

Terrific Matter Transformations

Grades: 5th–8th

Duration: 30 minutes

Program Description

Students will identify chemical and physical properties of matter and use their observational skills to identify chemical changes.

Louisiana GLEs:

Science

Grade 5-8 Science as Inquiry

1. Generate testable questions about objects, organisms, and events that can be answered through scientific investigation (SI-M-A1)
10. Identify the difference between description and explanation (SI-M-A4)
16. Use evidence to make inferences and predict trends (SI-M-A5)
21. Distinguish between *observations* and *inferences* (SI-M-A7)
23. Use relevant safety procedures and equipment to conduct scientific investigations (SI-M-A8)

Grade 5

4. Identify the physical and chemical properties of various substances and group substances according to their observable and measurable properties (i.e. conduction, magnetism, light transmission) (PS-M-A3)
6. Describe new substances formed from common chemical reactions (e.g., burning paper produces ash) (PS-M-A6)

English Language Arts

Speaking and Listening

Standard 4

32. Adjust diction and enunciation to suit the purpose for speaking
33. Use complete sentences and standard English grammar, diction, syntax, and pronunciation when speaking
35. Restate or describe oral directions/procedures for tasks
36. Adjust volume and inflection to suit the audience and purpose of presentations
38. Demonstrate active listening strategies
39. Deliver formal and informal presentations for a variety of purposes, including:
41. Participate in group and panel discussions

Grade 6

5. Compare physical and chemical changes (PS-M-A3)
9. Describe the properties of reactants and products of chemical reactions observed in the lab (PS-M-A6)

Key Terms:

Acid – This is anything that gives off H⁺ ions in water. Acids have a pH less than 7 and are good at dissolving metals. They turn litmus paper red and phenolphthalein colorless.

Aqueous – Dissolved in water

Anion – A negative ion

Base – A compound that gives off OH⁻ ions in water. They are slippery and bitter and have a pH greater than 7.

Cation – A positive ion

Chemical Change – A rearrangement of atoms and/or molecules to produce one or more new substances with new properties

Chemical Properties – Properties that can only be described by making a chemical change (by making or breaking bonds). For example, color isn't a chemical property because you don't need to change something chemically to see what color it is. Flammability, on the other hand, is a chemical property, because you can't tell if something burns unless you actually try to burn it.

Explanation: a meaning or interpretation

Hydronium Ion: The H^+ ion, made famous by acids.

Hydroxide Ion: The OH^- ion, made famous by bases.

Inference: the reasoning involved in drawing a conclusion or making a logical judgment on the basis of circumstantial evidence and prior conclusions rather than on the basis of direct observation

Indicator: A compound that turns different colors at different pH values. We generally like to have the color change at a pH of around seven because that's where the equivalence point of a titration is.

Ion – Atom that has lost or gained an electron giving it a positive or negative charge

Observation – An act or instance of noticing; an act or instance of regarding attentively or watching

pH – $-\log[H^+]$; the logarithm of the reciprocal of hydrogen-ion concentration in gram atoms per liter; provides a measure on a scale from 0 to 14 of the acidity or alkalinity of a solution (where 7 is neutral and greater than 7 is more basic and less than 7 is more acidic)

Polyatomic – A group that contains more than one atom but acts like a single ion

Physical Property – A property, which can be determined without changing something chemically. If that doesn't make sense, see the definition of "chemical change".

Products – Substance that react together to produce new materials in a chemical reaction; they are found on the right side of a chemical equation

Reactants – Substances produced from a chemical reaction; they are found on the left side of a chemical equation

Salt – An ionic compound that contains a metallic ion and a nonmetallic ion

Connections to Permanent Exhibits

Rocket Fuel: How is the hydrogen and oxygen produced? Is this a chemical or physical change?

Web Resources:

Changing Matter

Utah Department of Education

<http://www.usoe.k12.ut.us/curr/science/core/8thgrd/sciber8/matter/html/intro.htm>

A list of explanations and experiments to help students understand chemical and physical changes.

The Chem Collective...Online Resources for Teaching and Learning Chemistry

Carnegie Mellon

<http://www.chemcollective.org/applets/vlab.php>

This website allows the teacher to download an exciting interactive chemistry program called Virtual Lab Simulation. The Virtual Laboratory allows students to select from hundreds of standard reagents and manipulate them in a manner that resembles that of a real lab. It allows students to design and perform diverse experiments in acid-base chemistry, thermochemistry, solubility, and redox chemistry. This comes in Windows and Mac versions.

Creative Chemistry

Nigel Saunders

<http://www.creative-chemistry.org.uk/index.htm>

Great high school interactive website with games like balancing equations and puzzles to build vocabulary skills. There are also great teacher resources here like how to do fire writing and urine analysis.

Mixtures Lab

Harcourt School Publishers

<http://www.harcourtschool.com/activity/mixture/mixture.html>

An interactivity that allows students to choose tools to separate mixtures and then choose the characteristic of the material that allowed the separation.

Home Experiments Scifun.org
<http://scifun.chem.wisc.edu/HOMEEXPTS/HOMEEXPTS.html>

Simple experiments that can be done in the classroom and at home. This website outlines using cabbage juice indicators, polymers, bubbles, chemiluminescence's, polymers and density.

WebElements Periodic Table Mark Winter
<http://www.webelements.com/>

This is an interactive periodic table. Just click on an element and find out the name, symbol, atomic number, atomic weight, the number of isotopes, the group number, the group name, and the period number. It also provides a brief description, a picture of the element, and how it can be isolated. There may even be a downloadable movie of the element reacting with other elements or compounds. Along with all this there is a list of compounds formed from a specific element. When the compound is clicked it provides a description of the compounds, a chemical reaction for the synthesis of the compound and a picture of the solid state structure of the compound.

Chemistry Fun Page MdeA, Science Humor Webring
<http://www.angelfire.com/md2/chmfunpage/>

This is a list of fun high school, chemistry jokes. Students could be given the jokes and asked to explain the chemical concepts behind them.

Quia Shared Activities Quia Corporation
<http://www.quia.com/shared/chem/>

There is a huge diversity of interactive chemistry activities on everything from elements to compounds. Some of these are vocabulary builders and others test the understanding of chemistry concepts.

Chemistry 4Kids-States of Matter Andrew Radar Studios
http://www.chem4kids.com/files/matter_chemphys.html

A good informational resource to help students understand the characteristics of physical and chemical changes.

Your Virtual Chemistry Club American Chemical Society at Chemistry.Org
<http://www.chemistry.org/portal/a/c/s/1/acsdisplay.html?DOC=vc2%5Cindex.html>

This website has all kinds of resources and an information for teachers. Check out the science fairs section or this week in chemical history. There are also activities like analysis of common substances for calcium carbonate and the analysis of Orbiz soft drink. For students under "What's that Stuff?" there are news articles about chemistry. It's Elemental is an interactive periodic table and "Careers in Chemistry" has articles about different jobs in chemistry.

Pre-Visit Activities

Post-Visit Activities