

SCoPE Site Lesson Plan

Title: Lesson 11 – Do Molecules Change Their Nature? (SC070311)

Abstract

Students see additional instances of chemical changes. They identify chemical properties and review the distinction between chemical changes and physical changes, both in terms of the production of new substances and changes in molecules.

Subject Area: Science

Grade Level and Course Title: Seventh Grade/Movement of Energy Through Living and Non-Living Systems; Matter, Its Structure and Changes; From Atoms to the Universe

Unit of Study: Physical and Chemical Changes

Benchmarks

- Explain chemical changes in terms of reactants and products (IV.2.MS.2).
- Design and conduct scientific investigations to explore physical and chemical changes (I.1.MS.2).

Key Concepts

chemical change
chemical products
chemical reactants
physical change

Instructional Resources

Equipment/Manipulative

Blank transparencies
One cooked pancake
Pancake batter
Paper
Matches
Steel wool (2 pieces)
Transparency marking pens
Vinegar

Student Resource

Kahan, Janet, and Juliana Texley. *Unit 3 Lesson 11 Student Pages*. Teacher-made material.
Lansing, MI: Michigan Department of Treasury, 2004.

Teacher Resource

Aldridge, Bill et al. *Glencoe Science Interactions: Course 1*. New York: Glencoe, McGraw-Hill, 1998.

Sequence of Activities

Advance Preparation: Prepare a rusty piece of steel wool. To do this, submerge it in vinegar to remove the protective coating, then pat it dry with paper towels. You should be able to see the rust within 20 minutes, if not sooner. Prepare pancake batter and cook a pancake.

1. Use the first paragraph of the Student Pages to introduce the lesson. The fact that cooking changes the substance is not easy to understand. You might explain that at least cooking is not the same as melting, because in the case of an egg, something liquid turns into something solid when it is heated!
2. Review what students have learned already about physical and chemical properties using an unfilled table with the headings below as an overhead and the text in the Student Pages. Fill in the boxes as you discuss each point. Have the students fill in the table in the Student Pages as well.

Students should also complete the questions in the Student Pages to help them understand chemical changes.

| | |
|--|---|
| Physical Properties Color, texture, mass, volume, density, boiling point, melting point | Chemical Properties Reacts with indicators Could be acid or base |
| Physical Changes Melting, evaporation, condensation, solidifying, freezing Mixing, Dissolving Changes are reversible by mechanical means such as filtering, evaporating, cooling. Molecules stay the same. | Chemical Changes Produces new substances. Molecules change during chemical reactions. |

3. Continue the exploration of chemical changes by presenting three more examples. You can do them as slow, clear demonstrations or set up stations where the students can observe them. The Student Pages contain charts for observations. If you set up stations, students will need eye protection for the burning paper. This is Michigan state law.

Reaction 1: Burn a piece of paper. Have students record the changes they see. Ask students to identify the starting substances (reactants) and the ending substances (products). They know that one of the starting substances was paper. Ask them what else they know about fire [it cannot burn without oxygen]. So oxygen is the other starting substance. They can observe that the ashes produced by the burning have very different physical properties from the paper, and are probably therefore a different substance. [The other two ending substances are carbon dioxide and water, but these are hard to detect at this level of instruction.]

Note: It is important for students to know that carbon dioxide and water are produced during burning, as well as smoke and ashes. Paper is a compound of carbon, hydrogen and oxygen,

and the oxygen from the air also takes part in this chemical reaction. Therefore, the products need to contain each of these atoms – carbon, hydrogen and oxygen. The smoke and ashes may seem to account for the carbon. The carbon dioxide is a compound of carbon and *oxygen*, and the water is a compound of oxygen and *hydrogen*, accounting for the other two types of atoms.

Reaction 3: Show pancake batter and a cooked pancake. Have students record the differences they observe.

Reaction 2: Compare rusted and unrusted pieces of metal. Have students record the differences they observe. Ask them whether it appears that the ending substance (the rust) has different physical properties from the starting substance (the metal) and if that suggests that rust is a different substance than metal. [It is. Rust is a compound of iron and oxygen. Rusting requires oxygen from the air, just as burning does.]

4. After students have completed their observations and the questions on the Student Pages related to these chemical changes, ask if they want to add anything to the chart of physical/chemical properties and changes.
5. Close the lessons by using the summary at the end of the Student Pages.

Assessment

Question #1: Is burning a candle a physical or chemical change? How do you know? [Both! Wax and wick burn by combining with oxygen – a chemical change. But some wax melts and then hardens again, which is a physical change.] Question #2: Is dissolving sugar in tea a physical or chemical change? How do you know? [Physical, because 1) it does not produce a new substance, and 2) it can be reversed by evaporating the tea and separating the sugar from any tea particles left when the water evaporates.] Question #3: Is using a garbage disposal an example of changing the garbage through a physical or chemical change? How do you know? [Physical; the material is the same, just changed in size.] (An example of waste treatment that chemically changes the waste is what occurs in sewage treatment plants and septic tanks. Bacteria and chemicals are used to change the sewage to non-toxic substances.)

Application Beyond School

Ask students to think of examples of chemical changes they use or try to avoid at home. (Cooking, burning fuel to heat water, rusting of tools and cars – prevented by painting.)

Connections

Arts

While studying chemical change, students can learn about how many media materials such as paints, paper mache, and glazes undergo chemical changes. Some glazes and ceramics must be heated for the chemical change to occur properly.