

Chemistry

Merit Badge Workbook



Merit badges are earned by doing: reading the pamphlet, practicing the skills, and showing your counselor what you have learned.
This workbook gives you a place to organize your notes and track your progress along the way.
Merit badge counselors may not require the use of this or any similar workbook.
You still must satisfy your counselor that you can demonstrate each skill and have learned the information.
Use the space under each requirement to note what you have done and what you want to talk about, not to write out full answers.
When a requirement says discuss, show, tell, explain, or demonstrate, that is what you must do.
No one may add to or subtract from the official requirements found on scouting.org (Guide to Advancement 7.0.4.8).
Scouting America last updated this badge's requirements page on December 15, 2025.
Requirements change from time to time. Double-check scouting.org before you start.

Scout's name: _____ Unit: _____ Date started: _____

Counselor's name: _____ Phone no.: _____ Email: _____

Links marked "Scouting America resources" are the ones Scouting America shares on its official badge page.
Links marked "ScoutSmarts" open the matching part of Cole's guide. This workbook is unofficial and not endorsed by Scouting America.

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1. Chemistry and Safety. Do the following and discuss with your counselor:

(a) Obtain safety data sheets (SDS) for sucrose (sugar), isopropyl alcohol (rubbing alcohol), and a waterproofing spray. Compare their properties and potential hazard(s), including handling and disposal guidelines and toxicity information.

Scouting America resources: Safety Data Sheets Training (video)

Comparing the three safety data sheets

Product	Properties	Potential hazards	Handling and disposal	Toxicity
sucrose (sugar)				
isopropyl alcohol (rubbing alcohol)				
waterproofing spray				

(b) What types of personal protective equipment (PPE) are recommended for each, and why? How does the recommended PPE change with toxicity and route of exposure?

Scouting America resources: How to Dress in the Lab and the Use of PPE (video)

Recommended PPE

Product	PPE recommended	Why
sucrose (sugar)		
isopropyl alcohol (rubbing alcohol)		
waterproofing spray		

How the PPE changes with toxicity and route of exposure

(c) Review the pictograms in Section 2 of each SDS. What do they mean, and how do you see them used in your community?

Scouting America resources: Safety Pictograms in SDS (video)

Pictograms in Section 2

Pictogram (and which SDS)	What it means	Where I see it used in my community

(d) Discuss the safe storage of chemicals. How does the safe storage of chemicals apply to your home, school, community, and the environment?

Scouting America resources: Chemical Storage Safety (video) · Store Household Chemicals Safely (video)

ScoutSmarts: Requirement 1d explained

Safe storage of chemicals: my notes

Where safe storage applies

Place	How safe storage of chemicals applies
home	
school	
community	
the environment	

Requirement 1 completed on _____ counselor initials _____

2. Chemistry and First Aid. After successfully completing requirement 1, do the following:

(a) Discuss with your counselor why you think soap and alcohol are used to clean cuts and scrapes. Discuss how you could test your hypotheses with your counselor.

Scouting America resources: Soap and Hand Sanitizers vs Viruses and Bacteria (video)

Why I think soap and alcohol are used to clean cuts and scrapes (my hypotheses)

How I could test my hypotheses

(b) Coat your hands with a mixture of cooking oil and a nontoxic powder, such as sand or cocoa. Wash your hands with water and observe what happens. Coat your hands again, then wash with soap and water. Discuss the differences with your counselor.

Scouting America resources: How Does Soap Work? (video)

Date | Powder I used

What I observed

How I washed	What happened
water only	
soap and water	

The differences I noticed

(c) Perform an experiment to demonstrate how rubbing alcohol affects microbial growth using baker's yeast. Discuss the results with your counselor.

Scouting America resources: Watching How Alcohol Kills Virus and Bacteria Under a Microscope (video)

Date | Where

My experiment setup

My results

Sample	When I checked	What I observed

What the results show

Requirement 2 completed on | counselor initials

3. Chemistry and Cooking. After successfully completing requirement 1, do EACH of the following:

(a) Perform a Maillard, or browning, reaction. Discuss with your counselor whether a physical or chemical change has occurred, and what happened to molecules in the food during the cooking process.

Scouting America resources: The Maillard Reaction (video) · Why Pizza Tastes So Good (video) Understanding the Maillard Reaction (video)

Food I cooked _____ Date _____

Physical or chemical change, and what happened to the molecules in the food

(b) Prepare and use red cabbage indicator to measure the pH of five common household liquids, including water. Discuss your observations with your counselor.

Scouting America resources: Why Is Red Cabbage a pH Indicator (video) · pH Indicator Made From Red Cabbage (video) Red Cabbage Indicator Infographic (website)

Date I made the indicator _____ Where _____

Five household liquids

Liquid	Color with the indicator	pH I measured	Acid, base, or neutral
water			

My observations

Requirement 3 completed on _____ counselor initials _____

4. Chemistry and Camping. After successfully completing requirement 1, do TWO of the following:

☐ **(a)** Design and conduct an experiment to compare at least two different types of waterproofing. Discuss with your counselor which one you would prefer to use on your tent and which one you would prefer to use on your boots, and why.

