

# Lesson Outline for Teaching

## Lesson 4: Chemical Properties and Changes

### A. Chemical Properties

1. A(n) chemical property is a characteristic of matter that can be observed as it changes to a different type of matter.
2. The ability of a fuel to burn is one example of a chemical property, and the ability of iron to rust is another example.

### B. Comparing Properties

1. All matter can be described by using its physical properties and its chemical properties.
2. The difference in the types of properties is whether or not the matter changed identity while it was being observed.

### C. Chemical Changes

1. A(n) chemical change is a change in matter in which the substances that make up the matter change into other substances that have new physical and chemical properties.
2. New substances that are formed no longer have the same identity because they no longer have the same properties.

### D. Signs of Chemical Change

1. The formation of bubbles can indicate a chemical change.
2. Energy is released during a fireworks explosion because a chemical change occurred.
3. When fruit rots, changes in color and odor show that a chemical change occurred.
4. These signs of chemical change only show that a(n) chemical change might have occurred; some of these signs also occur during physical changes.
5. The only sure sign that a chemical change occurred is when new substances form.

### E. Explaining Chemical Reactions

1. Another name for a chemical change is a(n) chemical reaction.
2. A chemical reaction occurs when atoms rearrange during a chemical change.
3. A chemical reaction can be represented by a(n) chemical equation, which shows the chemical formula of each substance in the reaction.
  - a. A(n) arrow indicates that a reaction takes place.
  - b. The formulas to the left of the arrow in the equation represent the reactants, which are the substances that are present before the reaction began.
  - c. The formulas to the right of the arrow in the equation represent the products, which are the substances that are present after the reaction is complete.

## Lesson Outline continued

4. Chemical equations must be balanced, because mass is conserved during a chemical reaction.
    - a. When balancing a chemical equation, you cannot change the chemical formula of any reactant or product.
    - b. To balance the equation, numbers called coefficients are placed in front of the chemical formulas.
- F. The Rate of Chemical Reactions
1. Higher temperature usually increases rate of reaction because the particles move more quickly and collide harder.
  2. Concentration is the amount of substance in a certain volume. Reaction rate increases when concentration increases.
  3. Surface area affects reaction rate if at least one reactant is a solid. Reaction rate is faster if surface area is large.

### Discussion Question

What can a baker do to slow down the chemical reaction that causes bread to mold?

He or she can reduce the temperature at which the bread is kept or increase the concentration of anything added to keep the bread fresh.