

**THE AMERICAN CHEMICAL SOCIETY  
CLEVELAND SECTION &  
NASA GLENN RESEARCH CENTER**

As part of the National Chemistry Week celebration  
(October 22-28, 2006)

Ask students in grades 9 through 12 to investigate:

**“IF YOU HAVE RUST, YOUR HOUSE MAY BUST”  
RUST NEVER SLEEPS!**

Rust can do a lot of damage to many household materials made of iron. Try the experiments below to determine what causes iron to rust.

*Follow the instructions below and answer the questions.*

***Materials:***

- **12 small clear plastic disposable cups**
- **½ inch plain iron nails (i.e., not coated)**
- **Salt**
- **Vinegar**
- **Vegetable Oil**
- **Water**
- **Measuring cups**
- **Measuring spoons**
- **Plastic stirrer**

1. Label 11 cups with the following: Control, Water 1, Salt 1, Vinegar 1, Salt / Vinegar 1, Oil 1, Water 2, Salt 2, Vinegar 2, Salt / Vinegar 2, Oil 2.
2. Add 10 nails to each of the 11 cups.
3. In another cup, make a salt solution by adding 1½ tsp salt to ¼ cup water and stirring till dissolved.
4. Add the following to the labeled cups:

<b>Control</b>	No water added
<b>Water 1</b>	½ tsp water
<b>Salt 1</b>	½ tsp salt solution
<b>Vinegar 1</b>	½ tsp vinegar
<b>Salt / Vinegar 1</b>	½ tsp vinegar + ½ tsp salt solution
<b>Oil 1</b>	½ tsp vegetable oil
<b>Water 2</b>	¼ cup water
<b>Salt 2</b>	¼ cup water + ½ tsp salt solution
<b>Vinegar 2</b>	¼ cup vinegar
<b>Salt / Vinegar 2</b>	¼ cup vinegar + ½ tsp salt solution
<b>Oil 2</b>	¼ cup vegetable oil

5. Keep the 11 cups on a table or counter away from drafts and observe them daily, starting from a day after preparation.

6. Record your observations for each cup in a table for 7 days.

**Questions:**

- ***On the basis of your observations, what factors can you identify as being essential for rusting?***
- ***What chemicals can you identify as factors that accelerate rusting?***
- ***Write a chemical equation that describes the reaction that takes place when iron rusts.***
- ***Explain why galvanizing protects iron from rusting. Write equations to describe the reactions involved.***
- ***What environmental factors could cause rusting of iron nails on the outside of a house?***

To complete your entry send us:

- a. Written answers to all the questions and your data table.
- b. Please complete the entry form ([Chemistry Contest Entry Form](#)) and attach it to your entry. Entries should be postmarked by Friday, November 3, 2006.
- c. Send your entry with a self-addressed stamped envelope (refer to [Chemistry Contest General Information](#) for details) to:

Dr. Mark Waner  
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John Carroll University  
20700 North Park Boulevard  
University Heights, Ohio 44118