

Iron Oxide Lab: Incorporating Science and Math

Concepts:

- mean, median, mode, range, line graphs, data tables
- creating a compound produces heat

Sunshine State Standards:

MA.E.1.2.1

MA.E.1.2.2

MA.E.1.2.3

MA.E. 3.2.2

Materials per lab group:

(The following materials are enough for groups of 4)

- 4 data tables
- 1 piece of chart paper with the experiment procedure listed on it (see #9 below)
- 1 large jar with lid (a deli pickle jar works well)
- 1 thermometer
- 1 piece of masking tape approximately 6 inches long (If you have enough rolls, just give one roll to each group)
- 1 rectangular piece of steel wool (no soap) about 1.5 inches x 2 inches
- 1-2 paper towels
- 1 rubber band
- 1 small container filled with enough vinegar to cover the steel wool
- 4 pairs of goggles
- 1 watch (a class wall clock will do)
- 4 calculators (if necessary)

Student Arrangement:

The children should be placed in groups of 3 or 4 for this activity.

Procedure:

Note: This lab should be done following preliminary work on atoms, molecules, and formulas.

Day 1

1. Review and discuss the parts of a compound.
2. Discuss that the purpose of this lab is to learn what happens when a chemical change creates a compound.
3. Don't tell the students that the common name for the compound iron oxide is rust. Let them figure that out for themselves.
4. Introduce the children to the materials in their lab baskets.
5. Show them each item and demonstrate the proper set up for their lab.
6. Have a chart available for them to read to help simplify the procedure.
7. This is good time to discuss constants and variables.
8. Hand out a copy of their data table. (If the students don't have experience with this type of data collection, then make sure that they understand that they should only write their data on the data table as they collect it. They will fill in the rest of the class's data later.)
9. Have students begin the lab by following the directions on the chart:
 - a. Record the beginning temperature from your thermometer on your data chart.
 - b. Put on goggles.
 - c. Place steel wool in vinegar for 30 seconds. Squeeze until it doesn't drip.
 - d. Wrap steel wool around the bottom of the thermometer. Attach it by wrapping a rubber band around it.
 - e. Place tape on the thermometer and hang it inside the jar SO THAT YOU CAN READ IT FROM THE OUTSIDE.
 - f. Close the lid and do not open it again until you are instructed to do so.
 - g. Take off goggles.
 - h. Record temperature every 2 minutes. Record any changes seen in the jar on the back of your data chart.
10. When each group has recorded their data for 14 minutes, instruct them to open the jar. They should smell the inside of the jar and feel the moisture in the jar.
11. Now is a good time to discuss the reaction that took place. Iron oxide is formed when iron and oxygen mix in the presence of water. How did this happen? The creation of rust happens slowly. It happened quickly in this lab because the acid in the vinegar removed the protective coating that may have been on the steel wool. That paved the way for the iron that is in the steel wool to rust because it was in the presence of water from the vinegar. This chemical reaction produced heat which was evident from the increase in temperature on the thermometer.
12. Have students clean up their lab area and prepare to copy the rest of the class's data.

Day 2

1. Have each lab group share their data so that everyone can place the information on their individual data sheets. Having a large class data chart is very helpful for this type of activity.
2. When all the data is recorded, then find the mean, median, mode, and range for each column. Students can do this in a variety of ways. You may want to have each lab group do one column, or you may want to do each calculation as a whole class. Calculators are helpful for this activity.

Day 3

1. Following the completion of the data charts, create a line graph that will show the temperature over a period of time.
2. Discuss the title, horizontal axis and vertical axis, appropriate scale, etc.

Day 4

1. Now it's time to draw conclusions. The line should show a rapid increase, may stay the same for a short period of time, and then finally start to decrease.
2. The class can make predictions about the temperature in the jar at certain periods of time. Will the temperature ever decrease to zero? Why? What will the line look like after 30 minutes?
3. You may want to give children a worksheet to do as a conclusion or have them write a conclusion that answers several questions related to the lab. One of the questions should pertain to the fact that chemical reactions produce heat. Some of the other questions should address the increase and decreases that are seen on the graph.