



Chemistry

Merit Badge Workbook

This workbook can help you but you still need to read the merit badge pamphlet (book). No one can add or subtract from the Boy Scout Requirements #33215. Merit Badge Workbooks and much more are below: [Online Resources](#).

Workbook developer: craig@craiglincoln.com. Requirements revised: 2006, Workbook updated: December 2010.

Scout's Name: _____ Unit: _____

Counselor's Name: _____ Counselor's Ph #: _____

1. Do EACH of the following activities:

a. Describe three examples of safety equipment used in a chemistry laboratory and the reason each one is used.

b. Describe what a material safety data sheet (MSDS) is _____

and tell why it is used. _____

c. Obtain an MSDS for both a paint and an insecticide. Compare and discuss the toxicity, _____

disposal, _____

and safe-handling sections for these two common household products.

d. Discuss the safe storage of chemicals. _____

How does the safe storage of chemicals apply to your home, _____

your school, _____

your community, _____

and the environment? _____

2. Do EACH of the following activities:

a. Predict what would happen if you placed an iron nail in a copper sulfate solution. _____

Then, put an iron nail in a copper sulfate solution. Describe your observations _____

and make a conclusion based on your observations. _____

Compare your prediction and original conclusion with what actually happened. _____

Write the chemical equation for the reaction that you described.

b. Describe how you would use physical properties to separate sand from water, _____

table salt from water, _____

oil from water, _____

and gasoline from motor oil. _____

Name the practical processes that require these kinds of separations. _____

c. Describe the difference between a chemical reaction _____

and a physical change. _____

3. Construct a Cartesian diver. Describe its function in terms of how gases in general behave under different pressures and different temperatures. _____

Describe how the behavior of gases affects a backpacker at high altitudes _____

and a scuba diver underwater. _____

4. Do EACH of the following activities:

a. Cut a round onion into small chunks. Separate the onion chunks into three equal portions. Leave the first portion raw. Cook the second portion of onion chunks until the pieces are translucent. Cook the third portion until the onions are caramelized, or brown in color. Taste each type of onion. Describe the taste of

raw onion _____

versus partially cooked onion _____

versus caramelized onion. _____

Explain what happens to molecules in the onion during the cooking process. _____

b. Describe the chemical similarities and differences between toothpaste and an abrasive household cleanser. _____

Explain how the end use or purpose of a product affects its chemical formulation. _____

c. In a clear container, mix a half-cup of water with a tablespoon of oil. Explain why the oil and water do not mix. _____

Find a substance that will help the two combine, and add it to the mixture. _____

Describe what happened, and explain how that substance worked to combine the oil and water. _____

5. List the four classical divisions of chemistry. Briefly describe each one, and tell how it applies to your everyday life.

6. Do EACH of the following activities:

a. Name two government agencies that are responsible for tracking the use of chemicals for commercial or industrial use. _____

Pick one agency and briefly describe its responsibilities to the public and the environment. _____

b. Define pollution. _____

Explain the chemical effects of ozone, _____

and acid rain. _____

Pick a current environmental problem as an example. _____

Briefly describe what people are doing to resolve this hazard _____

and to increase understanding of the problem. _____

c. Using reasons from chemistry, describe the effect on the environment of ONE of the following:

1. The production of aluminum cans or plastic milk cartons

3. Used motor oil

2. Sulfur from burning coal

4. Newspaper

describe the effect on the environment _____

d. Briefly describe the purpose of phosphates in fertilizer and in laundry detergent. _____

Explain how the use of phosphates in fertilizers affects the environment. _____

Also, explain why phosphates have been removed from laundry detergents. _____

7. Do ONE of the following activities:

a. Visit a laboratory and talk to a practicing chemist. Ask what the chemist does and what training and education are needed to work as a chemist. _____

-OR- b. Using resources found at the library and in periodicals, books, and the Internet (with your parent's permission), learn about two different kinds of work done by chemists, chemical engineers, chemical technicians, or industrial chemists. For each of the jobs, find out the education and training requirements.

-OR- c. Visit an industrial plant that makes chemical products or uses chemical processes and describe the processes used. What, if any, pollutants are produced and how they are handled. _____

-OR- d. Visit a county farm agency or similar governmental agency _____ and learn how chemistry is used to meet the needs of agriculture in your county. _____

Online Resources (Use any Internet resource with caution and only with your parent's or guardian's permission.)

Boy Scouts of America: ► scouting.org ► [Guide to Safe Scouting](#) ► [Age-Appropriate Guidelines](#) ► [Safe Swim Defense](#)
► [Scout](#) ► [Tenderfoot](#) ► [Second Class](#) ► [First Class](#) ► [Rank Videos](#) ► [Safety Afloat](#)

Boy Scout Merit Badge Workbooks: usscouts.org -or- meritbadge.org **Merit Badge Books:** www.scoutstuff.org

Requirement Resources

These resources and much more are at: <http://meritbadge.org/wiki/index.php/Chemistry>

1b. & c. [Material Safety Data Sheets \(MSDS\) Online](#) - [more](#)

3. [How to Make a Cartesian Diver](#)

5. [Definition of Analytical Chemistry](#) [Definition of Inorganic Chemistry](#) [Definition of Organic Chemistry](#)
[Definition of Physical Chemistry](#) [University of Connecticut Chemistry Divisions](#)

6a: [U.S. Chemical Safety and Hazard Investigation Board](#) [Occupational Safety and Health Administration](#)

6b: [What is Pollution and How Does it Affect us?](#) [Ozone](#) [The Myth of Global Warming](#)

[Myths and Facts about the Environment: Acid Rain](#) From the National Center for Public Policy Research

6c: [Coal and the Environment: Land and Air](#)

6d: [Phosphate Facts](#)

7b: [A Day in the Life of a Chemical Engineer](#) [A Day in the Life of a Chemist](#)

General Resources

American Chemical Society: <http://pubs.acs.org/service/serv.html#educ>

Environmental Protection Agency: <http://www.epa.gov>

The Science Page: <http://www.sciencepage.org>

U.S. Department of Agriculture: <http://www.usda.gov>

U.S. Food and Drug Administration: <http://www.fda.gov>

WebElements Periodic table: <http://www.webelements.com>