

Observing Pollution from Mining

In the past, mining companies were largely unregulated. As a result, land was often stripped of its topsoil, open pits were dug, and piles of waste rock were left. The United States Environmental Protection Agency (EPA) has documented many cases of harmful effects to people and ecosystems as a result of these past practices. The EPA now has regulations for the proper conduct of mining, protection and replenishment of land, and proper disposal of mining waste. The regulations were developed from the documented cases of damage to human health and the environment. These regulations require mining companies to properly treat and dispose of mining waste so that toxins are not released into the environment.

In this lab, you will be observing toxic releases into the environment that can occur if water leaches through piles of waste coal and rock that contains pyrite. You will document detailed and specific observations of coal and pyrite leaching in water. You will use process skills of collecting data and classifying to estimate the extent of pollution that can occur when a pile of mining waste is left unprotected in the open in the environment.

OBJECTIVES

Collect data based upon detailed and specific observations of coal and pyrite leaching in water.

Classify your observations to establish a relative measure of the extent of pollution.

Compare the pollution caused by pyrite to the pollution caused by coal.

MATERIALS

- Cheesecloth, 10" square (3)
- Eyedropper
- Hammer
- Jar, glass, wide-mouth (6)
- Litmus paper, blue (stock)
- Marker, waterproof
- Pyrite (stock)
- Safety goggles
- Sulfur coal (stock)
- Tape, masking (stock)
- Towel, cloth (2)
- Water, distilled (stock)



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Procedure**PART I—PREPARATION**

1. Place a piece of masking tape on the side of each of the six jars. Using the waterproof marker, write the following on each of the jars, respectively: "Pyrite Leachate," "Filtered Pyrite Leachate," "Coal Leachate," "Filtered Coal Leachate," "Control Water," and "Filtered Control Water."
2. Completely wrap a sample of pyrite with a clean towel. Put on safety goggles and use the hammer to smash the pyrite into small shards. Place the pyrite sample shards in the jar labeled "Pyrite Leachate."
3. Completely wrap a sample of coal with the second clean towel. Using the hammer, smash the coal into small shards. Place the coal sample shards in the jar labeled "Coal Leachate."
4. Using the eyedropper, drip distilled water over the pyrite and coal samples in the jars until they are completely covered.
5. Fill the jar labeled "Control Water" with distilled water.

PART II—DAY 1 OBSERVATIONS

6. Without disturbing the contents of the jar, visually examine the pyrite in the "Pyrite Leachate" jar. Record your observations in Table 1. Visually examine the water in the "Pyrite Leachate" jar. Record your observations in Table 1. Test the water in the "Pyrite Leachate" with blue litmus paper. Record the litmus paper color in Table 1.
7. Without disturbing the contents in the "Coal Leachate" jar, visually examine the coal and the water. Record your observations in Table 1. Test the water in this jar with blue litmus paper. Record the litmus paper color in Table 1.
8. Without disturbing the contents of the "Control Water" jar, visually examine the water. Record your observations in Table 1. Test the water in this jar with blue litmus paper. Record the litmus paper color in Table 1.
9. Place the three jars in a sunny window or another warm place and allow them to sit for three days.

PART III—DAY 4 OBSERVATIONS

10. Repeat steps 6 through 8 for observations on Day 4.
11. Have two of your lab team members hold a clean piece of cheesecloth as a funnel over the top of the jar labeled "Filtered Pyrite Leachate." Slowly pour all of the contents from the jar labeled "Pyrite Leachate" into the cheesecloth, being careful not to spill anything. Examine what was filtered out of the water by the cheesecloth. Record your observations in Table 1. Examine the water in the jar labeled "Filtered Pyrite Leachate." Record your observations in Table 2. Test the water in the "Filtered Pyrite Leachate" with blue litmus paper. Record the litmus paper color in Table 2.
12. Repeat step 11 for the coal leachate and the control water.

Observing Pollution from Mining *continued***TABLE 1: UNFILTERED LEACHATE OBSERVATIONS**

	Blue Litmus Test	Observations of Solids	Observations of Water
Day 1 Control Water Jar			
Day 4 Control Water Jar			
Day 1 Pyrite Leachate Jar			
Day 4 Pyrite Leachate Jar			
Day 1 Coal Leachate Jar			
Day 4 Coal Leachate Jar			

TABLE 2: FILTERED LEACHATE OBSERVATIONS

	Blue Litmus Test	Observations of Cheesecloth	Observations of Filtered Water
Day 4 Filtered Pyrite Water Jar			
Day 4 Filtered Coal Leachate Jar			
Day 4 Filtered Control Leachate Jar			

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Analysis

- 1. Examining Data** Analyze the observations that you recorded. What kinds of information did you record?

- 2. Classifying** Break down the kinds of observations you made into classifications. The number of classifications for a given kind of observation should be based on what can be reasonably estimated by visual examination.

- 3. Analyzing Data** Compare the data for the two test jars and the control jar using the classifications identified in question 2. What are the differences in the observations and litmus paper tests that you made?

- 4. Analyzing Results** Identify cause-and-effect relationships between the contents of the jars and the resulting observations and litmus paper tests.

Conclusions

- 5. Drawing Conclusions** Imagine that the observations you made are the conditions of a lake. What could the effect be on the environment in and around that lake?

- 6. Applying Conclusions** What if mining companies disposed of the rock waste from their mining operations out in the open environment? What could the effect be on the environment in and around the waste pile?
