



# CHEMISTRY

## Merit Badge Requirements

- 1) Define chemistry and tell what chemicals are.
  - A) Make a list of 10 chemicals found in your home and their use.
  - B) Tell how chemicals in your home are safely stored and how to dispose of them safely.
  - C) Tell the difference between a chemical reaction and a physical change.
- 2) Tell what analytic chemists do. Do THREE of the following:
  - A) Prepare an indicator from a plant leaf or bloom. Show that it works when vinegar neutralizes a baking soda solution.
  - B) Compare the strengths of 5 percent solutions of baking soda and borax by titrating each with vinegar.
  - C) Test two different bits of food for starch and protein.
  - D) Compare the amounts of vitamin C in two kinds of fruit juice.
  - E) Show that an ink or food color had two or more colors by using paper chromatography.
- 3) Define biochemistry.
  - A) Write the simple equation for photosynthesis. Explain what parts sunlight and chlorophyll play in it. Give the names and symbols of the three main parts of a 10-6-4 fertilizer. Explain what each does for plants. Draw from memory a sketch of the carbon dioxide-oxygen cycle.
  - B) Explain what oxygen does in the body of an animal. Describe how oxygen, carbon dioxide, and carbon monoxide are carried in the body. Describe the chemical changes taking place when:
    - \* Vegetables Cook
    - \* Meat Cooks
    - \* Bread dough rises
    - \* Bread bakes
    - \* Bread is chewed
- 4) Define inorganic chemistry. Carry out an experiment to show three different ways of protecting iron or steel from rusting. Tell why aluminum doesn't rust the way iron does. Do an experiment in which one metal makes another metal deposit from solution. Explain what takes place in terms of the activity series of metals.
- 5) Define organic chemistry.
  - A) What are organic chemicals?
  - B) Name three organic chemicals.
  - C) Tell the difference between polar and nonpolar.
  - D) Show how polar and nonpolar substances do not mix.
- 6) Define physical chemistry.
  - A) Construct a Cartesian diver.
  - B) Explain why the medicine dropper sinks to the bottom when the sides are squeezed.
- 7) Define pollution.
  - A) Name two chemicals that cause air, water, or solid waste pollution near your home. Tell where these pollutants might have come from. Find one way to control one of these. Do one test to show that air or water is polluted.
  - B) Do ONE of the following:
    - 1) Write the formula for ozone. Tell where it is found. Tell how it is both a pollutant and also necessary for a healthy environment.
    - 2) Write the formula for carbon dioxide. How can it cause the greenhouse effect?
    - 3) Write the formula for sulfur dioxide. Explain what acid rain is. What does pH measure? Measure the pH of rain or a body of water near your home. Tell how acid rain can be prevented.
- 8) Do ONE of the following:
  - A) Visit an industrial plant that makes chemical products or uses chemical processed, and describe the processes used. What, if any, pollutants are produced and how are they handled?
  - B) Visit a laboratory or business that uses chemicals and find out how and why chemicals are used.
  - C) Visit a county agent to learn how chemistry is meeting farm problems of soil fertility and crop pests.
- 9) Describe two different kinds of work done by chemists, chemical engineers, and chemical technicians. Explain the differences in college courses for training each of these three kinds of people.

### Requirement 1

Define chemistry: \_\_\_\_\_

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What are chemicals? \_\_\_\_\_

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Make a list of 10 chemicals found in your home and their use:

Chemical: \_\_\_\_\_ Use: \_\_\_\_\_

Chemical: \_\_\_\_\_ Use: \_\_\_\_\_

Chemical: \_\_\_\_\_ Use: \_\_\_\_\_

Chemical: \_\_\_\_\_ Use: \_\_\_\_\_

Chemical: \_\_\_\_\_ Use: \_\_\_\_\_

Chemical: \_\_\_\_\_ Use: \_\_\_\_\_

Chemical: \_\_\_\_\_ Use: \_\_\_\_\_

Chemical: \_\_\_\_\_ Use: \_\_\_\_\_

Chemical: \_\_\_\_\_ Use: \_\_\_\_\_

Chemical: \_\_\_\_\_ Use: \_\_\_\_\_

Describe how chemicals in your home are safely stored: \_\_\_\_\_

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Describe how to dispose of household chemicals properly: \_\_\_\_\_

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Tell the difference between a chemical reaction and a physical change: \_\_\_\_\_

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## Requirement 2

What do analytic chemists do? \_\_\_\_\_

You have been given five options for the next requirement. You must select and complete three of the options.

