

Lab Summary

The Tech Science Labs: Chemicals of Innovation

Students explore chemical properties and bring the periodic table right into their hands as they experiment with chemical reactions to discover dramatic results and see how chemicals work in Silicon Valley inventions.

Grade Levels:

5 – 8

Learning Outcomes:

- Student will understand the format of the periodic table and be able to identify the name, atomic number, and atomic symbol.
- Students will gain an understanding of the basic difference between physical, endothermic, and exothermic reactions.
- Students will gain first-hand experience creating hypotheses, observing the results of an experiment, and judging the accuracy of their hypotheses based on their observations.

Estimated Time:

1.5 hours

- Introduction: 5 minutes
- Atomic Structure and Magnesium Demonstration: 10 minutes
- Compounds and Compounds Demonstration: 10 minutes
- Periodic Table introduction, Worksheet, and Demonstration: 15 minutes
- Physical Reaction Experiment and Discussion: 15 minutes
- Chemical Reaction Experiments and Discussion: 30 minutes
- Closing Demonstration and Discussion: 5 minutes

California Science Content Standards Connections:

- Grade 5: Physical Sciences: 1a, 1b, 1c, 1d, 1f, 1g, 1h, 1i; Investigation and Experimentation: 6b, 6d, 6e, 6f, 6g, 6h
- Grade 6: Investigation and Experimentation: 7a
- Grade 8: Physical Sciences: 3a, 3b, 3d, 3e, 3f, 5a, 5c, 5d, 5e; Life Sciences: 6b, 6c; Physical Sciences: 7a, 7b; Investigation and Experimentation: 9a, 9c
- All Grades: Investigation and Experimentation: Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other 3 strands, students should develop their own questions and perform investigations.

The Tech Museum™ Gallery Connections:

The Tech Silicon Valley Innovation Gallery:

- “Microchips”: Students see that silicon makes up microchips that power many Silicon Valley inventions.

The Tech Museum™ Gallery Connections (continued):*Green By Design Gallery:*

- “Harnessing Energy”: Students learn how solar panels use silicon to convert sunlight into electricity. Then they manipulate solar collectors to focus sunlight onto a solar cell and light up the tower.

Pre-Visit Vocabulary:

These are words and concepts that we will discuss in the lab. Your students' lab experience will be enhanced if they are familiar with these terms prior to your visit.

- Element: A substance comprised of identical atoms that cannot be separated into simpler substances by chemical means.
- Atom: The smallest component of an element having the chemical properties of the element.
- Nucleus: The positively charged central region of an atom, composed of protons and neutrons and containing almost all of the mass of the atom.
- Electron: An elementary particle having a negative charge, found outside the nucleus of an atom.
- Neutron: An elementary particle having no charge, found in the nuclei of all atoms except those of hydrogen.
- Proton: An elementary particle having a positive charge that is a fundamental constituent of all atomic nuclei.
- Compound: 2 or more elements bonded together whose composition is constant.
- Control: A standard of comparison in scientific experimentation.
- Hypothesis: Educated guess about what we think will happen.
- Catalyst: Something that causes a chemical reaction that remains unchanged by the reaction.

Teacher Resources:

- Fireworks and Elements:
<http://www.pbs.org/wgbh/nova/kaboom/textindex.html>
- Glow Sticks:
<http://scifun.chem.wisc.edu/HOMEEXPTS/Chemilum.html>
- Chemistry Experiments:
https://portal.acs.org/portal/acs/corg/memberapp?_nfpb=true&_pageLabel=PP_TRANSITIONMAIN&node_id=878&use_sec=false&sec_url_var=region1
- Acids and Bases:
<http://scifun.chem.wisc.edu/HOMEEXPTS/ACIDBASE.html>

Post-Lab Activity—Bubble Blower:

Handout available in The Tech Science Labs

Estimated Time: 40 – 50 minutes

More bubbles! Students explore a chemical reaction by creating their own carbon dioxide bubble machine from household products and supplies.

Learning Outcomes:

- Students will be able to differentiate reactants, which interact to form products with different chemical properties.
- Students will be able to describe the end results of an endothermic reaction.

Post-Lab Activity—Chemical Heating:

Handout available in The Tech Science Labs

Estimated Time: 25 minutes

Students explore a chemical reaction that produces heat from common household materials.

Learning Outcomes:

- Students will be able to differentiate reactants, which interact to form products with different chemical properties.
- Students will be able to describe the end results of an exothermic reaction.