher's potion	5
Which pairs should we test?	7
Test four pairs	13
Bubbles and the reveal	8
Brew your own potion	12
Clear away	5
Total	**50**

THE STUDENT RESOURCE

A separate two-page PDF. Page 1 is the Potion Lab recording page. Page 2 is My Magic Potion, a short page children can finish in the lesson.

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PREPARATION

Get ready

What to gather, the amounts to use and what the fizz will really look like.

Materials

For each pair

- A tray to catch spills
- 5 small clear cups, 4 numbered for the tests and 1 larger cup for the potion
- A ½ teaspoon measure and a tablespoon measure
- Small labeled pots of baking soda and salt
- A cup of white vinegar and a cup of water, both labeled
- Safety goggles for each child
- The two student pages

For you

- A cauldron, jar or large cup on a deep tray for the opening
- Baking soda, vinegar and food coloring
- Paper towels

Amounts that work

USE	POWDER	LIQUID
Each of the four tests	½ teaspoon	2 tablespoons
A potion for each pair	1 teaspoon baking soda	¼ cup vinegar with 2 drops of food coloring
Your opening potion	1 tablespoon baking soda	¾ cup vinegar with a few drops of food coloring

A small squirt of dish soap in the vinegar makes a thicker foam that lasts longer. The soap does not cause the reaction. It traps the gas in bubbles, so tell children this if you use it.

Set up the opening

Before children arrive, put the tablespoon of baking soda in the cauldron where it cannot be seen. Pour the colored vinegar into a jug. Children should see a liquid go in and a fizz come out, with no clue yet about the powder.

What the fizz will look like

In a cup, 1 teaspoon of baking soda with ¼ cup of vinegar fizzes up quickly and settles in well under a minute. It is a lively fizz and not an overflow. For a foam that climbs out of the container as on the cover, use your opening amounts in a narrow jar on a deep tray and add a squirt of dish soap to the vinegar.



One tray for each pair. Label every pot and cup before the lesson.

SAFETY

Children wear goggles. Vinegar stings eyes and any small cuts on hands.

Nobody tastes anything, even though the ingredients come from a kitchen.

Keep cups on the tray. Food coloring stains clothes and tables.

WHY LABEL EVERYTHING

The two powders look alike, and so do the two liquids. Children can only trust a result if they know what went into each cup.

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Run the lesson

A mystery fizz, a test plan the class reasons out and a reveal that the evidence has to support.

The teacher's potion 5 MINUTES

DO Say a few magic words and pour the colored vinegar into the cauldron. Let the foam rise and settle, then ask what children saw and heard.

SAY *"My potion used one of these two powders and one of these two liquids. Your job is to find out which pair makes the fizz."*

Which pairs should we test? 7 MINUTES

DO Hold up the baking soda, the salt, the water and the vinegar. Give pairs two minutes to decide which powder and liquid they would mix first and why. Take three or four suggestions and write each pair on the board.

ASK "If that pair fizzes, are we sure about the other pairs? How many different pairs can we make?"

Draw out all four pairs and show that they match the table on the student page. Every cup gets ½ teaspoon of powder and 2 tablespoons of liquid. Children circle the test they predict will fizz.

Test four pairs 13 MINUTES

DO Pairs put ½ teaspoon of powder in each numbered cup, following the table. They add 2 tablespoons of liquid to one cup at a time, watch until nothing is changing and record what they see before they start the next cup.

Bubbles and the reveal 8 MINUTES

DO Collect results by a show of hands for each test. Then ask the class to name your powder and your liquid, and to say which results prove it.

ASK

- "Which test tells us the powder was not salt? Which tells us the liquid was not water?"
- "There was no gas in either cup before. Where did the bubbles come from?"

SAY **Reveal the baking soda box and the vinegar bottle.** *"When baking soda and vinegar mix, they react and make new substances. One of them is a gas called carbon dioxide. The bubbles are that gas pushing its way out of the liquid."*

Brew your own potion 12 MINUTES

DO Pairs put 1 teaspoon of baking soda in the larger cup. They add 2 drops of food coloring to ¼ cup of vinegar, pour it in and watch. Partners tell each other what their potion does. Then each child completes page 2, which asks for a name, a drawing, the real recipe and one science sentence.

