

# Rusting Iron

**Objective:** In this laboratory you will study the oxidation of iron. This lab requires several weeks so it should be started early in the course.

**Observations:** As you continue to learn to observe chemical and physical changes remember to

- consider the rate at which a change takes place, is it fast, slow?
- consider the strength of a material - is it brittle, elastic, malleable (bendable)?



## Materials

3 steel wool pads  
Water  
White vinegar  
3 quart size zip lock bags  
scale to record weight

## The Experiment

### *Step One: Preparing the steel wool to rust*

Label three quart size ziplock bags with the numbers 1, 2, and 3. Place one steel wool pad into each bag and weigh each steel wool pad. Record all weights to the nearest gram. A typical steel wool pad has a mass of about 15 grams.

Pour 1/4 cup of water into bag 2. Pour 1/4 cup of vinegar into bag 3. Leave bag 1 without any liquid. Seal the bags and place them in a place where they will not be disturbed. Every 2-3 days observe the changes in the bags. After one week open the bags and place them in a container to dry out.



Continue to observe any changes for up to two more weeks. Carefully feel the outside of the bags to gently determine the texture of the material. Record all observations.

When several weeks have passed reweigh the bags. Some water may still be present.

## Organizing your data

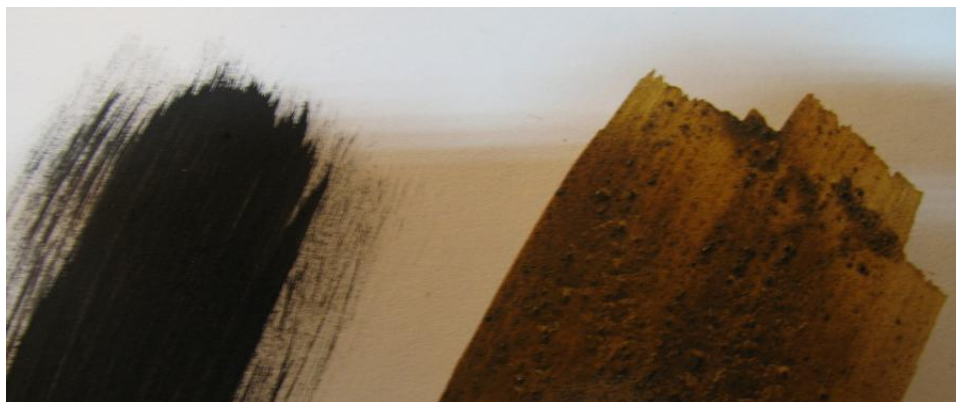
Create a chart to summarize all of your observations:

Date	Bag One	Bag Two	Bag Three

## Analysis and Conclusions

Use the data you have collected to answer the following questions:

1. How did the mass of the steel wool change as it rusted? Did it increase or decrease?
2. Which bag appeared to form the most rust, the least rust.
3. Rust is a complex process forming iron hydroxides and iron oxides. Iron has two common ions:  $\text{Fe}^{2+}$  [ferrous or iron (II)] and  $\text{Fe}^{3+}$  [ferric or iron(III)]. Rust incorporates both of these ions in different proportions. The darker the color the more iron (II) and the more yellow the color the more iron (III). Based on this - which bag seems to have the most iron (III).
4. Rust was one of the first pigments used in art. Dip a brush or a gloved finger into the material that has formed and rub it onto a white card. Describe what you see:



## Further Research

5. What colors are produced with other metals such as silver, copper as they react with oxygen?
6. What is the composition of steel? What is done to keep steel from rusting easily?

*This lab was written and photographed by Joy Walker.*