



## Chemistry Merit Badge Workbook

# SCOUTMASTER BUCKY

Scouts participating in a Scoutmaster Bucky merit badge opportunity, whether online or in person, should consider using the Chemistry merit badge pamphlet for discovery and knowledge, along with the class preparation pages for clarifications, insights, and expectations.

<https://scoutmasterbucky.com/merit-badges/chemistry/chemistry-pamphlet.pdf>

<https://scoutmasterbucky.com/merit-badges/chemistry/chemistry-cpp.pdf>

### REQUIREMENTS 4c and 4d REQUIRE COUNSELOR APPROVAL.

**REQUIREMENT 1a:** Obtain safety data sheets (SDS) for sucrose (sugar), isopropyl alcohol (rubbing alcohol), and a waterproofing spray.

#### Safety Data Sheets

1. [Sucrose \(sugar\)](#)
2. [Isopropyl Alcohol \(rubbing alcohol\)](#)
3. [Waterproofing Spray](#)

**REQUIREMENT 1a:** Compare their properties and potential hazard(s), including handling and disposal guidelines and toxicity information.

**REQUIREMENT 1b:** 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?

Notes:



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## SUCROSE (SUGAR):

Properties and Potential Hazards:

Handling and Disposal Guidelines:

Toxicity:

Recommended PPE Types and Why:

How does the recommended PPE change with toxicity and route of exposure?



ISOPORPYL ALCOHOL (RUBBING ALCOHOL):

Properties and Potential Hazards:

Handling and Disposal Guidelines:

Toxicity:

Recommended PPE Types and Why:

How does the recommended PPE change with toxicity and route of exposure?



**WATERPROOFING SPRAY:**

Properties and Potential Hazards:

Handling and Disposal Guidelines:

Toxicity:

Recommended PPE Types and Why:

How does the recommended PPE change with toxicity and route of exposure?



**REQUIREMENT 1c:**

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



Sucrose (Sugar):

Isopropyl Alcohol (Rubbing Alcohol):

Waterproofing Spray:



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**REQUIREMENT 1d:** Discuss the safe storage of chemicals. How does the safe storage of chemicals apply to your home, school, community, and the environment?

Notes:

**REQUIREMENT 1d:** How does the safe storage of chemicals apply to your home, school, community, and the environment?

Home:

School:

Community:

Environment:



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<b>REQUIREMENT 2:</b>	After successfully completing requirement 1, do the following:
<b>REQUIREMENT 2a:</b>	Discuss with your counselor why you think soap and alcohol are used to clean cuts and scrapes.

Notes:

<b>REQUIREMENT 2a:</b>	Discuss how you could test your hypotheses with your counselor.
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Notes:



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**REQUIREMENT 2b:** 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.

Consider using the [Chemistry Merit Badge Pamphlet](#) for preparation information.

**This requirement will be reviewed with your merit badge counselor.**

**BE PREPARED!**

**REQUIREMENT 2c:** Perform an experiment to demonstrate how rubbing alcohol affects microbial growth using baker's yeast. Discuss the results with your counselor.

Consider using the [Chemistry Merit Badge Pamphlet](#) for preparation information.

**This requirement will be reviewed with your merit badge counselor.**

**BE PREPARED!**

**REQUIREMENT 3:** After successfully completing requirement 1, do EACH of the following.

**REQUIREMENT 3a:** 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.

Consider using the [Chemistry Merit Badge Pamphlet](#) for preparation information.

**This requirement will be reviewed with your merit badge counselor.**

**BE PREPARED!**

**REQUIREMENT 3b:** Prepare and use red cabbage indicator to measure the pH of five common household liquids, including water. Discuss your observations with your counselor.

Consider using the [Chemistry Merit Badge Pamphlet](#) for preparation information.

**This requirement will be reviewed with your merit badge counselor.**

**BE PREPARED!**

Notes:





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**AFTER SUCCESSFULLY COMPLETING REQUIREMENT 1, DO TWO OF THE FOLLOWING (4A, 4B, 4C, or 4D) FOR REQUIREMENT 4**

**REQUIREMENT 4a:** 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.

Consider using the [Chemistry Merit Badge Pamphlet](#) for preparation information.

**This requirement will be reviewed with your merit badge counselor.**

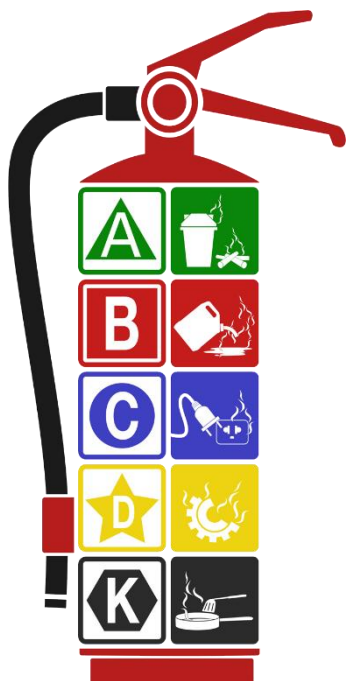
**BE PREPARED!**

**REQUIREMENT 4b:** Describe the four classes of fires, and four classes of fire extinguishers.

CLASSES OF FIRES:



CLASSES OF FIRE EXTINGUISHERS:





**REQUIREMENT 4b:** Discuss with your counselor how sand, baking soda, and the four classes of extinguishers work to put out fires.

