

Chemistry Balancing Act

Grades: 9th and 11th grade

Duration: 55 minutes

Program Description

Students use their observational skills to identify chemical changes, then act out and balance chemical equations. This program is for students competent in chemical symbols, chemical formulas, and oxidation numbers.

Louisiana GLE:

Grade 9-12 Science as Inquiry

- 2. Describe how investigations can be observation, description, literature survey, classification, or experimentation (SI-H-A2)
- 10. Given a description of an experiment, identify appropriate safety measures (SI-H-A7)

Grade 9

Physical Science

- 3. Distinguish among symbols for atoms, ions, molecules, and equations for chemical reactions (PS-H-A2)
- 4. Name and write chemical formulas using symbols and subscripts (PS-H-A2)
- 11. Investigate and classify common materials as *elements*, *compounds*, or *mixtures* (heterogeneous or homogeneous) based on their physical and chemical properties (PS-H-C1)
- 21. Classify changes in matter as *physical* or *chemical* (PS-H-D1)
- 22. Identify evidence of chemical changes (PS-H-D1)
- 23. Classify unknowns as *acidic*, *basic*, or *neutral* using indicators (PS-H-D2)
- 24. Identify balanced equations as neutralization, combination, and decomposition reactions (PS-H-D3)

Grade 11

Chemistry

- 5. Write and name formulas for ionic and covalent compounds (PS-H-A2)
- 6. Write and name the chemical formula for the products that form from the reaction of selected reactants (PS-H-A2)
- 7. Write a balanced symbolic equation from a word equation (PS-H-A2)
- 31. Describe chemical changes and reactions using diagrams and descriptions of the reactants, products, and energy changes (PS-H-D1)
- 35. Predict products (with phase notations) of simple reactions, including acid/base, oxidation/reduction, and formation of precipitates (PS-H-D3)

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 Equation – The recipe that describes what you need to do to make a reaction take place; reactants are on the left side of the equation; products on the right side

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.

Decomposition – When a big molecule falls apart to make two or more smaller ones

Double-displacement Reaction (a.k.a. double replacement reaction) – When the cations of two ionic compounds switch places.

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 – $-\log[\text{H}^+]$; 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

Single-displacement Reaction (a.k.a. single replacement reaction) – When one unbonded element replaces an element in a chemical compound. These are frequently redox reactions.

Synthesis – When you make a big molecule from two or more smaller ones.

Valence Electron – The outermost electrons in an atom.

Connections to Permanent Exhibits: These exhibits are upstairs in the Exploring Space Cluster.

Rocket Fuel: How is the rocket fuel produced? What type of chemical reaction is this?

Web Resources:

The ChemCollective...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.

Chemmy Bear-Resouces

Chemmybear and his students

<http://www.chemmybear.com/>

A great resource for high school chemistry teachers with everything from notes and tips of chemical reactions to mole clip art.

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.

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 websites outlines using cabbage juice indicators, polymers, bubbles, chemiluminescence, 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 these 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.

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

Ions and Compounds-Multiple Choice Exercise

This is an on-line 20 item test to identify students ability to write chemical formulas from the name of a compound. They must know the correct oxidation numbers, the appropriate chemical symbol, and how to set the formula of a compound with subscripts. The website will allow the students to print out a copy of their answers to the problems.

This on-line interactivity is found at

<http://www.sciencegeek.net/Chemistry/taters/Unit4IonicCompoundFormulas.htm>

Classic ChemBalancer

This is an on-line interactive that allows your students to place the appropriate coefficients for 11 chemical equations. You may print out a worksheet in advance. When the students gets the answer correct FunBased Learning will provide a pop-up box with an important fact about the compound, the reaction, or some element in the equation.

This on-line interactivity is found at

<http://funbasedlearning.com/chemistry/chemBalancer/default.htm>

Post-Visit Activities

Brain Boggle ChemBalancer

This is an advanced on-line interactive that provides your with 5 difficult chemical equations they must balance. You may print out a worksheet in advance. When the students gets the answer correct FunBased Learning will provide a pop-up box with an important fact about the compound, the reaction, or some element in the equation.

This on-line interactivity is found at

<http://funbasedlearning.com/chemistry/chemBalancer3/default.htm>

Reaction Identification Practice-Multiple Choice Exercise

This is an on-line 15 item test to identify students identify the types of chemical reactions including synthesis, decomposition, single replacement, double replacement, and combustion. The website will allow the students to print out a copy of their answers to the problems.

This on-line interactivity is found at

<http://www.sciencegeek.net/Chemistry/taters/EquationIdentification.htm>