

New Substance Lab

Mix, collect, and compare a product property.

5-PS1-4 "Conduct an investigation to determine whether the mixing of two or more substances results in new substances."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Read the procedure. Circle amounts that must be measured. Underline each observation you will record. Conduct the investigation with your teacher.

Two solutions, one investigation

Prepare to investigate

Question: Does mixing baking soda solution and calcium chloride solution produce a new substance? Your teacher provides clear, room-temperature solutions, water, open cups, measuring tools, stirrers and filters. Wear splash goggles. Do not taste or touch the mixtures. Keep cups open. Wash hands afterward.

Before mixing, inspect both solutions. If either contains visible solid, ask the teacher to filter it before you begin. Label three cups A, B and C. Use clean tools so the cups do not contaminate one another.

Mix and record

1. Cup A: combine 20 mL baking soda solution with 20 mL water. Cup B: combine 20 mL calcium chloride solution with 20 mL water. These are comparisons.
2. Cup C: combine 20 mL of each solution. Swirl every cup gently for 10 seconds. Record what you actually see immediately and after one minute. Keep the cups at the same room temperature.
3. Pour Cup C through a coffee filter into a clean cup. Let the liquid drain. Ask the teacher to help rinse any trapped material with water. Label the filter and leave it to dry until the next class.

Test a property

At the next class, compare dissolving in water. With teacher help, put 0.1 g dry collected solid, 0.1 g fresh baking soda and 0.1 g fresh calcium chloride in three clean labeled cups. Add 25 mL water to each. Stir for one minute and record whether visible solid remains. If too little solid was collected, pool filtered material from matching class trials; record that change.

Use the comparison cups and the property test together to decide whether a new substance formed. A change in appearance alone is a clue, not a complete identification. Report unexpected results honestly. Do not claim a product name from color alone.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 Why must both starting solutions be clear before you mix them?

2 What do Cups A and B help you check?

3 Why use the same solid mass, water volume and stirring time in the property test?

3 YOUR TURN

Your own words

Complete the investigation and record your own observations below. Finish the conclusion only after the property test.

1. Compare the cups

Record A, B and C immediately and after one minute. Include any bubbles, cloudiness or visible solid. State if nothing changed.

2. Collect and compare

Record what filtering collected. For each of the three equal-water tests, say whether visible solid remained. Record any change to the procedure.

3. Make your conclusion

Decide whether your results support a new substance forming. Use one comparison-cup observation and the dissolving-property comparison. Explain how these support your decision and name one limit of the evidence.

PART 1 • READ AND MARK

Read the procedure. Circle amounts that must be measured. Underline each observation you will record. Conduct the investigation with your teacher. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Why must both starting solutions be clear before you mix them?	Otherwise an undissolved starting solid could be mistaken for a newly formed product.
2	What do Cups A and B help you check?	They check whether diluting either starting solution with water produces visible changes without mixing the two solutions.
3	Why use the same solid mass, water volume and stirring time in the property test?	It makes the dissolving comparison fair so differences are evidence about the substances rather than different test conditions.

PART 3 • YOUR TURN (SAMPLE ANSWER)**Example observations, not results to copy**

A and B stayed clear. C became cloudy with white particles and bubbles. Filtering C trapped a white solid.

In equal-water tests, baking soda and calcium chloride dissolved; collected solid remained visible. The starting clear solutions did not contain visible solid, and adding water separately did not produce it.

The results support a new substance forming when the solutions mixed. The collected solid behaved differently from both starting solids in water. Bubbles alone would not identify a product. These tests distinguish properties but do not prove a chemical name.

TEACHER ASSESSMENT NOTES

Teacher preparation: use classroom-grade reagents, not road salt. Dissolve 1 g baking soda in 40 mL water and 1 g calcium chloride in a separate 40 mL water per group. Calcium chloride dissolving warms water: prepare it in advance and cool both to room temperature. Filter any undissolved material. Supply extra clean water, six cups, measuring cylinders, stirrers, splash goggles, coffee filters, collection cups and a balance reading 0.1 g. Supervise mixing, rinsing and the next-class mass measurements. Calcium chloride may irritate eyes and skin. Follow reagent disposal guidance. The expected solid is calcium carbonate; its name is not inferred from whiteness. Accept conclusions qualified by actual results, including an inconclusive result needing a repeat. Adapted scientifically from ACS, Forming a Precipitate: acs.org/middleschoolchemistry/lessonplans/chapter6/lesson3.html. No molecular equations required.