

Grade 8: Physical Sciences, Life Sciences Earth Sciences, Investigation and Experimentation

California State Science Content Standards

Covered in:

**Hands-on science labs, demonstrations, & activities.
Investigation and Experimentation. Lesson Plans.**

Presented by Climate Change Education .org during

Mobile Climate Science Labs

- Professional development for teachers
 - In school presentations
- Climate science and hands-on education *specialists* presenting alongside teachers and teaching assistants
- Presentations at CSTA, NSTA, AAAS conferences
- For school field trips, as presented at local science museums

As aligned with existing science content standards, adopted 1997

Referencing: *Science Framework for California Public Schools*

<http://www.cde.ca.gov/ci/sc/cf/documents/scienceframework.pdf>

Adopted by the California State Board of Education

Published by the California Department of Education

Enabling teachers and schools to provide outstanding education called for in the standards under *Investigation and Experimentation* sections. Requirements for a minimum of 20-25% hands-on education in science.

Index of Standards Alignment—other grades, courses and standards:

http://climatechangeeducation.org/labs/k12_standards/index.html

Themes: <http://climatechangeeducation.org/labs/themes/index.html>

In the following, sections of standards noted are part of one or more lab theme.

Sections highlighted in **green** are a *primary focus* of one or more hands-on science lab.

Updated April 27, 2011

8th Grade – Focus on Physical Sciences

Standard Set 1 -- Motion

Standard Set 2 -- Forces

1. **b.** *Students know* when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.
1. **d.** *Students know* how to identify separately the two or more forces that are acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.
1. **e.** *Students know* that when the forces on an object are unbalanced, the object will change its velocity (that is, it will speed up, slow down, or change direction).
1. **f.** *Students know* the greater the mass of an object, the more force is needed to achieve the same rate of change in motion.

Standard Set 3 -- Structure of Matter

3. Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept:

3. a. *Students know* the structure of the atom and know it is composed of protons, neutrons, and electrons

3. b. *Students know that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.*

3. d. *Students know the states of matter (solid, liquid, gas) depend on molecular motion.*

3. e. *Students know* that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; **and in gases the atoms and molecules are free to move independently, colliding frequently.**

3. f. *Students know* how to use the periodic table to identify elements in simple compounds.

Standard Set 4 -- Earth in the Solar System (Earth Sciences)

4. b. *Students know* that the Sun is one of many stars in the Milky Way galaxy and that stars may differ in size, **temperature, and color**

4. c. *Students know* how to use astronomical units and light years as measures of distance between the Sun, stars, and Earth

4. d. *Students know* that stars are the source of light for all bright objects in outer space and that the Moon and planets shine by reflected sunlight, not by their own light.

4. e. *Students know* the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.

Standard Set 5 -- Reactions

5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept:

5. a. *Students know* reactant atoms and molecules interact to form products with different chemical properties.

5. b. *Students know* the idea of atoms explains the conservation of matter: In chemical reactions the **number of atoms stays the same no matter how they are arranged, so their total mass stays the same.**

5. c. *Students know* **chemical reactions usually liberate heat or absorb heat.**

5. d. *Students know* physical processes include **freezing and boiling, in which a material changes form with no chemical reaction.**

5. e. *Students know* **how to determine whether a solution is acidic, basic, or neutral.**

Standard Set 6 -- Chemistry of Living Systems (Life Sciences)

6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept:

6. a. *Students know* that carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.

6. b. *Students know* that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.

Standard Set 7 -- Periodic Table

7. The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept:

7. a. *Students know* how to identify regions corresponding to metals, nonmetals, and inert gases.

7. b. *Students know* each element has a specific number of protons in the nucleus (the atomic number) and **each isotope of the element has a different but specific number of neutrons in the nucleus.**

7. c. *Students know* **substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.**

Standard Set 8 -- Density and Buoyancy

8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept:

8. a. *Students know* density is mass per unit volume.

8. c. *Students know* the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced.

8. d. *Students know* how to predict whether an object will float or sink.

Standard Set 9 -- Investigation and Experimentation

9. 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 three strands, students should develop their own questions and perform investigations. Students will:

9. a. **Plan and conduct a scientific investigation to test a hypothesis.**

9. b. **Evaluate the accuracy and reproducibility of data.**

9. c. **Distinguish between variable and controlled parameters in a test.**

9. d. Recognize the slope of the linear graph as the constant in the relationship $y = kx$ and apply this principle in interpreting graphs constructed from data.

9. e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.

9. f. Apply simple mathematical relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance/time, density = mass/volume, force = pressure · area, volume = area · height).

9. g. Distinguish between linear and nonlinear relationships on a graph of data.