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 #33216. Merit Badge Workbooks and much more are below: Online Resources.
Send comments to the workbook developer: craig@craiglincoln.com. Requirements revised: 2006, Workbook updated: May 2009.

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.

_____

_____

_____

_____

_____

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_____

b. Describe what a material safety data sheet (MSDS) is and tell why it is used. _____

_____

_____

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_____

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.)*

Boy Scouts of America: ► scouting.org ► Guide to Safe Scouting ► Age-Appropriate Guidelines ► Safe Swim Defense ► Scout ► Tenderfoot ► Second Class ► First Class Rank Videos ► Safety Afloat

Boy Scout Merit Badge Workbooks: usscouts.org -or- meritbadge.org **Merit Badge Books:** www.scoutstuff.org

Requirement Resources

These resources and much more are at: http://meritbadge.org/wiki/index.php/Swimming

1a. Safety & Health: OSHA Health and Safety - Composites
1b. Material Safety Data Sheet (MSDS) List
2a. What are composites? - Wikipedia: Composite Materials
2b. Benefits of composites - Composites products examples by market - Composite Material Key Concepts
3. Overview of composites manufacturing processes
3. Overview of composite materials - SME Society of Manufacturing Engineers Composites
4. Resource of companies who make composites
5. Project ideas

Group Projects: Surf board, Canoe or kayak, Troop box, Totem poles, Snow shoes, Lightweight troop/patrol kitchen, Troop trailers, Klondike derby sled, Snow boards, Camp signage

Individual Projects: Skate board, Skim board, Walking sticks, Car or Boat Repair, Tool Handle Repair, Window flower box, Camp fire bucket, Small toy boat, Modified pinewood derby cars

6. Careers in the Composites Industry

General Resources

American Composites Manufacturers Association: http://www.acmanet.org
Amer. Soc. for Composites: http://www.asc-composites.org
Center for Composite Materials: http://www.ccm.udel.edu
Composites World: http://www.compositesworld.com
Composites Worldwide: http://www.compositesnews.com
E-Composites Inc.: http://www.e-composites.com
NetComposites: http://www.netcomposites.com
Occupational Safety & Health Admin.: http://www.osha.gov
OSHA Composites safety: http://www.osha.gov/SLTC/composites/index.html