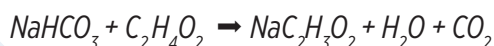


# Wait, Weight?

Name:

Chemical and physical changes are two ways to alter a substance. Remember in the case of a physical change, we alter the substance's state of matter or size, but the molecular structure remains the same. In a chemical change, the molecules rearrange to create a new molecule with new properties.

Take the interaction between baking soda (sodium bicarbonate) and vinegar (acetic acid). When the molecules interact, they rearrange to form carbon dioxide, sodium acetate, and water. We can use the chemical equation below to help us communicate and understand this rearrangement.



Look at the equation and count the number of atoms of each element for the reactants and the products.

	Reactants	Products
Sodium (Na)		
Hydrogen (H)		
Carbon (C)		
Oxygen (O)		
Total atoms		

**What do you notice about the number of atoms before and after the reaction?**

This balance between the reactants and products is something scientists have thought about and studied for hundreds of years. Even since the times of Ancient Greece, philosophers have held the idea that something cannot come from nothing. In the 18th century, many scientists and chemists sought to prove that this was true in chemical reactions. Their experiments were able to prove that the mass of the reactants is equal to the mass of the products in a chemical change. This idea became commonly accepted by scientists around the world as the law of conservation of mass.

Today, we want to test this law ourselves to see if it holds true for both chemical and physical changes.

## MATERIALS


- Ascorbic Acid solution
- Sodium Hydroxide Solution
- Indigo carmine
- Graduated cylinder
- Small bottle or flask
- Scale

### PART I — Ascorbic Acid Solution and Indigo Carmine

- ☐ 1. With a graduated cylinder, measure 25mL of the ascorbic acid solution and pour it into to a small bottle or flask.
- ☐ 2. Record physical observations for the ascorbic acid solution and indigo carmine in Table 1 below.
- ☐ 3. Zero the scale, making sure that there is nothing on top of it.
- ☐ 4. Place the flask of ascorbic acid solution and the weigh boat of indigo carmine onto the scale. Record the mass of the reactants and containers in Table 1 below under “Combined Mass”.
- ☐ 5. Add the indigo carmine to the ascorbic acid solution. Shake gently to combine.
- ☐ 6. Place the flask and the empty weigh boat onto a zeroed scale. Record your observations and record the combined mass in Table 1 below.

Table 1	State of Matter	Color	Combined Mass
Ascorbic Acid Solution			
Indigo Carmine			
Product			

### QUICK CHECK:

-  Indigo carmine is soluble in water. The ascorbic acid solution is mainly composed of water. With this information, what kind of change contributed to the observed color change? Why?

## PART II — Ascorbic Acid-Indigo Carmine and Sodium Hydroxide

- ☐ 7. With a graduated cylinder, measure 25mL of sodium hydroxide (NaOH).
- ☐ 8. Record physical observations for the sodium hydroxide and the ascorbic acid- indigo carmine solution in Table 2 below.
- ☐ 9. Place the flask with the ascorbic acid-indigo carmine solution and the graduated cylinder of sodium hydroxide on a zeroed scale.
- ☐ 10. Record the mass of the reactants and their containers in Table 2 below under “Combined Mass”.
- ☐ 11. Pour the sodium hydroxide into the ascorbic acid-indigo carmine flask. Be sure to set the flask and graduated cylinder back onto the zeroed scale.
- ☐ 12. Record your observations of the physical properties and record the combined mass in Table 2 below immediately and start a stopwatch.
- ☐ 13. Record your observations of physical properties and combined mass (flask and empty graduated cylinder) in 30 second intervals for a total of 3 minutes.

Table 2	State of Matter	Color	Combined Mass
Ascorbic Acid-Indigo Carmine Solution			
Sodium Hydroxide (NaOH)			
Product (0 min)			
Product (30 sec)			
Product (60 sec)			
Product (90 sec)			
Product (120 sec)			
Product (150 sec)			
Product (180 sec)			

### QUICK CHECK:

1. Does the NaOH cause a physical or chemical change with the ascorbic acid-indigo carmine solution? How do you know?
2. Does the change result in a change in mass? Why not?
3. When the now yellow solution reacts with oxygen, a chemical reaction occurs. Shake your flask and record what happens.