

# Fast Rusting

Will steel wool weigh more or less if burned? Find out!



## Ingredients:

- Fine mesh Steel wool (can be purchased from a paint or hardware store)
- 9-volt battery or match
- Scale accurate to 1/10 of a gram
- Ceramic or Pyrex container



## To Do:

1. Weigh a clump of steel wool the size of your fist on a scale. Record this weight.
2. Take a guess: Will this clump of steel wool weigh more or less after being burned?
3. Place the clump of steel wool in a ceramic or Pyrex container.
4. Go to a well-ventilated area.
5. Burn the steel wool. To ignite the steel wool, use a match or a battery.  
To burn the steel wool with a battery, just touch the battery to a few strands. It should start to glow. \*



## **BE CAREFUL!**

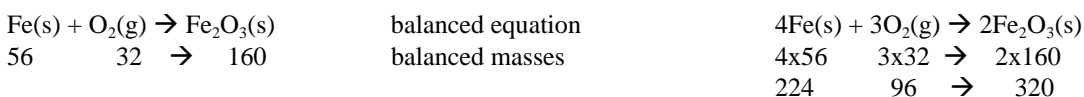
6. Blow on the burning steel wool to make sure that the entire clump has burned (this enables oxygen to get to all the nooks and crannies of the clump).
7. Let the steel wool cool.
8. Collect all the bits and pieces of burned steel wool and reweigh it. Record this weight.

## What's going on:

Steel wool is made mostly of the element iron (Fe). To prevent this iron from rusting, steel wool is usually coated with an oil based coating. When the steel wool is heated, this coating is burned off. The heat and large amount of surface area allows the iron in the steel wool to burn or combine with the oxygen in the air. This accelerated oxidation is rusting.

**The steel wool weighs more after it is burned.**

When iron becomes iron oxide, it usually forms the compound Fe<sub>2</sub>O<sub>3</sub>. Since oxygen atoms have mass and are joined to the iron atoms, the resultant compound weighs more. If you were able to do this activity under perfect conditions, your clump of steel wool would weigh 30% more than its original mass.



Therefore a clump of iron weighing 224 units would weigh 320 units after being burned...a 30% increase..

## Etc.

\*Touching the 9-volt battery to the steel wool will make the metal strands glow red-hot and melt. This is because the resistance of the narrow strands or wires is too great for the flow of electrons. The internal friction caused by this electrical overload causes the steel wool to heat up.

The orange colored rust associated with oxidized iron is not Fe<sub>2</sub>O<sub>3</sub>, but iron hydroxide Fe<sub>2</sub>O<sub>3</sub>•nH<sub>2</sub>O.