Composite Materials

Merit Badge Workbook

This workbook can help you, but you still need to read the merit badge pamphlet.
This Workbook can help you organize your thoughts as you prepare to meet with your merit badge counselor

Merit Badge Counselors may not require the use of this or any similar workbooks.
You still must satisfy your counselor that you can demonstrate each skill and have learned the information.
You should use the work space provided for each requirement to keep track of which requirements have been completed, and to make notes for discussing the item with your counselor, not for providing full and complete answers.
If a requirement says that you must take an action using words such as "discuss", "show", "tell", "explain", "demonstrate", "identify", etc, that is what you must do.
No one may add or subtract from the official requirements found in Scouts BSA Requirements (Pub.# 33216) and/or on Scouting.org.
The requirements were last issued or revised in 2023 • This workbook was updated in December 2022.

Scout's Name:_____ Unit: _____

Counselor's Name: _____ Phone No.:_____ Email: _____

Please submit errors, omissions, comments or suggestions about this **workbook** to: Workbooks@USScouts.Org

Comments or suggestions for changes to the **requirements** for the **merit badge** should be sent to: Merit.Badge@Scouting.Org

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1. Do the following:
   a. Explain to your counselor the most likely hazards you may encounter while working with composite materials and what you should do to anticipate, mitigate and prevent, and respond to these hazards.

Describe the appropriate safety gear and clothing that should be used when working with composite materials.

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b. Explain the precautions that must be taken when handling, storing, and disposing of resins, reinforcements, and other materials used in composites. Include in your discussion the importance of health, safety, and environmental responsibility and awareness.

c. Describe what a safety data sheet (SDS) is and tell why it is used.

2. Do the following:

a. Explain what are composite materials.

Include a brief history of composites and how they have developed.

b. Compare the similarities and differences between composites and wood, aluminum, copper, and steel. Explain the physical, electrical, mechanical, corrosive, flammability, cost, and other such properties. For each of these raw materials, give one example of how it can be shaped and used for a specific application.

Composites

Physical properties:	
Electrical properties:	
Mechanical properties:	
Corrosive properties:	
Flammability:	
Cost:	
Other properties.	

How can it be shaped and used for a specific application.

Wood

Physical properties:	
Electrical properties:	
Mechanical properties:	
Corrosive properties:	
Flammability:	
Cost:	
Other properties.	

How can it be shaped and used for a specific application.

Aluminum

Physical properties:	
Electrical properties:	
Mechanical properties:	
Corrosive properties:	
Flammability:	
Cost:	
Other properties.	

How can it be shaped and used for a specific application.

Copper

Physical properties:	
Electrical properties:	
Mechanical properties:	
Corrosive properties:	
Flammability:	
Cost:	
Other properties.	

How can it be shaped and used for a specific application.

Steel

Physical properties:	
Electrical properties:	
Mechanical properties:	
Corrosive properties:	
Flammability:	
Cost:	
Other properties.	

How can it be shaped and used for a specific application.

3. Describe how composite materials are made.

Then do the following:

a. Discuss three different composite reinforcement materials, their positive and negative characteristics, and their uses. Obtain the SDS for each one and discuss the toxicity, disposal, and safe-handling sections for these materials.

Composite Reinforcement Material 1:	
Positive Characteristics	
Negative Characteristics	
Uses.	
Toxicity	
Disposal	
Safe-Handling	

Composite Reinforcement Material 2:	
Positive Characteristics	
Negative Characteristics	
Uses.	
Toxicity	
Disposal	
Safe-Handling	

Composite Reinforcement Material 2:	
Positive Characteristics	
Negative Characteristics	

Uses.	
Toxicity	
Disposal	
Safe-Handling	

b. Discuss three different resins used in composites, their positive and negative characteristics, and their uses. Obtain the SDS for each one and discuss the toxicity, disposal, and safe-handling sections for these materials. Include thermoset resins and thermoplastic resins in your discussion.

Resin 1:	
Positive Characteristics	
Negative Characteristics	
Uses.	
Toxicity	

Disposal	
Safe-Handling	

Resin 2:	
Positive Characteristics	
Negative Characteristics	
Uses.	
Toxicity	
0Disposal	
Safe-Handling	

Resin 3:	
Positive Characteristics	
Negative Characteristics	
Uses.	
Toxicity	
Disposal	
Safe-Handling	

c. For each of the three resins you chose for requirement 3b, think of a new application that might be worth developing.

Resin 1:	
New Application	
Resin 2:	
New Application	
Resin 3:	
New Application	

4. With your parent's permission and your counselor's approval do ONE of the following:

☐ a. Visit a company that manufactures or repairs products made with composites. Discuss what you learn with your counselor.

☐ b. Find three composites-related websites.

1.
2.
3.

Share and discuss what you learn with your counselor.

5. Do the following:
   a. Use composite materials to complete two projects, at least one of which must come from the Composite Materials merit badge pamphlet. The second project may come from the pamphlet OR may be one you select on your own that has been approved by your counselor in advance.

Project 1	
Project 2	

   ☐ b. With your counselor's assistance, find an appropriate site where the projects can be safely completed under your counselor's supervision and/or the supervision of an adult approved by your counselor who is knowledgeable about composites.

   c. With your counselor, determine how the finished projects will be evaluated.

Using those guidelines, evaluate the completed projects with your counselor.

6. Find out about three career opportunities in composite materials.

1.	
2.	
3.	

Pick one and find out the education, training, and experience required for this profession.

Career:	
Education:	
Training:	
Experience:	

Discuss this with your counselor, and explain why this profession might interest you.

When working on merit badges, Scouts and Scouters should be aware of some vital information in the current edition of the *Guide to Advancement* (BSA publication 33088).Important excerpts from that publication can be downloaded from http://usscouts.org/advance/docs/GTA-Excerpts-meritbadges.pdf.

You can download a complete copy of the *Guide to Advancement* from http://www.scouting.org/filestore/pdf/33088.pdf.