



Composite Materials

Merit Badge Workbook

This workbook can help you but you still need to read the merit badge pamphlet (book). No one can add or subtract from the Boy Scout Requirements #33215. Merit Badge Workbooks and much more are below: [Online Resources](#).

Send comments to: craig@craiglincoln.com. Requirements revised: 2006, Workbook updated: February 2008.

Scout's Name: _____ Unit: _____

Counselor's Name: _____ Counselor's Ph #: _____

1. Do the following:

- a. 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. _____

- b. Describe what a material safety data sheet (MSDS) 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.

Composites

Explain the physical, _____

electrical, _____

mechanical, _____

corrosive, _____

flammability, _____

cost, _____

and other such properties. _____

For each of these raw materials, give one example for how it can be shaped and used for a specific application. _____

Wood

Explain the physical, _____

electrical, _____

mechanical, _____

corrosive, _____

flammability, _____

cost, _____

and other such properties. _____

For each of these raw materials, give one example for how it can be shaped and used for a specific application. _____

Aluminum

Explain the physical, _____

electrical, _____

mechanical, _____

corrosive, _____

flammability, _____

cost, _____

and other such properties. _____

For each of these raw materials, give one example for how it can be shaped and used for a specific application. _____

Copper Steel

Explain the physical, _____

electrical, _____

mechanical, _____

corrosive, _____

flammability, _____

cost, _____

and other such properties. _____

For each of these raw materials, give one example for how it can be shaped and used for a specific application. _____

Steel

Explain the physical, _____
 electrical, _____
 mechanical, _____
 corrosive, _____
 flammability, _____
 cost, _____
 and other such properties. _____

For each of these raw materials, give one example for how it can 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 MSDS 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 3: _____

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 MSDS for each one and discuss the toxicity, disposal, and safe-handling sections for these materials. Include thermoset resins and thermoplastic resins in your discussion.
- c. For each of the three resins you chose for requirement 3b, think of a new application that might be worth developing.

Resin 1: _____

Positive Characteristics _____

Negative Characteristics _____

Uses. _____

Toxicity _____

Disposal _____

Safe-Handling _____

New Application _____

Resin 2: _____

Positive Characteristics _____

Negative Characteristics _____

Uses. _____

Toxicity _____

Disposal _____

Safe-Handling _____

New Application _____

Resin 3: _____

Positive Characteristics _____

Negative Characteristics _____

Uses. _____

Toxicity _____

Disposal _____

Safe-Handling _____

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 Web sites. 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. _____

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

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

Online Resources *(Use any Internet resource with caution and only with your parent's or guardian's permission.)*

Merit Badge Workbooks: usscouts.org -or- meritbadge.org

► **Merit Badge Books:** www.scoutstuff.org

Boy Scouts of America: <http://www.scouting.org/> ► [Requirements](#) ► [Intro to Merit Badges](#) ► [Guide to Safe Scouting](#)

Amer. Composites Manufacturers Assn: <http://www.acmanet.org> Amer. Society for Composites: <http://www.asc-composites.org>

Center for Composite Materials: <http://www.ccm.udel.edu> Composites World: <http://www.compositesworld.com>

Composites Worldwide Inc.: <http://www.compositesnews.com> E-Composites Inc.: <http://www.e-composites.com>

NetComposites: <http://www.netcomposites.com>

Occupational Safety and Health Administration: <http://www.osha.gov>

OSHA Composites safety: <http://www.osha.gov/SLTC/composites/index.html>