Leave 5 minutes to clear away. Everything can be rinsed down the sink with plenty of water.

LOOK FOR

Children who use the tests with no fizz as evidence. "It was not salt, because salt and vinegar did nothing" shows more than naming the pair that fizzed.

IF THE FIZZ DOES NOT HAPPEN

Test 2 does not fizz. The cup probably holds salt, or water was added. Check the labels and run it again in a clean cup.

A different test fizzes. A spoon or cup has carried baking soda or vinegar across. Rinse, dry and repeat that one test.

The fizz is weak. Old baking soda loses strength. Use a fresh box.

IF THIS HAPPENS

Test 1 shows a few tiny bubbles. That is air trapped in the powder. Ask children to compare it with test 2.

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The science behind it

What is happening in the cup, how to adjust the lab and how to see what children learned.

What is happening in the cup

Baking soda is a solid called sodium bicarbonate. Vinegar is water with a small amount of acetic acid in it. When they meet, the acid and the baking soda react. The reaction makes carbon dioxide gas, water and a salt called sodium acetate that stays dissolved in the liquid.

The gas is the important clue. It was not in either cup before, so a new substance has formed. Scientists call this a chemical reaction. The mixture also takes in a little heat from its surroundings, which is why the cup can feel slightly cooler.

The other tests show mixing without a reaction. Salt dissolves in water and in vinegar, and it could be recovered by letting the liquid dry up. Baking soda needs an acid to fizz, so water alone does very little.

Support and challenge

Support. Younger classes can run the four tests as a whole-class demonstration first, then repeat test 2 in pairs. Children can draw what they saw in each cup.

Challenge. Ask older children whether the powder or the liquid runs out first in their potion, and how they could find out by adding a little more of each to two cups.

Ideas children often bring

A CHILD MIGHT SAY	YOU COULD RESPOND
“The bubbles were hiding in the vinegar.”	Look at the cup of vinegar on its own. Bubbles only appear when the baking soda is added.
“It is boiling.”	Boiling needs heat. Feel the cup and compare it with your hand.
“Any powder and liquid will fizz.”	Point back to tests 1, 3 and 4. Which results show that is not true?
“The baking soda disappeared, so it is gone.”	It changed into new substances. The gas left the cup and the rest stayed in the liquid.

ASSESSMENT

Use page 1 and the discussion.

Testing fairly: same amounts in every cup.

Using evidence: names a test that rules out salt or water.

Explaining: says the gas is new and names the pair that made it.

TAKE IT FURTHER

More of what? When a potion stops fizzing, add a little more baking soda to one cup and a little more vinegar to another. Which one restarts it?

Catch the gas. Stretch a balloon over a small bottle of vinegar with baking soda inside the balloon, then tip it in.

Another powder. Test flour with vinegar and predict the result first.

ANY TIME OF YEAR

Swap the cauldron for a volcano, a science beaker or a dragon’s egg. The tests stay the same.

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Potion lab

Which ingredients make a potion fizz, and where do the bubbles come from?

Name _____ **Date** _____

1 My prediction

I think test number _____ will fizz because

_____

2 Test each pair

Put ½ teaspoon of powder in the cup. Add 2 tablespoons of liquid. Watch until nothing is changing, then write what you see.

TEST	POWDER	LIQUID	WHAT I SAW	DID IT FIZZ?
1	Baking soda	Water		Yes No
2	Baking soda	Vinegar		Yes No
3	Salt	Water		Yes No
4	Salt	Vinegar		Yes No

3 The teacher's potion

I think the powder was _____ and the liquid was _____.

I know it was not salt because

_____

I know it was not water because

_____

4 Where did the bubbles come from?

_____

_____

Stay safe. Wear your goggles. Keep your cups on the tray. Do not taste anything.

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My magic potion

Invent a potion. Use real science to make it fizz.

Name _____ **Date** _____

1 Name of my potion

2 Draw your potion fizzing

Tell your partner what your potion does. You do not need to write that part.

3 The real recipe

Write the two real ingredients and how much of each you used.

_____ of _____

_____ of _____

4 The science in my potion

My potion fizzes because

_____

_____

More to write? On the back, write the steps for brewing your potion so someone else could make it.

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