Activity 5.3
Exploring baking powder

What are the active ingredients in baking powder?

In *Activity 5.2* baking powder was the only substance that reacted with water to produce a gas. Baking powder is not just a single substance. It is a combination of substances that, when mixed with water, react to release carbon dioxide gas. Baking powder can be made from baking soda, cream of tartar, and corn starch. In *Activity 5.2*, students tested these substances and others and kept a record of their observations. In this activity, students will use these recorded results to identify the substances in baking powder. They will then test combinations of these substances to find out which are the active ingredients in baking powder.

Materials needed for each group

Baking soda
Cream of tartar
Cornstarch
Water
3 Popsicle sticks
1 Dropper
3 Small cups

Notes about the materials

- **Be sure you and the students wear properly fitting goggles.**

Preparing materials

- Label 3 small cups **baking soda**, **cream of tartar**, and **cornstarch**.
- Place ½ teaspoon of each powder into its labeled cup.

Testing sheet

Make 3 or 4 copies of *Testing sheet 5.3—Exploring baking powder*, p. 272. (This page contains two testing sheets and each group will need only one.) You may choose to copy the testing sheets onto colored paper to give some contrast to the white powders. Be sure the paper you select is light enough that the labels can be easily read. Cut along the dotted lines and laminate each testing sheet. Once laminated, these testing sheets can be reused. Distribute the testing sheets when specified in the activity.

Activity sheet

Copy *Activity sheet 5.3—Exploring baking powder*, p. 273, and distribute one per student when specified in the activity. Students will need to refer back to their recorded observations on *Activity sheet 5.2—Using chemical change to identify an unknown*, p. 268.

Assessment

An assessment rubric for evaluating student progress during this activity is on pp. 305–307. For this formative assessment, check a box beside each aspect of the activity to indicate the level of student progress. Evaluate overall progress for the activity by circling either "Good", "Satisfactory", or "Needs Improvement".

Activity 5.3
Exploring baking powder

Question to investigate

What are the active ingredients in baking powder?

1. Have students identify the substances in baking powder.

Distribute *Activity sheet 5.3—Exploring baking powder.* Remind students that baking powder was a unique powder in *Activity 5.2* because it was the only one that bubbled when water was added to it. Tell students that baking powder is a combination of three substances and that some of the powders used in *Activity 5.2* can be combined to make baking powder.

Ask students to look back at their recorded observations on *Activity sheet 5.2—Using chemical change to identify an unknown*, to see whether they can identify substances that reacted similarly to baking powder. They should see how baking powder reacted with each test liquid, write that reaction down on *Activity sheet 5.3*, and then write the name of the powder that reacted similarly with that liquid.

Students should notice similarities like the following:

Test liquid	What did you observe when you added this test liquid to baking powder?	Which substance reacted in a similar way?
Water	Bubbled	None
Vinegar	Bubbled	Baking soda
Iodine	Turned black	Cornstarch
Cabbage	Pinkish-purple, then changed to blue; bubbled	Cream of tartar (Pinkish, but didn't turn to blue)

Baking soda, cornstarch, and cream of tartar each reacted in a similar way to baking powder when tested with the test liquids. Since students know that baking powder is made from a combination of different substances, they could agree that these substances might be baking soda, cornstarch, and cream of tartar.

2. Help students identify all the possible combinations of two powders that could be the active ingredients in baking powder.

Tell students that two of the three powders they identified are the active ingredients in baking powder. When these two powders are combined and water is added, they will bubble. To find which combination of powders are the active ingredients in baking powder, students will need to test the different combinations with water.

Ask students to figure out all the different combinations of two powders using baking soda, cornstarch and cream of tartar. Have students list these combinations on *Activity sheet 5.3.* The different possible combinations are:

Baking soda + Cornstarch
Baking soda + Cream of tartar
Cornstarch + Cream of tartar

Distribute laminated *Testing sheet 5.3—Exploring baking powder.* Students should recognize that the combinations of powders on the testing sheet are the same as the ones they figured out.

3. Have students test their combinations with water and identify the active ingredients in baking powder.

Ask students to suggest how they could test each set of powders. As a whole class, agree on a procedure. The following procedure is an example.

Procedure

1. Use a separate popsicle stick to place a small amount of each powder in its labeled area onto laminated *Testing sheet 5.3—Exploring baking powder.*
2. Use a popsicle stick to combine the powders in each area together to make three separate combinations of powder.
3. Use a dropper to add about 5–10 drops of water to each pile.

***Expected results*: Only the combination of baking soda and cream of tartar bubbles when water is added.**

4. Discuss student observations.

Ask students which combinations of powders bubbled when water was added. Then ask them to identify the active ingredients in baking powder.

Students should conclude that baking soda and cream of tartar are the active ingredients in baking powder. Cornstarch is also an ingredient in baking powder, but it is not involved in the reaction. Its purpose is to absorb moisture from the air so that the baking soda and cream of tartar don't react while in an open can. Tell students that cream of tartar is an acid. Remind students that vinegar is an acid too. This is why both cream of tartar and vinegar react with baking soda to produce a gas.

Students will explore cream of tartar and vinegar further in *Activity 5.7—Color changes with acids and bases*, pp. 285–288.

Testing sheet 5.3

Exploring baking powder

Baking soda + Cornstarch	Baking soda + Cream of tartar	Cornstarch + Cream of tartar

Testing sheet 5.3

Exploring baking powder

Baking soda + Cornstarch	Baking soda + Cream of tartar	Cornstarch + Cream of tartar