A 4D BOOK

CHEMISTRY

PROJECTS TO BUILD ON

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BUBBLE AND POP!

Hiss, pop, whoosh! Chemists are always studying matter and how it changes. Gas bubbles, growing things, and frozen crystals are all results of chemical reactions.

Learn the science behind these fizzy mysteries by re-creating them yourself. You may be starting out with balloons and bubbles, but keep on practicing. Someday your chemistry skills could get a good reaction!

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PROJECT 1

AIRHEAD

A chemical reaction occurs when two substances are mixed together to form something new. Become a chemist by mixing up your own reaction.

PROJECT 1, LEVEL 1

MAGIC BALLOON

What happens when you combine baking soda and vinegar? The results might surprise you!

YOU'LL NEED

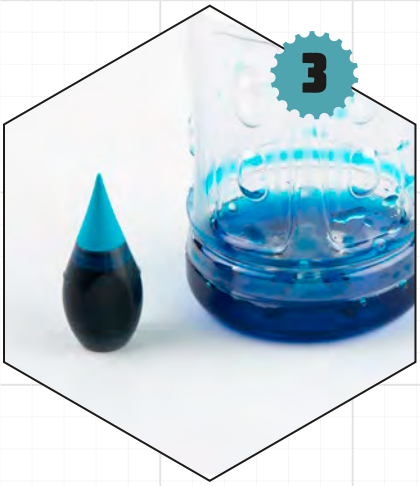
- small funnel
- 2 tablespoons (30 grams) baking soda
- balloon
- plastic water bottle, cap removed
- 2 tablespoons (30 milliliters) white vinegar
- blue food coloring

STEPS

1. Use the funnel to pour the baking soda into the balloon.
2. Set the funnel over the bottle. Pour the vinegar into the bottle, and then remove the funnel.

FACT Everything is made of tiny particles, or pieces, called atoms. Multiple atoms connect to make molecules. A molecule is the smallest unit of a substance, such as water or gas. For example, water is made of two hydrogen atoms and one oxygen atom—H_20. A single H_20 combination is a molecule.

3 Add a few drops of food coloring.



4 Stretch the mouth of the balloon over the opening of the water bottle. Be careful not to let the baking soda fall into the bottle.

5 When the balloon is secure, tip the bottle. The vinegar and baking soda should mix.

6 Set the bottle upright, and watch the balloon inflate.

FACT When baking soda (a base) and vinegar (an acid) are mixed together, they combine to form something new. This reaction makes a gas called carbon dioxide. The molecules in the gas rise and spread out. Gas molecules pushing against the inside of the balloon cause it to expand.

PROJECT 1, LEVEL 2

FIZZ-POWERED BOAT

The Magic Balloon collected all the energy created by the vinegar and baking soda. You can put that energy to work for you with this fizz-powered boat.

YOU'LL NEED

- utility knife
- plastic bottle with lid
- scissors
- drinking straw
- hot glue and hot glue gun
- ½ cup (120 mL) white vinegar
- 2 tablespoons (30 g) baking soda
- large tub of water

STEPS

1. Ask an adult to cut a small X in the bottom of the bottle. It should be about 1 inch (2.5 centimeters) from the bottle's edge.

FACT Expanding carbon dioxide gas pushes out of the bottle. The straw helps the gas escape. The escaping gas pushes the boat forward on the water's surface.

2. Cut a 6-inch- (15.2-cm-) long piece of straw. Push it halfway through the hole. Use hot glue to hold the straw in place.
3. Pour the vinegar into the bottle.
4. Add the baking soda. Screw on the bottle cap.
5. Tip the bottle to mix the vinegar and baking soda.
6. Place the bottle in the tub of water, and then watch your boat move!

FACT The scientific name for baking soda is sodium bicarbonate. Baking soda is called a base. When you mix baking soda and an acidic ingredient like vinegar, it creates carbon dioxide gas. In the kitchen, you mix baking soda with acidic ingredients like lemon juice, brown sugar, dairy products, or fruit. Those combinations make fluffy cakes and soft cookies.

PROJECT 1, LEVEL 3

SODA BURST

The Magic Balloon inflated as it collected gas. The straw in the Fizz-Powered Boat let the gas escape. But what happens when there is nowhere for carbon dioxide gas to go as it expands? Try this activity to find out.

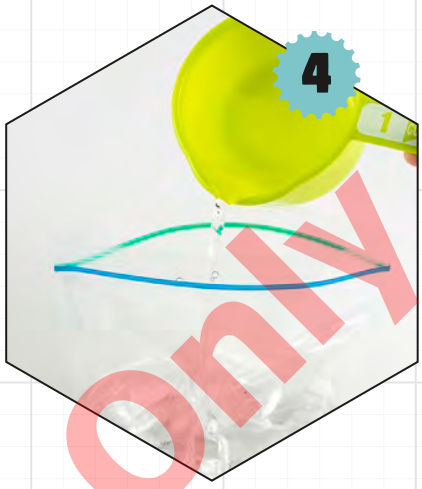
YOU'LL NEED

- scissors
- paper towel
- 1 ½ tablespoons (23 g) baking soda
- ½ cup (120 mL) white vinegar
- ¼ cup (60 mL) warm water
- food coloring
- sandwich-sized zip-top bag

STEPS

1. Find an outdoor space where it's OK to spill liquid.
2. Cut a paper towel into a 5-inch (13-cm) square.
3. Pour the baking soda into the center of the paper towel.

4. Fold the towel into a tight packet, with the soda in the center.
5. Pour the vinegar, water, and food coloring into the sandwich bag.
6. Place the paper towel inside the bag, but don't let it touch the vinegar and water.
7. Close the bag firmly.
8. Shake the bag. Set it quickly on the ground, and step away.



FACT In this experiment, the expanding gas has nowhere to go. It keeps expanding until the building pressure causes the bag to explode. The paper towel delayed the vinegar from reaching the baking powder, giving you enough time to safely set the bag on the ground.