



# CHEMISTRY MERIT BADGE WORK SHEET (BYU/UVSC PowWow)

Scout's Name

Instructor's Name

Scout's Address

City

State

ZIP

## Instructions

- 1) The Scout is to review the merit badge book before the first week of PowWow.
- 2) Bring this work sheet, paper, and pencil or pen each week.

## Requirement Instructions\*

- 1) The Scout will complete requirement 1 **either before** PowWow **or as homework** between the sessions of PowWow.
- 2) Requirement 2 will be completed **during** either session of PowWow.
- 3) Requirement 3 will be completed **during** either session of PowWow.
- 4) The Scout will complete requirement 4 **either before** PowWow **or as homework** between the sessions of PowWow.
- 5) The Scout will complete requirement 5 **either before** PowWow **or as homework** between the sessions of PowWow.
- 6) Requirement 6 will be completed **during** either session of PowWow **for the BYU classes**. It will be assigned as **homework for UVU classes**.
- 7) Requirement 7 will be completed **during** either session of PowWow.

\* All requirements may be subject to change by the Merit Badge Counselor based on time constraints at the PowWow session. Please listen to all instructions by the instructor to be aware of any changes.

## Requirement 1

**Initial**

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

Safety Equipment #1:

Purpose and reason for use:

Safety Equipment #2:

Purpose and reason for use:

Safety Equipment #3:

Purpose and reason for use:

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

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.

Toxicity:

Disposal:

Safe handling:

Discuss the safe storage of chemicals:

Tell how the safe storage of chemicals applies to each of the following areas.

Your home:

Your school:

Your community:

The environment:

## **Requirement 2**

**Initial**

Predict what you think would happen if you placed an iron nail in a copper sulfate solution.

Then, put an iron nail in a copper sulfate solution. Describe your observations.

What conclusion can you make based on these observations?

Compare your prediction and original conclusion with what actually happened.

Write the formula for the action that you described.

Tell how you would separate the following materials and name the practical processes that require these separations.

Sand from Water:

Names of processes:

Table Salt from Water:

Names of processes:

Oil from Water:

Names of processes:

Gasoline from Motor Oil:

Names of processes:

Describe the difference between a chemical reaction and a physical change.

## **Requirement 3**

**Initial**

Construct a Cartesian diver. Explain the process.

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

(Show the completed diver to your counselor.)

Describe how the behavior of gases affects a backpacker at high altitudes.

Describe how it affects a scuba diver underwater.

#### **Requirement 4**

**Initial**

With the supervision of an adult, 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 cleaner.

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

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.

What substance did you use?

Describe what happened, and explain how that substance worked to combine the oil and water.

#### **Requirement 5**

**Initial**

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

1st Division of Chemistry:

Description:

Application to life:

2nd Division of Chemistry:

Description:

Application to life:

3rd Division of Chemistry:

Description:

Application to life:  
4th Division of Chemistry:  
Description:

Application to life:

### **Requirement 6**

### **Initial**

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

Pick (and circle) one of these agencies and briefly describe its responsibilities to the public and the environment.

Define pollution.

Explain the chemical effects of the following:

Ozone:

Global Warming:

Acid Rain:

Pick a current environmental problem as an example of pollution.

Describe what people are doing to resolve this hazard and to increase understanding of the problem.

Use reasons from chemistry to describe the effect on the environment of ONE of the following. (circle your choice):

The production of aluminum cans or plastic milk cartons

Used motor oil

Sulfur from burning coal

Newspaper

Effect on environment:

Describe the purpose of phosphates in fertilizer.

Describe the purpose of phosphates 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

## Initial

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

### *Option 1:*

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. List the name of the lab or chemist you visited, the date, and a description of what you learned.

Name of lab or chemist:

Date of visit:

What the chemist does:

Education and training:

Anything else you learned or were interested in:

### *Option 2:*

Use resources found at the library and in periodicals, books, and the Internet (with your parent's permission) to find the following information:

Describe two different kinds of work done by chemists.

- 1.
- 2.

Describe two different kinds of work done by chemical engineers.

- 1.
- 2.

Describe two different kinds of work done by chemical technicians.

- 1.
- 2.

Describe two different kinds of work done by industrial chemists.

- 1.
- 2.

Describe the education and training requirements for each profession.

Chemist:

Chemical Engineer:

Chemical Technician:

Industrial Chemist:

### *Option 3:*

Visit an industrial plant that makes chemical products or uses chemical processes and describe the processes used. List what, if any, pollutants are produced.

Describe how are they handled?

*Option 4:*

Visit a county farm agency or similar governmental agency to learn how chemistry is used to meet the needs of agriculture in your community. Give a summary of your report and what information you learned.

**Merit badge work sheets will not be accepted at the Council Office in place of the official Merit Badge Application Card. Those who do not complete all the requirements should take their partially completed merit badge work sheet and their official application card to their local merit badge counselors for completion.**