CHEMISTRY

Merit Badge Requirements

BSA Troop 413, Torrance

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1. Do EACH of the following activities:

A) Describe three examples of safety equipment used in a chemistry laboratory and the reason each one is used.

Suggested link: http://www.baruch.cuny.edu/tutorials/weissman/chemlab/ and go to Exploring the Lab, Slides 6, 7, and 9.

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

Suggested link: http://www.ilpi.com/msds/faq/parta.html#whatis

C) Obtain an MSDS for both a Paint and an Insecticide. Compare and discuss the toxicity, disposal, and safe-handling sections for these two common household products.

Compare a paint from Home Depot and the insecticide Lorsban from Dow. You will find the toxicity in Section 11 where the LD50 tells you the lethal dose of 50% of the subjects (rats typically). The disposal is in Section 13 and the handling is in Section 7. Suggestion: check the oral LD50 of the different ingredients.

Suggested Link:

http://ws.greenbook.net/Docs/Msds/M90141.pdf

http://www.homedepot.com/catalog/pdfImages/fd/fd6aad5a-fd9e-4bdb-9740-7f0a83919d7e.pdf

D) Discuss the safe storage of chemicals. How does the safe storage of chemicals apply to your home, your school, your community, and the environment?

Home: http://www.kingcounty.gov/healthservices/health/ehs/toxic/HouseholdChemicals.aspx

Home, Community, and Environment:

Search with your parent permission the subject, and understand how chemicals storage and disposal impact the environment.

2. Do EACH of the following activities:

A) Predict what would happen if you placed and iron nail in a copper sulfate solution. Then, put an iron nail in a copper sulfate solution. Describe your observations and make a conclusion based on your

observations. Compare your prediction and original conclusion with what actually happened. Write a formula for the reaction that you best described.

B) Describe how you would separate sand from water, table salt from water, oil from water, and gasoline from motor oil. Name the practical processes that require these kinds of separations. C) Describe the difference between a chemical reaction and a physical change.

3. Perform this activity

A) Construct a Cartesian Diver. Describe its function in terms of how gases in general behave under different pressures and different temperatures. Describe how the behavior of gases affects a backpacker at high altitudes and a scuba diver under water.

4. Do EACH of the following activities:

A) Cut a round onion into small chunks. Separate the onion chunks into three equal portions. Leave the first portion raw. Cook the second portion of onion chunks until the pieces are translucent. Cook the third portion until the onions are caramelized, or brown in color. Taste each type of onion. Describe the taste of raw onion versus partially cooked onion versus caramelized onion. Explain what happens to molecules in the onion during the cooking process.

B) Describe the chemical similarities and differences between toothpaste and an abrasive household cleanser. Explain how the end use or purpose of a product affects its chemical formulation.

Suggested http://sci-toys.com/ingredients/toothpaste.html

Suggested http://lancaster.unl.edu/home/Articles/2002/HouseholdCleaning.htm

5. List the four classical divisions of chemistry. Briefly describe each one, and tell how it applies to your everyday life.

6. Do EACH of the following activities:

A) Name two government agencies that are responsible for tracking the use of chemicals for commercial or industrial use. Pick **ONE** agency and briefly describe its responsibilities to the public and the environment.

Suggestion: Check out the following governmental agencies Mission Statements.

The CDC http://www.cdc.gov/niosh/about.html

The EPA: http://www.epa.gov/ocir/scas_lgac/mission.htm

The FDA: http://www.fda.gov/AboutFDA/WhatWeDo/default.htm

B) Define pollution. Explain the chemical effects of ozone, global warming, and acid rain. Pick **ONE** current environmental problem as an example. Briefly describe what people are doing to resolve this hazard and to increase understanding of the problem.

Ozone: http://www.ucar.edu/learn/1_7_1.htm

Global Warming: http://en.wikipedia.org/wiki/Global_warming

Acid Rain: http://pubs.usgs.gov/gip/acidrain/2.html

C) Using reasons from chemistry, describe the effect on the environment of **ONE** of the following:

1) The production of aluminum cans or plastic milk cartons

2) Sulfur from burning coal

3) Used, motor oil

4) Newspaper

Aluminum cans http://cancentral.com/recycling-sustainability/sustainability

Plastic http://www.theguardian.com/sustainable-business/tetra-pak-versus-plastic-bottles-water

Sulfur http://www.eia.gov/energyexplained/index.cfm?page=coal_environment

Oil http://www.eia.gov/kids/energy.cfm?page=oil_home-basics#oil_environment-basics

Paper http://www.tappi.org/paperu/all_about_paper/earth_answers/Whyrec1.htm and http://www.tappi.org/paperu/all_about_paper/earth_answers/Recycle1.htm

D) Briefly describe the purpose of phosphates in fertilizer and in laundry detergent. Explain how the use of phosphates in fertilizers affects the environment. Also, explain why phosphates have been removed from laundry detergents.

Fertilizer http://www.agroservicesinternational.com/Environment/Problems.html

Fertilizer and Detergent http://www.ncsu.edu/sciencejunction/depot/experiments/water/lessons/np/

7. Do ONE of the following activities:

A) Visit a laboratory and **talk to a practicing chemist**. Ask what the chemist does, and what training and education are needed to work as a chemist.

B) Using resources found at the library and in periodicals, books, and the Internet (with your parent's permission), learn about two different kinds of work done by chemists, chemical engineers, chemical technicians, or industrial chemists. For each of the jobs, find out the education and training requirements.

