



It's Magic! Bibbidi-Bobbidi-Boo!

Science

Physical Sciences

Changing mice into horses, pumpkins into carriages, is it possible? In the Cinderella story magic makes it happen, but can you?

National Standards > Science

NS.K-4.1, NS.5-8.1 Science as Inquiry (Grade 4) (Grades 5 & 6)

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

NS.K-4.2, NS.5-8.2 Physical Science (Grade 4) (Grades 5 & 6)

- Properties of objects and materials
- Properties and changes of properties in matter
- Position and motion of objects
- Motions and forces
- Light, heat, electricity, and magnetism
- Transfer of energy

Kentucky: Science > Physical Science

2. Students shall develop their abilities to apply core concepts and principles from mathematics, the sciences, the arts, the humanities, social studies, practical living studies, and vocational studies to what they will encounter throughout their lives.

Properties of Objects and Materials (2.2 Patterns of Change, 2.3 Systems, 2.4 Scale and Models, 2.5 Constancy, and 2.6 Change Over Time)

2.6 Students understand how living and nonliving things change over time and the factors that influence the changes.

(Grade 4)

SC-E-1.1.1 Objects have many observable properties such as size, mass, shape, color, temperature, magnetism, and the ability to react with other substances. Some properties can be measured using tools such as metric rulers, balances, and thermometers.

SC-E-1.1.2 Objects are made of one or more materials such as paper, wood, and metal. Objects can be described by the properties of the materials from which they are made. Those properties can be used to separate or classify objects or materials.

SC-E-1.1.3 Materials can exist in different states--solid, liquid, and gas. Some common materials, such as water, can be changed from one state to another by heating or cooling.

(Grades 5 and 6)

SC-M-1.1.1 A substance has characteristic physical properties (e.g., density, boiling point, solubility) that are independent of the amount of the sample. A mixture of substances often can be separated into the original substances by using one or more of these characteristic physical properties.

SC-M-1.1.2 The chemical properties of a substance cause it to react in predictable ways with other substances to form compounds with different characteristic properties. In chemical reactions, the total mass is conserved. Substances are often classified into groups if they react in similar ways.

SC-M-1.1.3 Chemical elements do not break down during normal laboratory reactions such as heating, exposure to electric currents, or reaction with acids. Elements combine in many ways to produce compounds.

Ohio: Science > Science > Physical Sciences

- Demonstrate an understanding of the composition of physical systems and the concepts and principles that describe and predict physical interactions and events in the natural world.
- Demonstrate an understanding of the structure and properties of matter, the properties of materials and objects, chemical reactions and the conservation of matter.
- Understand the nature, transfer and conservation of energy, as well as motion and forces affecting motion, the nature of waves and interaction of matter and energy.
- Demonstrate an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with the physical sciences.

Benchmark(s) Grade 4

A. Compare the characteristics of simple physical and chemical changes.

Benchmark(s) Grade 6

A. Relate uses, properties and chemical processes to the behavior and/or arrangement of the small particles that compose matter.

Note: Emphasis for Grade 5 is on the production and transfer of energy.

Ohio: Science > Science Inquiry Standard

- Develop scientific habits of mind [for] use of the processes of scientific inquiry to ask valid questions and to gather and analyze information.

Benchmark(s) Grades 4 & 5

B. Organize and evaluate observations, measurements and other data to formulate inferences and conclusions.

C. Develop, design and safely conduct scientific investigations and communicate the results.

Benchmark(s) Grade 6

B. Analyze and interpret data from scientific investigations using appropriate mathematical skills in order to draw valid conclusions.

Objective

Students will:

- Identify the characteristics of simple chemical and physical changes, and identify whether a given example is a chemical or physical change.

