Iron in Cereal

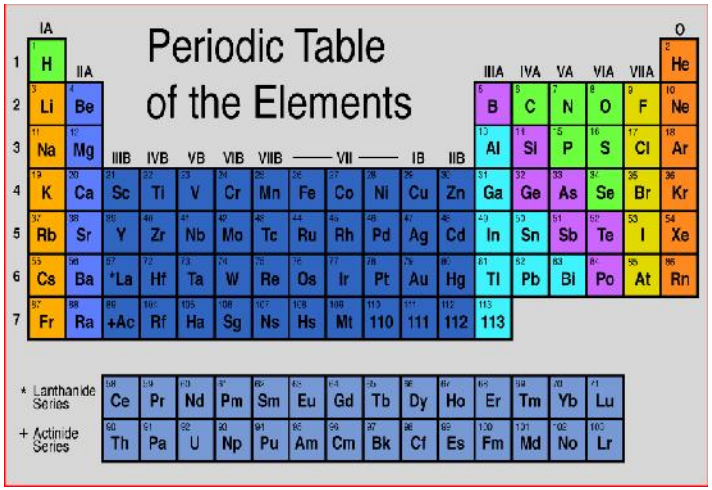
Vanderbilt Student Volunteers for Science
Spring 2016
Training Presentation

II. Introduction

- **Hand out the periodic tables (in binder).**

Ask students: What is the difference between an element, compound, and mixture? (Keep the discussion as simple as possible.)

- **Elements** are the building blocks of matter. Show students the models of elements, compounds and mixtures (pictured below).
- There are two elements (Fe and O_2), one example of a compound (Fe_2O_3 or rust), and one example of a mixture (the differently colored balls represent different elements).
- You can take the Fe_2O_3 out of the bag to show the class, but do not remove the Fe and O_2 from their bag.



II. Introduction: Elements, Compounds and Mixtures contd.

Compounds are formed by chemical combinations of two or more elements (ex. iron oxide or rust)

Mixtures are substances that are mixed together but can be separated into their components by physical means (ex. sand)

This lesson looks at **iron** as:

(1) an element

(2) one of the elements in a chemical compound

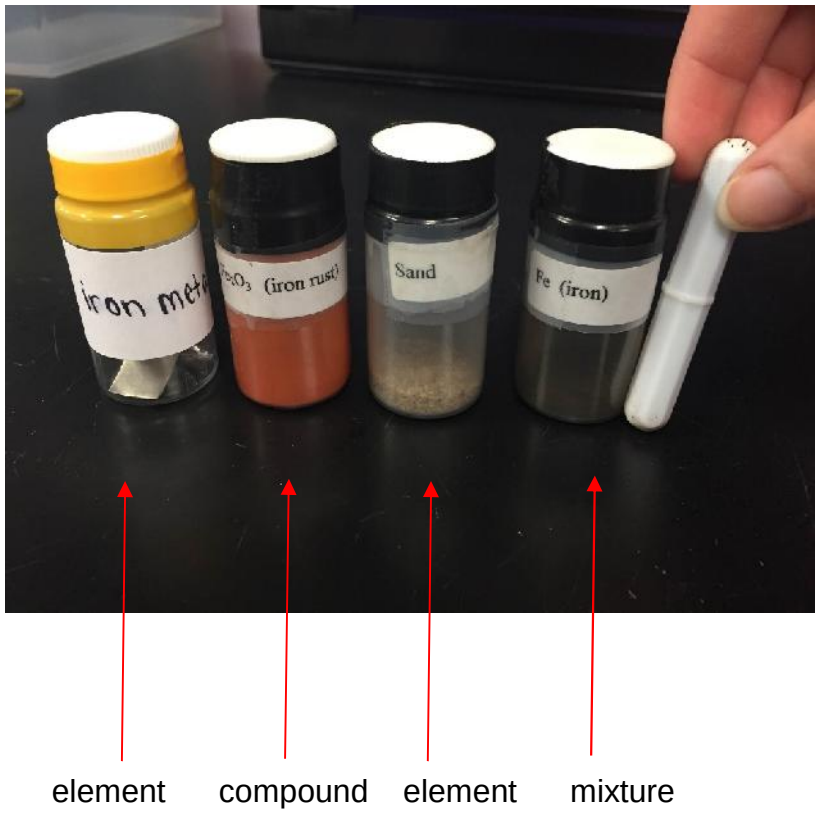
(3) one of the substances in a mixture

II. Elements, Compounds and Mixtures.

- Tell the students to take the 4 bottles out of the bag and look at the labels.
- Ask students which containers have the element, which has the compound, and which has the mixture?

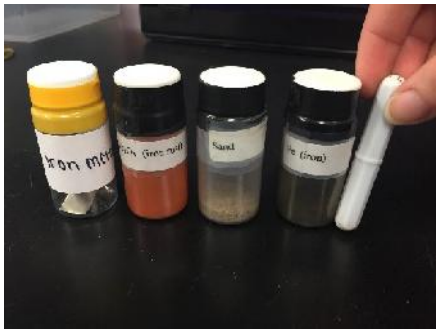
Tell the students:

- Every compound has its own properties, which are different from the properties of the elements that make up the compound.



