

The Law of Conservation of Mass (2 Demonstrations)

Grade: 5

SEEd Standard 5.2.4

Use mathematics and computational thinking to provide evidence that regardless of the type of change that occurs when heating, cooling, or combining substances, the total weight of matter is conserved.

Supplies Needed:

For Both: Mass balance or kitchen scale

For Water/Sugar Demo:

Small cup or bowl
Water
Sugar (any small amount ~20 to 40 grams)
Plastic baggie
Spoon to stir

For Vinegar/Baking Soda Demo

Disposable water bottle, emptied of water (could use for the water/sugar demo)
Baking Soda (common, ~1tsp)
White Vinegar (common ~100 grams or 3-4oz)
Balloon

Instructions for Setup:

Water/Sugar Demo

1. Place an amount of water in the small cup or bowl. (warm dissolves the sugar faster, but cold is fine)
2. Place your amount of sugar in a plastic baggie.
3. Turn scale on. Wait for it to “zero” out, or tare.
4. Place cup or bowl of water, sugar in baggie, and spoon. (You’ll leave the spoon in the bowl after stirring so as not to remove any mass.)
5. Observe and record the total mass of all reactants and objects.
6. Combine the sugar into the water and stir to dissolve. Be sure to leave the baggie on the scale as well, as this will affect the total mass, and it was included in step 5’s total mass.
7. Observe and record the total mass again. They should be the same, even though it looks like the sugar disappeared!

Vinegar/Baking Soda Demo

1. Pour vinegar into the empty water bottle.
2. Place baking soda into the balloon.
3. Place balloon (holding the baking soda) and the bottle holding the vinegar onto the scale. Set them side by side. Do not attach balloon yet!
4. Observe and record the mass.
5. Take the balloon and carefully stretch the opening of the balloon over the mouth of the bottle. ***Caution** - Do not let any baking soda fall into the vinegar before the mouth of the bottle is sealed off by the balloon.
6. Lift the balloon so that all the baking soda falls to the vinegar simultaneously. Let go of the balloon and be sure it isn't pressing on any surfaces as it expands, such as the bottom of a cupboard or wall, as this will affect the mass observed.
7. After the balloon has expanded, and reaction has completed, observe and record the mass. It should be very, very close to original mass. If there is discrepancy, this can be explained through escaped gas from the imperfect seal of the balloon to the water bottle mouth, or imperfection of the scale. Emphasize this is a "closed system". All matter is still contained (as well as possible for the materials used).
8. Now remove the balloon, allowing the gas to escape, and lay the balloon on the scale. Is there a change in mass? This change is due to the molecules of gas escaping into the surroundings. This is now an "open system", where atoms can travel out to the surrounding areas.

All ingredients used may be safely disposed of down a drain with water.



*Both Sodium Bicarbonate and white vinegar may cause eye and respiratory irritation. Handle carefully, rinsing skin if contact occurs.