Sand:

Baking Soda:

Class A:

Class B:

Class C:

Class D:

Class K:



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**REQUIREMENT 4c:** 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.

Consider using the [Chemistry Merit Badge Pamphlet](#) for preparation information.

**This requirement will be reviewed with your merit badge counselor.**

**BE PREPARED!**

**COUNSELOR APPROVAL:** IS REQUIRED.

Counselor's Name

Phone or Email

Counselor's Signature

Date

☐

*approved*

Flame Test #1:

Flame Test #2:



Flame Test #3:

Flame Test #4:

Flame Test #5:



**REQUIREMENT 4d:** 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).

Consider using the [Chemistry Merit Badge Pamphlet](#) for preparation information.

**This requirement will be reviewed with your merit badge counselor.**

**BE PREPARED!**

**COUNSELOR APPROVAL:** IS REQUIRED.

Counselor's Name

Phone or Email

Counselor's Signature

Date

☐

*approved*

Notes:



**REQUIREMENT 5:** Describe how chemistry can be used to reduce the environmental impacts of single-use items, such as water bottles.

Notes:

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Notes:

**REQUIREMENT 5:** Describe how chemistry can be used to reduce the environmental impacts of single-use items, such as straws.

Notes:

**REQUIREMENT 5:** Describe how chemistry can be used to reduce the environmental impacts of single-use items, such as batteries.

Notes:



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

Consider the following chemistry fields; Agricultural, Atmospheric, Computational, Electrochemistry, Environmental (Green), Flavor, Fragrance, Food, Medicinal, Natural Products, Photochemistry, and Polymer

**CHEMISTRY FIELD #1:**

Name:

Description:

How this field applies to your life:

How this field interacts:



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CHEMISTRY FIELD #2:

Name:

Description:

How this field applies to your life:

How this field interacts:





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## CHEMISTRY FIELD #3:

Name:

Description:

How this field applies to your life:

How this field interacts:



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CHEMISTRY FIELD #4:

Name:

Description:

How this field applies to your life:

How this field interacts:



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## CHEMISTRY FIELD #5:

Name:

Description:

How this field applies to your life:

How this field interacts:



**REQUIREMENT 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.

GOVERNMENT AGENCY #1:

Name:

For which of the following does this agency provide oversight?

Personal Use

Pharmaceutical Use

Commercial Use

Industrial Use

History of this Agency:

Agency's Responsibilities:



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GOVERNMENT AGENCY #2:

Name:

For which of the following does this agency provide oversight?

Personal Use

Pharmaceutical Use

Commercial Use

Industrial Use

History of this Agency:

Agency's Responsibilities:



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GOVERNMENT AGENCY #3:

Name:

For which of the following does this agency provide oversight?

Personal Use

Pharmaceutical Use

Commercial Use

Industrial Use

History of this Agency:

Agency's Responsibilities:



**DO ONE OF THE FOLLOWING (8A, 8B, or 8C) FOR REQUIREMENT 8**

**REQUIREMENT 8a:** Visit a research laboratory, and discuss the research performed there with a chemist or chemical technician. Learn what education and training they received.

Research Laboratory:

Location and Date of Visit:

Chemist's Name and Title you visited with:

Research performed at this Laboratory:

Chemist's Education and Training earned/received:



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**REQUIREMENT 8b:** 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.

Chemical Product Company or Plant:

Location and Date of Visit:

Name and Title of Person you visited with:

Products and Processes at this Location:

The Education and Training earned/received by the Person you Visited with at this Location:





**REQUIREMENT 8c:** Identify three career opportunities that would use skills and knowledge in chemistry.

Career Opportunity #1:

Career Opportunity #2:

Career Opportunity #3:

**REQUIREMENT 8c:** Pick one and research the training, education, certification requirements, experience, and expenses associated with entering the field.

Selected Career Opportunity:

Training Requirements:

Education Requirements:

Certification Requirements:

Experience Requirements:

Expenses associated with entering the field:



**REQUIREMENT 8c:** Research the prospects for employment, starting salary, advancement opportunities and career goals associated with this career. Discuss what you learned with your counselor.

Prospects for Employment:

Starting Salary:

Advancement Opportunities:

Career Goals associated with this career:

**REQUIREMENT 8c:** Discuss whether you might be interested in this career.

Notes: