# Conservation of Mass

Problem: What will the mass of the reactants be compared to the mass of the products?

Background Information:
In this activity you will make steel wool (iron) react with oxygen to make iron oxide. Steel wool has an oil based outer covering to it. You will need to remove that outer covering first, and then expose it to oxygen. Oxygen in water reacts with iron better than oxygen in the air. Vinegar, which has water, will be used for both purposes. The chemical reaction that will happen is shown below

$$Fe \ (s) \quad + \quad O_2 \ (g) \quad ----------> \quad Fe_2O_3 \ (s)$$
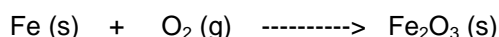
Identify the reactants of this chemical reaction by placing an (r) above the reactants. Identify the products by placing a (p) above them. When iron reacts with oxygen what will the mass be before, compared to the mass after the reaction?

Procedure

1. Tear off an egg sized piece of steel wool. Be careful not to ball it up too tightly.
2. Place the steel wool into the 250 mL beaker and add white vinegar until the entire piece of steel wool is immersed. Soak for 4-7 minutes.
3. Remove the steel wool from the vinegar and wring out any excess vinegar.
4. Place the steel wool into the 250 mL flask and cover the opening of the flask with a balloon. Make sure the neck of the balloon is centered over the opening of the flask.
5. Mass the entire steel wool-balloon-flask system and record.
6. Allow this system to sit for 30-45 minutes.
7. Later, observe the results and again take the mass of the steel wool-balloon-flask system and record.

CLEAN UP: Throw away what is left in the flask into the garbage. Wash inside of the flask with hot soapy water and a brush. Rinse out thoroughly and set on paper towel to air dry. Save the balloon. Clean up the lab countertop.

Data: Make a data table that records the mass of the reactants and the mass of the products to the nearest tenth of a gram.

Analyze and Conclude:
1. How did the mass of the materials before the reaction compare to the mass of the materials after the reaction? (if the mass is within .2 g, assume it is the same).

2. Describe what the reactants looked like (iron, oxygen) compared to the products (iron oxide).

The Law of Conservation of Matter says that matter can neither be created nor destroyed, but can be changed in form. In other words, the total mass of the material(s) before the reaction (reactants) is the same as the total mass of material(s) (products) after the reaction. Generally, this fact has been confirmed by countless experiments. If done carefully your results in this experiment should confirm this. If you did this experiment correctly the mass of the reactants and products should be the same (within an error of + or – 0.2g).

In the background information section of this handout showed that the chemical reaction that took place was this:

$$Fe\ (s)\ \ +\ \ O_2\ (g)\ \ \text{----------}>\ \ Fe_2O_3\ (s)$$
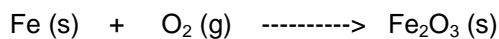
3. Fill in the table below based on the above chemical equation.

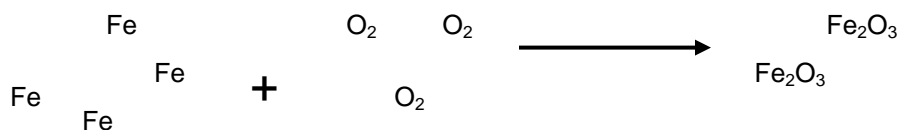| reactants		products	
# of Fe atoms_____	# of O atoms _____	# of Fe atoms_____	# of O atoms _____

Does the number of iron atoms in the reactants equal the number of iron atoms in the products?

Does the number of oxygen atoms in the reactants equal the number of oxygen atoms in the products?

4. Remember according to the law of the conservation of matter, the mass of the reactants must equal the mass of the products. The only way for that to happen is for the number of atoms of each element to remain the same before and after the reaction. The atoms just form bonds in different combinations. The more accurate equation of this reaction is below:

$$4\ Fe\ (s) + 3\ O_2\ (g)\ \text{-------->}\ 2\ Fe_2O_3\ (s)$$
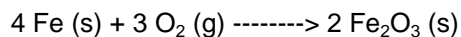
The 4 Fe atoms that react with the 3 O_2 molecules to make 2 Fe_2O_3 molecules can written in a different way that is easier to see (see below).

Fe O_2 O_2 Fe_2O_3

   Fe   **+** Fe_2O_3

Fe O_2

   Fe

How many Fe atoms are in the reactants? _____

How many oxygen *atoms* are in the reactants? _____

How many Fe atoms are in the products? _____

How many oxygen atoms are in the products? _____

5. Explain what purpose the balloon served. Write complete sentences.