- Characteristics of physical changes may include one or more of the following:
 - Change in size
 - Change in shape
 - End with same substance you started with
 - Dissolving
 - Absorption
 - Change of state/phase (solid, liquid, gas)
- Characteristics of chemical changes may include one or more of the following:
 - Production of heat
 - Production of gas/bubbles
 - Production of light
 - Change in color
 - Burning
 - Production of new substance(s)

Assessment

Students will be able to:

- Compare similarities and differences between chemical and physical changes.
- Identify a change as chemical or physical using characteristics that accompany the change.

Sample items to gauge student understanding:

1. Circle all of the following that indicate a chemical change may have occurred?
 - a. Heat was produced
 - b. Change in size
 - c. Object changed shape
 - d. A new substance was produced
 - e. Gas was produced
 - f. Object changed color
 - g. Change is irreversible (*a, d, e, f and g*)

2. Cinderella is told to get a rose from the garden. During the day, when the sun is out, the rose bush experiences a process of photosynthesis. Photosynthesis uses the energy in sunlight to combine carbon dioxide and water into a sugar that the plant uses for food. The food that is created did not exist in the same form before the photosynthesis process occurred. The combination of carbon dioxide and water to form sugar is a _____ change? (*chemical*)

3. When Drizella realizes the beads on Cinderella's dress are her beads and rips them off of Cinderella's dress, she causes a chemical or physical change? Explain your answer. (*physical*)

Vocabulary

- Chemical change
- Physical change

Materials

- White board or chart paper
- Markers
- Paper for student lists

Activity 1

Constantly Changing

Students will need prior knowledge regarding the difference between chemical and physical change to complete the following activities. For background information and activities that may assist students, check the following Web sites:

- www.bbc.co.uk/schools/revisewise/science/materials/09_act.shtml
- www.spartechsoftware.com/reeko/Experiments/ExpSteelWoolGeneratingHeat.htm
- www.iit.edu/~smile/chbi9915.htm

Teacher will:

1. Introduce/review the differences between chemical and physical changes through class discussion, sharing of examples and demonstrations. The book, 100 Reproducible Activities – Chemistry, contains two reproducible pages (18 & 19) that assist with the understanding of physical and chemical properties as well as physical and chemical changes. (See, Instructional Fair Reproducibles. 100 Reproducible Activities – Chemistry. Grand Rapids: Instructional Fair, Inc. ISBN: 1-56822-187-8)
2. Have students brainstorm changes that happened throughout the Children's Theatre production of, Cinderella.
3. Explain that many of the changes in the play were due to magic.
4. Facilitate student discussion on the fact that there are many changes that take place in the every day world that are not magic, but can be classified scientifically as a physical or chemical change.
5. Have students brainstorm real changes that take place everyday, share, and record on a chalk board or on chart paper without identifying whether the changes are chemical or physical changes. *(Make sure that there are both chemical and physical changes on the list. If students are offering examples of one type of change more than the other, offer suggestions that will balance out the list.)*
6. Once a list is generated, review with students how one identifies a chemical or physical change.
7. Have students work in small groups to discuss the list of changes and record whether they believe the change is chemical or physical, and how the change occurred.
8. After student groups finish recording their answers, lead a class discussion for students to disclose their group's answers, and identify correct answers.

9. After students share and discuss their answers, have students identify and classify physical or chemical changes found present in the play and story of Cinderella.

Students will:

1. Review the characteristics of physical and chemical changes.
2. Work together in small groups to identify changes that take place in the Children's Theatre production, Cinderella.
3. Realize that many of the changes in Cinderella are magical.
4. Work in small groups to create a list of real world changes that occur in every day life.
5. Work in small groups to classify and record whether the class lists of every day changes are chemical or physical.

Self-Selected Reading Suggestions

DePaola, T. (1982) Strega Nona's Magic Lessons. New York: Harcourt Brace Jovanovich.

Activity Extensions

- An activity to accompany the self selected reading suggestion is found on pp. 206-210 of the following book: Butzow, C. M., and Butzow, J. W. (1989). Science Through Children's Literature – An Integrated Approach. Englewood, Colorado: Teacher Ideas Press.