Name_____ Period _____ Date _____

Bacteria Miner

STEM Sims

Lesson 1: Copper Reactions

Copper is a metal that is used in many materials, including pennies and wires. Copper is also a reactive metal that can change colors when oxidized. What solutions can oxidize copper?

Doing the Science

1. Start the "Bacteria Miner" simulation.
2. Select the "Metal Test" button.
3. Select and drag a small copper nugget above the 0.5 m ferric oxide (Fe_2O_3) beaker.
4. Select and drag a large copper nugget above the water (H_2O) beaker.
5. Select the "Run" button.
6. Record the color of the solution and the copper nugget in Table 1 below.

Table 1. Copper Nugget Observations

Day	Small Copper Nugget: 0.5 m Fe_2O_3	Large Copper Nugget: H_2O
1		
2		
3		
4		
5		
6		
7		

7. Repeat steps 5–6 for each of the 7 days.
8. Select on the "Reset" button.
9. Repeat steps 3–4 except with a large copper nugget above the 0.5 m ferric oxide beaker (Fe_2O_3) and a small copper nugget above the water beaker (H_2O).
10. Repeat steps 5–7 and record in Table 2 below.

Table 2. Copper Nugget Observations

Day	Large Copper Nugget: 0.5 m Fe_2O_3	Small Copper Nugget: H_2O
1		
2		
3		
4		
5		
6		
7		

What Do You Understand?

1. What happened to the ferric oxide beaker and the water beaker by the 7th day?

2. Did the size of the copper nugget affect the color of the solution?

3. What does the phrase "oxidation state" mean with respect to atoms?

4. What are the most likely oxidation states of iron?

5. What is the oxidation number of any pure metal, such as gold or silver?

6. An ion has a negative oxidation number. What does the negative oxidation number imply?

7. What are the major species in the 0.5 m Fe_2O_3 solution?

8. Write the oxidation half reaction when the copper metal reacted with the Fe_2O_3 solution.

9. Write the reception half reaction when the copper metal reacted with the Fe_2O_3 solution.

10. Describe how the bacteria aid in the processing the copper.