III. Physical Properties of Iron - Magnetism

- Students must NOT open their vials
- Tell students to put their magnet on the outside of the iron filings and Iron metal containers and slowly move it up the side and across the vial to detect movement.
- Have them repeat this with the iron oxide container
- Emphasize that the physical properties of elemental iron and iron compounds are not the same.
- Tell students to record their observations



III. Demonstration - Testing for Iron in a Mixture

- Show students a jar of sand. Explain that sand contains shells, fossils, and organic matter. Sometimes it also contains an iron mineral that is magnetic
- Ask them why this would be considered a mixture. Ask them how could the iron be separated from the sand
- The VSVS team will demonstrate this test by removing the cow magnet from the jar. Show the students the particles collected by the magnet.
- Explain the commercial use of cow magnets.
- **DO NOT LET THE STUDENTS DO THIS TEST WITH THEIR SAND.**

IV. Chemical Properties of Iron - Rusting

- Ask students if they know what **oxidation** is? What are some things that **oxidize**?
  - *Oxidation usually occurs when an element or compound combines with **oxygen**.*
  - ***Iron is oxidizing when it rusts and turns a reddish color.***
- Ask students to name things that rust.
  - *Anything made of iron, that is left outside*
- Ask students if they have ever seen iron rust in a few seconds? *Probably not*
- Tell the students they are going to put some chemicals together that will cause rusting in just a few minutes.

IV. Rusting of Iron Filings

- Tell the students that the iron filings are still metallic iron, just in smaller pieces.
- Tell students to:

  Put 1 piece of cotton into each cup. ***Note:*** *the reason for using the cotton is to make the color change due to rusting more obvious.*

  Sprinkle iron filings on top of the cotton in each cup (a small scattering is all that is needed).

IV. Rusting of Iron Filings

Have the students:

- Add a squirt of water on top of the filings in the 1st cup.
- Add a sprinkle of salt and a squirt of hydrogen peroxide on top of filings in 2nd cup.
- Observe the 2 cups for one minute and then ask them what differences they can see.

After 1 minute:

- The cotton containing iron and water (cup 1) does not have orange coloring.
- The cotton containing the hydrogen peroxide and salt (cup 2) will have some orange color (rust).
- Set aside to observe again later.

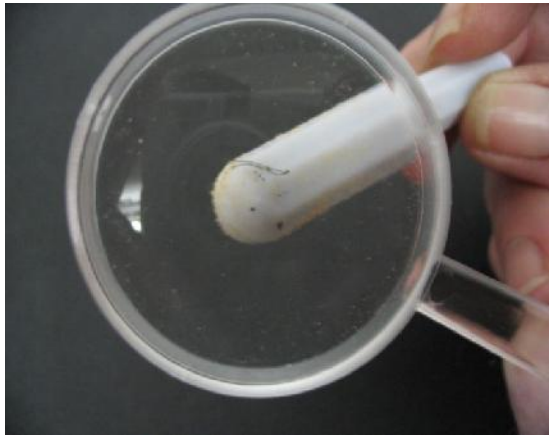
Ask students which of the 2 cups had the best conditions for rusting?

- *Cup #2, because the hydrogen peroxide could supply more oxygen than just air or water (as in cup 1) and salt speeds up rusting.*

Write the formula for hydrogen peroxide (H_2O_2)
And water (H_2O) on the board so they can see that the peroxide has more oxygens.

V. Removing Iron from a Mixture: Cereal

- Tell students to crush the cereal in their ziploc sandwich bags
- Have the student not working on this wipe off the white magnet with a tissue to make sure no iron filings are on it
- Tell them to place the white magnet in the bag and stir the cereal with it
- After removing the magnet, they should find small iron filings on the end of the magnet. They will need to use a hand lens to see the iron.
- Tell them to record their observations
- Explain the importance of iron in the human diet, citing hemoglobin as a primary example



Explanation of Source of Iron in Cereals

- Ask the students: How can we tell if iron element has been added to cereal as an element or as a compound?
  - ″reduced iron″ – elemental iron is added in the form of small iron filings and will be attracted to the magnet.
  - ″ferric phosphate″ or “ferrous sulfate” – iron is added in the form of a compound

- Tell the students to look at the ″Nutrition Facts″ and record their observations.

VI. Review

- Review the vocabulary words and the responses to the questions on the Observation Sheet.
  - Iron (Fe) is an essential element in our diets.
  - Cereals are fortified with food grade iron filings as a food supplement. This iron is metallic iron. In the stomach, this metallic iron is changed to iron compounds which are absorbed through the small intestine.
  - Suggest to students that they examine food labels of their cereals and snacks to see if iron is added and in what form. Often this will be listed under ingredients.
  - A deficiency of iron in the diet can result in fatigue, reduced resistance to disease, and increased heart and respiratory rate. Without a proper amount of iron in the body, impaired immune deficiency and anemia could develop.
  - Too much iron in the body could lead to liver damage, shock, and heart failure.
  - A healthy adult needs about 18 mg of iron each day.