If you selected *Option A*:

Prepare an indicator from a plant leaf or bloom. Show that it works when vinegar neutralizes a baking powder solution. Give a brief summary of the steps you took and the results you got: \_\_\_\_\_

If you selected *Option B*:

Compare the strengths of 5% solutions of baking soda and borax by titrating each with vinegar. Give a brief summary of the steps you took and the results you got: \_\_\_\_\_

If you selected *Option C*:

Test two different bits of food for starch and protein. Explain how you performed the test: \_\_\_\_\_

What were the results of the test: \_\_\_\_\_

Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_

If you selected *Option D*:

Compare the amounts of vitamin C in two kinds of fruit juice:

Amount of vitamin C in juice #1: \_\_\_\_\_ Amount of vitamin C in juice #2: \_\_\_\_\_

If you selected *Option E*:

Show that an ink or food color has two or more colors by using paper chromatography. Describe the process and your results: \_\_\_\_\_

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### Requirement 3

Define biochemistry: \_\_\_\_\_

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Write the simple equation for photosynthesis: \_\_\_\_\_

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Explain what parts sunlight and chlorophyll play in photosynthesis: \_\_\_\_\_

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Give the names and symbols of the three main parts of a 10-6-4 fertilizer and explain what each one does for plants:

Name: \_\_\_\_\_ Symbol: \_\_\_\_\_ What does it do for plants? \_\_\_\_\_

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Name: \_\_\_\_\_ Symbol: \_\_\_\_\_ What does it do for plants? \_\_\_\_\_

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Name: \_\_\_\_\_ Symbol: \_\_\_\_\_ What does it do for plants? \_\_\_\_\_

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Use this area to draw from memory a sketch of the carbon dioxide-oxygen cycle. Use another piece of paper if needed.

Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_

Explain what oxygen does in the body of an animal: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe how oxygen, carbon dioxide, and carbon monoxide are carried in the body: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe the chemical changes taking place when vegetables cook: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe the chemical changes taking place when meat cooks: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe the chemical changes taking place when bread dough rises: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe the chemical changes taking place when bread bakes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe the chemical changes taking place when bread is chewed: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

#### **Requirement 4**

Define inorganic chemistry: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Carry out an experiment to show three different ways of protecting iron or steel from rusting. Give a summary of your experiment and the steps you took to complete it: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_

List the results of your experiment. What were the three different ways of protecting iron & steel from rusting:

\_\_\_\_\_

Tell why aluminum doesn't rust the way iron does: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Do an experiment in which one metal makes another metal deposit from solution. Give a summary of your experiment and list the results: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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\_\_\_\_\_

Explain what takes place in terms of the activity series of metals: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Requirement 5

Define organic chemistry: \_\_\_\_\_

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What are organic chemicals? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Name three organic chemicals:

\_\_\_\_\_

Tell the difference between polar and nonpolar: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Show how polar and nonpolar substances do not mix. Describe how you are able to show this: \_\_\_\_\_

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### Requirement 6

Construct a Cartesian diver. Explain the process: \_\_\_\_\_

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\_\_ Show the completed diver to your counselor.

Explain why the medicine dropper sinks to the bottom when the sides are squeezed: \_\_\_\_\_

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### Requirement 7

Define pollution: \_\_\_\_\_

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Name two chemicals that cause air, water, or solid waste pollution near your home:

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Tell where these pollutants might have come from: \_\_\_\_\_

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Find one way to control one of these pollutants: \_\_\_\_\_

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For the next requirement (7b), you have been given three options. Select and complete one of them.

If you selected *Option A*:

Write the formula for ozone: \_\_\_\_\_

Tell where the ozone is found: \_\_\_\_\_

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Tell how the ozone is both a pollutant and also necessary for a healthy environment: \_\_\_\_\_

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Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_

If you selected *Option B*:

Write the formula for carbon dioxide: \_\_\_\_\_

How can carbon dioxide cause the greenhouse effect? \_\_\_\_\_

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If you selected *Option C*:

Write the formula for sulfur dioxide: \_\_\_\_\_

Explain what acid rain is: \_\_\_\_\_

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What does pH measure? \_\_\_\_\_

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Measure the pH of rain or a body of water near your home. What was the pH level? \_\_\_\_\_

Tell how acid rain can be prevented: \_\_\_\_\_

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## Requirement 8

For this requirement you have been given three options. Select and complete one of them.

If you selected *Option A*:

Visit an industrial plant that makes chemical products or uses chemical processes, and describe the processes used: \_\_\_\_\_

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What, if any, pollutants are produced at this plant? \_\_\_\_\_

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How are the pollutants handled? \_\_\_\_\_

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Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_

If you selected *Option B*:

Visit a laboratory or business that uses chemicals and find out how and why chemicals are used: \_\_\_\_\_

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If you selected *Option C*:

Visit a county agent to learn how chemistry is meeting farm problems of soil fertility and crop pests. Give a summary of your report and what information you learned: \_\_\_\_\_

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## Requirement 9

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: \_\_\_\_\_

Explain the different college courses and training for each person:

Chemists: \_\_\_\_\_

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Chemical Engineer: \_\_\_\_\_

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Chemical Technician: \_\_\_\_\_

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