C) Visit an industrial plant that makes chemical products or uses chemical processes and describe the processes used. What, if any, pollutants are produced and how they are handled.

E) Visit a county farm agent or similar governmental agency and learn how chemistry is used to meet the needs of agriculture in your county.

Scout Name: _____ Unit #: _____ Date: _____

Requirement 1

Describe three examples of safety equipment used in a chemistry laboratory and the reason each one is used.

Safety Equipment: _____

Reason Used: _____

Safety Equipment: _____

Reason Used: _____

Safety Equipment: _____

Reason Used: _____

What is a material safety data sheet (MSDS)? _____

Obtain an MSDS for both a paint and an insecticide. Compare and discuss the toxicity, disposal, and safe-handling sections for these two common household products: _____

Discuss the safe storage of chemicals: _____

How does the safe storage of chemicals apply to your home: _____

How does the safe storage of chemicals apply to your school: _____

How does the safe storage of chemicals apply to your community: _____

How does the safe storage of chemicals apply to the environment: _____

Scout Name: _____ Unit #: _____ Date: _____

Requirement 2

Predict what would happen if you placed and iron nail in a copper sulfate solution: _____

Put an iron nail in a copper sulfate solution. Describe your observations and make a conclusion based on your observations: _____

Compare your prediction and original conclusion with what actually happened: _____

Write the equation for the reaction that you described: _____

Describe how you would separate sand from water: _____

Describe how you would separate table salt from water: _____

Describe how you would separate oil from water: _____

Describe how you would separate gasoline from motor oil: _____

Name the practical processes that require these kinds of separations: _____

Describe the difference between a chemical reaction (chemical change) and a physical change:

Requirement 3

Construct a Cartesian diver. Show it to your counselor.

Describe its function in terms of how gases in general behave under different pressures and different temperatures: _____

Describe how the behavior of gasses affects a backpacker at high altitudes: _____

Describe how the behavior of gasses affects a scuba diver underwater: _____

Requirement 4

Cut a round onion into small chunks. Separate the onion chunks into three equal portions. Leave the first portion raw. Cook the second portion of onion chunks until the pieces are translucent. Cook the third portion until the onions are caramelized, or brown in color. Taste each type of onion.

Describe the taste of raw onion versus partially cooked onion versus caramelized onion: _____

Explain what happens to molecules in the onion during the cooking process: _____

Describe the chemical similarities and differences between toothpaste and an abrasive household cleanser: _____

Explain how the end use or purpose of a product affects its chemical formulation: _____

Scout Name: _____ Unit #: _____ Date: _____

In a clear container, mix a half-cup of water with a tablespoon of oil. Explain why the oil and water do not mix: _____

Find a substance that will help the two combine, and add it to the mixture. Describe what happened, and explain how that substance worked to combine the oil and water: _____

Requirement 5

List the four classical divisions of chemistry. Describe each one, and tell how it applies to your everyday life.

1) _____

Description: _____

How does it apply to your everyday life? _____

2) _____

Description: _____

How does it apply to your everyday life? _____

3) _____

Description: _____

How does it apply to your everyday life? _____

4) _____

Description: _____

How does it apply to your everyday life? _____

Requirement 6

Name two government agencies that are responsible for tracking the use of chemicals for commercial or industrial use.

1) _____ 2) _____

Pick one agency and briefly describe its responsibilities to the public and the environment: _____

Define pollution: _____

Explain the chemical effects of ozone: _____

Explain the chemical effects of global warming: _____

Explain the chemical effects of acid rain: _____

Pick a current environmental problem as an example. Which problem did you choose? _____

Briefly describe what people are doing to resolve this hazard and to increase understanding of the problem: _____

Select one of the following (circle it):

1) The production of aluminum cans or plastic milk cartons
2) Sulfur from burning coal
3) Used, motor oil
4) Newspaper

Using reasons from chemistry, take the item you circled above and describe the effect it has on the environment: _____

Scout Name: _____ Unit #: _____ Date: _____

Briefly describe the purpose of phosphates in fertilizer and in laundry detergent: _____

Explain how the use of phosphates in fertilizers affects the environment: _____

Explain why phosphates have been removed from laundry detergents: _____

Requirement 7

You have been given four options for this requirement. Select and complete ONE of them.

If you selected ***Option A***:

Visit a laboratory and talk to a practicing chemist.

Ask what the chemist does: _____

What training and education are needed to work as a chemist? _____

If you selected ***Option B***:

Using resources found at the library and in periodicals, books, and the Internet (with your parent's permission), learn about two different kinds of work done by chemists, chemical engineers, chemical technicians, or industrial chemists. Give a brief summary of what you learned: _____

For each of the jobs, find out the education and training requirements.

Chemist: Education: _____
Training: _____

Chemical Engineer: Education: _____
Training: _____

Chemical Technician: Education: _____
Training: _____

Industrial Chemist: Education: _____
Training: _____

Scout Name: _____ Unit #: _____ Date: _____

If you selected ***Option C***:

Visit an industrial plant that makes chemical products or uses chemical processes.

What plant did you visit? _____

What products or chemical processes do they use: _____
_____
_____

What pollutants are produced? _____
_____
_____

How are the pollutants handled? _____
_____
_____

If you selected ***Option D***:

Visit a county farm agency or similar governmental agency and learn how chemistry is used to meet the needs of agriculture in your county.

What agency did you visit? _____

Tell how chemistry is used to meet the needs of agriculture in your county: _____
_____
_____
_____
_____
_____
_____