



Chemistry

Scouts BSA · STEM

Name

Started

Completed

Chemistry is happening all around you, in your kitchen, your first aid kit, and your campfire. This badge lets you do safe, hands-on experiments to see how it works. You'll never look at cooking or cleaning the same way again.

Requirements

Every official requirement, in plain language. Check the official wording when you sign off (scouting.org/merit-badges/chemistry/). Tips and examples are ideas, not extra requirements.

1 Chemistry and safety

Tips for this section: Start with the safety data sheets for sugar, rubbing alcohol, and a waterproofing spray, and read them with a parent. Always wear eye protection when doing experiments.

Example for this section: Read the safety data sheet for rubbing alcohol with a parent. Find the hazard pictograms, protective gear, first aid steps, and storage advice, then compare them with the sheets for sugar and a waterproofing spray. Check that chemicals at home are in their original containers and that bleach and ammonia cleaners are stored apart.

- ☐ **1a** Get the SDS (safety data sheet) for sugar (sucrose), rubbing alcohol (isopropyl), and a waterproofing spray; compare their properties, hazards, handling, disposal, and toxicity, and discuss with your counselor

- ☐ **1b** Discuss with your counselor which personal protective equipment (PPE) each SDS recommends and why, and how PPE needs change with toxicity and the way a chemical can enter the body

- ☐ **1c** Look over the pictograms in Section 2 of every SDS, then discuss with your counselor what they mean and where you see them in your community

- ☐ **1d** Discuss with your counselor how to store chemicals safely and how that applies at home, at school, in your community, and to the environment

2 Chemistry and first aid (after requirement 1)

Tips for this section: Try simple experiments with soap and rubbing alcohol under adult supervision. Think about why they help clean wounds or hands.

Example for this section: Rub cooking oil mixed with a spoonful of cocoa powder on your hands, rinse with plain water, then wash with soap: the soap lifts the oily mess the water couldn't. For the yeast test, mix yeast into two cups of warm sugar water, add a little rubbing alcohol to one, and compare the foam after 20 minutes.

- ☐ **2a** Talk with your counselor about why soap and alcohol might be used to clean cuts and scrapes, and how you could test your ideas

- ☐ **2b** Coat your hands in cooking oil mixed with a nontoxic powder like sand or cocoa and wash with plain water; repeat using soap and water, then discuss the difference with your counselor

- ☐ **2c** Do an experiment with baker's yeast showing how rubbing alcohol affects microbial growth, and discuss the results with your counselor

3 Chemistry and cooking (after requirement 1)

Tips for this section: Experiment in the kitchen with an adult, like browning bread or testing pH with red cabbage juice.

Example for this section: Make a pH indicator by having an adult help steep chopped red cabbage in hot water. Add a few drops to plain water, lemon juice, vinegar, baking soda water, and soapy water. Record the colors from pink (acid) through purple (neutral) to green or yellow (base) in a table.

- ☐ **3a** Carry out a Maillard (browning) reaction, then discuss with your counselor whether the change was physical or chemical and what happened to the food's molecules as it cooked

- ☐ **3b** Make red cabbage indicator and use it to test the pH of 5 common household liquids, including water; discuss what you saw with your counselor

4 Chemistry and camping (after requirement 1): Choose 2 of 4

Tips for this section: Pick the two camp activities that interest you most, like testing waterproofing or flame tests. Flame tests and making nylon need your counselor or an adult they approve.

Example for this section: For a camp-themed choice, test two kinds of waterproofing: outdoors with an adult, treat one square of old cotton cloth with a waterproofing spray and rub wax into another, then drip water on each and time how long it takes to soak through. Decide which you'd use on a tent and which on boots, and explain why.

- ☐ **4a** Design and run an experiment comparing at least 2 kinds of waterproofing, then discuss with your counselor which you'd choose for your tent and which for your boots, and why

- ☐ **4b** Describe the 4 classes of fires and the 4 classes of fire extinguishers, and discuss with your counselor how each extinguisher class, sand, and baking soda put out fires

- ☐ **4c** Supervised by your counselor or a knowledgeable adult your counselor approved ahead of time, do flame tests on at least 5 elements with a kitchen or propane torch

- ☐ **4d** Supervised by your counselor or a knowledgeable adult your counselor approved ahead of time, make nylon (a kit is OK)

- ☐ **5** Describe how chemistry can help lessen the environmental harm of single-use items like water bottles, bags, straws, or batteries

Tip: Look at single-use items like bottles and bags and think about how chemistry helps make better or reusable options.

Example: Pick a single-use item like a plastic water bottle. Explain what it's made of, why it lasts so long, and one way chemistry helps: recycling it into fleece, designing plant-based plastics, or making a refillable bottle that lasts years.

- ☐ **6** Name 5 fields of chemistry, briefly describe each, and tell how each one relates to your life and how the fields connect with each other

Tip: Look up different fields of chemistry and find an everyday example of what each one makes possible.

Example: Five fields with everyday examples: organic chemistry (medicines and plastics), inorganic (batteries and cement), analytical (testing drinking water), biochemistry (how your body digests food), and physical chemistry (why ice packs get cold).

- ☐ **7** Name 3 government agencies that regulate or guide chemical use (personal, drug, commercial, or industrial), and discuss their history and duties with your counselor

Tip: Look up which government agencies keep people safe from harmful chemicals and what each one does.

8 Chemistry at work: Choose 1 of 3

Tips for this section: Ask a science teacher or parent to help you connect with a lab or chemist. Prepare questions about their job.

- ☐ **8a** Visit a research lab, talk with a chemist or chemical technician about their research, and find out what education and training they had

- ☐ **8b** Visit a business or plant that produces chemical products or relies on chemical processes; find out about its work and talk with an employee about their job, education, and training

- ☐ **8c** Name 3 chemistry careers; research one's training, education, certification, experience, costs, job outlook, starting pay, and advancement, and discuss with your counselor whether it interests you