

Lesson 7 Exercises

1. Possible answer: A chemical reaction is a change leading to the final substance or substances being different from the original substance or substances. Some of the signs that a new substance has formed include
 - color changes
 - formation of a new solid
 - formation of a gas
 - the release of energy as heat or light
 - an increase or decrease in the mass of material
 - a change in the texture of a material
2. Possible answer: The copper would always be present throughout the series of reactions. The copper could be in a different form after each reaction. For example, the copper could become part of a compound, then be dissolved in water, and then extracted and returned to its pure form.
3. Possible answer: A chemical reaction combined the zinc with part of the dissolved copper compound. The resulting zinc compound was also dissolved in water. The zinc was still present, but not as a pure element.

In fact, when the zinc was added, it formed a colorless solution of zinc sulfate and the copper came out of the solution as a precipitate.
4. Yes, the ingredients undergo a chemical change. The cookies are a different color and consistency from the cookie dough. These changes are present even after the cookies cool to room temperature.

As the cookies bake, the dough absorbs heat energy, which causes a chemical change in the ingredients of the dough. The composition of the cookies is very different from the original ingredients and from the dough.
5.
 - a. The baking soda is a solid, the vinegar is a liquid, the clear colorless liquid is a liquid, and the CO_2 is a gas.
 - b. Yes, the production of carbon dioxide gas is evidence that a chemical change has occurred after the original liquid and solid substances were mixed. The solution also becomes colder and the odor of the vinegar disappears—other indications of the chemical change.
 - c. Before the change, the sodium is in the solid baking soda. After the change, the sodium must be in the clear colorless liquid.

In fact, when baking soda is mixed with vinegar, the result is sodium acetate, CH_3COONa , dissolved in water.
6. Possible answer: Copper ore is crushed into a powder and changed to a copper sulfate solution by a chemical reaction. When an electric current passes through the solution, the copper metal comes out of the solution as copper deposited on a metal plate.