- Write the chemical equation for the production of water on the board. Ask students to label the reactants and the products. Now, reverse the equation and write it as \(2 \text{H}_2\text{O} \rightarrow 2 \text{H}_2 + \text{O}_2\) and ask students to again label the reactants and the products. Point out that a substance can be a reactant in one reaction and a product in another.

3. **Consolidate and Extend**

- After students complete **Investigation 9A**, ask them to consider Lavoisier's discovery of the Law of Conservation of Mass. How does this law apply to the investigation? When Lavoisier developed the Law of Conservation of Mass, he worked with closed systems. Ask students why they think it was important that the systems be closed. (Matter cannot enter or leave a closed system.)

- Have students complete the **Check Your Understanding** questions.

### CHECK YOUR UNDERSTANDING—SUGGESTED ANSWERS

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1. A

2. (a) physical change; Even though the water changes from a liquid to a solid, it is still water.
   (b) chemical change; The burned part of the bread has changed to a new substance.
   (c) chemical change; The brownish rust coating the nail is a new substance.
   (d) chemical change; A reaction between the water and the cement in concrete causes the concrete to harden.
   (e) physical change; The silver has changed from a liquid to a solid, but it is still silver.
   (f) chemical change; The rotten leaves have changed into a new substance.
   (g) physical change; The leaves have been cut into smaller pieces, but they are still leaves.

3. Water is a completely different substance than the elements that combine to make it. In a chemical reaction, the product has completely different properties than the reactants that combined to produce it.

4. A chemical equation is a model that uses chemical formulas to describe the substances that react and the substances that are produced.

5. (a) One atom of sulfur reacts with one molecule of oxygen to produce one molecule of sulfur dioxide.
   (b) Two molecules of sulfur dioxide react with one molecule of oxygen to produce two molecules of sulfur trioxide.
   (c) One molecule of nitrogen reacts with three molecules of hydrogen to produce two molecules of ammonia.

6. (a) (i) reactants: magnesium and oxygen; product: magnesium oxide
   (ii) reactants: water; products: hydrogen and oxygen
   (iii) reactants: methanol and oxygen; products: carbon dioxide and water
   (iv) reactants: aluminum and copper(III) chloride; products: aluminum chloride and copper
   (b) (i) \(\text{Mg} + \text{O}_2 \rightarrow \text{MgO}\)
   (ii) \(\text{H}_2\text{O} \rightarrow \text{H}_2 + \text{O}_2\)
   (iii) \(\text{CH}_3\text{OH} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}\)
   (iv) \(\text{Al} + \text{CuCl}_2 \rightarrow \text{AlCl}_3 + \text{Cu}\)
   (c) The masses of the products and reactants are not equal. In other words, the equations do not obey the Law of Conservation of Mass.

7. The Law of Conservation of Mass for a chemical reaction states that the total mass of the reactants is equal to the total mass of the products.

8. (a) 111.1 g calcium chloride
   (c) 96 g oxygen
   (b) 28 g nitrogen
   (d) 95.3 g aluminum chloride

9. A