Scouting America resources: Transforming Paper into a Waterproof Marvel (video) · Waterproofing Fabrics (video) Waterproofing Tent Seams (video)

My experiment design

My results

Type of waterproofing	How I tested it	What happened

Which I'd use on my tent and on my boots, and why

☐ **(b)** Describe the four classes of fires, and the four classes of fire extinguishers. Discuss with your counselor how sand, baking soda, and the four classes of extinguishers work to put out fires.

Scouting America resources: Four Classes of Fires (video) · Four Types of Fires (video)

The four classes of fires

Class	What it is

The four classes of fire extinguishers

Class	How it puts out a fire

Other ways to put out fires

Material	How it works to put out a fire
sand	
baking soda	

☐ **(c)** Under your counselor's supervision and/or the supervision of a knowledgeable adult approved in advance by your counselor, conduct flame tests of at least five elements using a kitchen or propane torch.

Scouting America resources: Metal Flame Test (video)

Date _____ Supervising adult _____

My flame tests

Element tested	Flame color	Notes

☐ **(d)** Under your counselor's supervision and/or the supervision of a knowledgeable adult approved in advance by your counselor, synthesize nylon (may be from a kit).

Scouting America resources: Making Nylon (video)

Date _____ Supervising adult _____

How I made it, and what I observed

Requirement 4 completed on _____ counselor initials _____

5. Describe how chemistry can be used to reduce the environmental impacts of single-use items, such as water bottles, bags, straws, or batteries.

Scouting America resources: Upcycling Plastic Bags Into Battery Parts (video) · What Is Sustainable Development (video) Edible, Biodegradable Food Packaging (video)

Chemistry and single-use items

Single-use item	How chemistry can reduce its environmental impact

Requirement 5 completed on _____ counselor initials _____

6. Identify five fields of chemistry. Briefly describe each, tell how each applies to your life and how they interact.

Scouting America resources: Areas of Chemistry - American Chemical Society (website)

Five fields of chemistry

Field	What it is	How it applies to my life

How these fields interact

Requirement 6 completed on _____ counselor initials _____

7. Identify three government agencies that oversee or provide guidance on the use of chemicals for personal, pharmaceutical, commercial, or industrial use, and discuss the agencies' history and responsibilities with your counselor.

Scouting America resources: Why Does the FDA Exist? (video) · The EPA Was Formed | Today in History (video) Preventing HAZMAT Accidents: DOT Safety Rules Explained (video) · Chemistry of a Killer: Inside a DEA Drug Lab (video)

Three government agencies

Agency	Its history	Its responsibilities

Requirement 7 completed on _____ counselor initials _____

8. Do ONE of the following:

☐ **(a)** Visit a research laboratory, and discuss the research performed there with a chemist or chemical technician. Learn what education and training they received.

Laboratory _____ Date _____ Person I talked with _____

The research performed there

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Their education and training

☐ **(b)** Visit a company or plant that makes chemical products or uses chemical processes. Learn about their products or processes, and talk with someone who works there. Learn what they do, and what education and training they received.

Company or plant | Date | Person I talked with

Their products or processes

What they do, and their education and training

☐ **(c)** Identify three career opportunities that would use skills and knowledge in chemistry. Pick one and research the training, education, certification requirements, experience, and expenses associated with entering the field. Research the prospects for employment, starting salary, advancement opportunities and career goals associated with this career. Discuss what you learned with your counselor and whether you might be interested in this career.

Scouting America resources: What do Chemical Engineers Do? (video) · Interactive Site for Chemical Careers (website) Careers in Science and Engineering (video)

Three careers that use chemistry

Career	How it uses chemistry

The one I picked

Getting into the field

Topic	What I found out
training	
education	
certification requirements	
experience	
expenses	

Working in the field

Topic	What I found out
prospects for employment	
starting salary	
advancement opportunities	
career goals	

Whether I might be interested in this career, and why

Requirement 8 completed on _____ counselor initials _____

Counselor sign-off

Your counselor signs your blue card or approves the badge in Scoutbook, and your unit records it. This line is for your own records.

Counselor's signature _____ Date completed _____

Official Scouting America resources

Scouting America resources: Chemistry merit badge page (requirements and resources) · Chemistry merit badge pamphlet (free PDF) All merit badges · **ScoutSmarts:** Chemistry Merit Badge Guide

Made by Cole at ScoutSmarts.com, an Eagle Scout who loves helping Scouts.
Spot an error or a requirement change? Tell me at scoutsmarts.com/contact.
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