



## Metalwork Merit Badge Workbook

# SCOUTMASTER BUCKY

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

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

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

**REQUIREMENTS 5a3, 5b3, 5c3, and 5d4 REQUIRE COUNSELOR APPROVAL.**

**REQUIREMENT 1:** Read the safety rules for metalwork. Discuss how to be safe while working with metal. Discuss with your counselor the additional safety rules that apply to the metalwork option you choose for requirement 5.

Notes:

**REQUIREMENT 2:** Explain the following terms: native metal, malleable, metallurgy, alloy, nonferrous, and ferrous.

Native Metal:



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Malleable:

Metallurgy:

Alloy:

Nonferrous:

Ferrous:



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**REQUIREMENT 2a:** Name two nonferrous alloys used by pre-Iron Age metalworkers. Name the metals that are combined to form these alloys.

Nonferrous Alloy #1:

Nonferrous Alloy #2:

**REQUIREMENT 2b:** Name three ferrous alloys used by modern metalworkers.

Ferrous Alloy #1:

Ferrous Alloy #2:

Ferrous Alloy #3:



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**REQUIREMENT 2c:** Describe how to work-harden a metal.

Notes:

**REQUIREMENT 2d:** Describe how to anneal a nonferrous and a ferrous metal.

Nonferrous:

Ferrous:

**REQUIREMENT 3a:** Work-harden a piece of 26- or 28-gauge sheet brass or sheet copper. Put a 45-degree bend in the metal, then heavily peen the area along the bend line to work-harden it. Note the amount of effort that is required to overcome the yield point in this unworked piece of metal.

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

**BE PREPARED!**



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**REQUIREMENT 3b:** Soften the work-hardened piece from requirement 3a by annealing it, and then try to remove the 45-degree bend. Note the amount of effort that is required to overcome the yield point.

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

**BE PREPARED!**

**REQUIREMENT 3c:** Make a temper color index from a flat piece of steel. Using hand tools, make and temper a center punch of medium-carbon or high-carbon steel.

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

**BE PREPARED!**

### DO ONE OF THE FOLLOWING (4A or 4B) FOR REQUIREMENT 4

**REQUIREMENT 4a:** Identify three career opportunities that would use skills and knowledge in metalworking.

Career Opportunity #1:

Career Opportunity #2:

Career Opportunity #3:

**REQUIREMENT 4a:** Pick one and research the training, education, certification requirements, experience, and expenses associated with entering the field.

Selected Career Opportunity:

Training Requirements:

Education Requirements:



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Certification Requirements:

Experience Requirements:

Expenses associated with this career:

**REQUIREMENT 4a:** Research the prospects for employment, starting salary, advancement opportunities and career goals associated with this career.

Prospects for Employment:

Starting Salary:

Advancement Opportunities:

Career Goals associated with this career:



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**REQUIREMENT 4a:** Discuss what you learned with your counselor and whether you might be interested in this career.

Notes:

**REQUIREMENT 4b:** Identify how you might use the skills and knowledge in metalworking to pursue a personal hobby.

Notes:

**REQUIREMENT 4b:** Research the additional training required, expenses, and affiliation with organizations that would help you maximize the enjoyment and benefit you might gain from it.

Additional Training Requirements:

Expenses:

Affiliations/Organizations:

**REQUIREMENT 4b:** Discuss what you learned with your counselor and share what short-term and long-term goals you might have if you pursued this.

Notes:



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**REQUIREMENT 5:** After completing the first four requirements, complete ONE of the following options.

**DO ONE OF THE FOLLOWING (5A, 5B, 5C, or 5D) FOR REQUIREMENT 5**

**REQUIREMENT 5a:** Option 1 - Sheet Metal Mechanic / Tinsmith

**REQUIREMENT 5a1:** Name and describe the use of the basic sheet metalworking tools.

Notes:

**REQUIREMENT 5a2:** Create a sketch of two objects to make from sheet metal. Include each component's dimensions on your sketch, which need not be to scale.

Notes:





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**REQUIREMENT 5a3:** Make two objects out of 24- or 26-gauge sheet metal. Use patterns either provided by your counselor or made by you and approved by your counselor. Construct these objects using a metal that is appropriate to the object's ultimate purpose, and using cutting, bending, edging, and either soldering or brazing.

- a. One object also must include at least one riveted component.
- b. If you do not make your objects from zinc-plated sheet steel or tin-plated sheet steel, preserve your work from oxidation.

**COUNSELOR APPROVAL:** IS REQUIRED.

Counselor's Name

Phone or Email

Counselor's Signature

Date

☐

*approved*

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

**BE PREPARED!**

Notes:



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**REQUIREMENT 5b:** Option 2 - Silversmith

**REQUIREMENT 5b1:** Name and describe the use of a silversmith's basic tools.

Notes:

**REQUIREMENT 5b2:** Create a sketch of two objects to make from sheet silver. Include each component's dimensions on your sketch, which need not be to scale.

Notes:



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### REQUIREMENT 5b3:

Make two objects out of 18- or 20-gauge sheet copper. Use patterns either provided by your counselor or made by you and approved by your counselor. Both objects must include a soldered joint. If you have prior silversmithing experience, you may substitute sterling silver, nickel silver, or lead-free pewter.

- At least one object must include a sawed component you have made yourself.
- At least one object must include a sunken part you have made yourself.
- Clean and polish your objects.

**COUNSELOR APPROVAL:** IS REQUIRED.

Counselor's Name

Phone or Email

Counselor's Signature

Date

☐

*approved*

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

**BE PREPARED!**

Notes:



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- REQUIREMENT 5c3:** Make two molds, one using a pattern provided by your counselor and another one you have made yourself that has been approved by your counselor. Position the pouring gate and vents yourself. *Do not use copyrighted materials as patterns.*
- Using lead-free pewter, make a casting using a mold provided by your counselor.
  - Using lead-free pewter, make a casting using the mold that you have made.

**COUNSELOR APPROVAL:** IS REQUIRED.

\_\_\_\_\_  
Counselor's Name

\_\_\_\_\_  
Phone or Email

\_\_\_\_\_  
Counselor's Signature

\_\_\_\_\_  
Date ☐ *approved*

**This requirement must be reviewed with your merit badge counselor.  
BE PREPARED!**

Notes:



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**REQUIREMENT 5d:** Option 4 - Blacksmith

**REQUIREMENT 5d1** Name and describe the use of a blacksmith's basic tools.

Notes:

**REQUIREMENT 5d2:** Make a sketch of two objects to hot-forge. Include each component's dimensions on your sketch, which need not be to scale.

Notes:



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- REQUIREMENT 5d3:** Using low-carbon steel at least 1/4 inch thick, perform the following exercises:
- Draw out by forging a taper.
  - Use the horn of the anvil by forging a **U**-shaped bend.
  - Form a decorative twist in a piece of square steel.
  - Use the edge of the anvil to bend metal by forging an **L**-shaped bend.

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

**BE PREPARED!**

Notes:

- REQUIREMENT 5d4:** Using low-carbon steel at least 1/4 inch thick, make the two objects you sketched that require hot-forging. Be sure you have your counselor's approval before you begin.
- Include a decorative twist on one object.
  - Include a hammer-riveted joint in one object.
  - Preserve your work from oxidation.

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

**BE PREPARED!**

Notes: