

## MONDAY MORNING SCIENCE BLAST

### Give Me Some Heat - Physical Science - Chemical reactions

It's time to barbecue! If you're a purist like my son-in-law Greg, it's charcoal all the way. So get out a match and swipe it along the striker strip of the matchbook or box. What just happened? You've created an exothermic reaction! In chemistry, a reaction happens when two or more molecules interact and something happens. That's it. What molecules are they? How do they interact? What happens? The possibilities in reactions are infinite.

All chemical reactions are accompanied by a change in energy. Some reactions need to absorb heat from their surroundings to proceed; these are called endothermic. Other reactions release energy to their surroundings (usually in the form of heat) and are called exothermic. For example, striking the match causes a reaction between the chemicals in the match head and oxygen in the air. However, the match doesn't light spontaneously. You first need to input energy, called the activation energy of the reaction. In the case of the match, the activation energy is supplied in the form of heat by the match striking the matchbook or box; after the activation energy has been absorbed and the reaction begins, the reaction continues until either the flame is extinguished or the material to react runs out. In this lab your students will be creating exothermic reactions - no matches required!

Before doing this lab you will need to get several empty baby food jars with lids. I like to use the large sized jars rather than the short jars. Next you will need to use an awl or similar tool to punch a hole in the center of the jar lid. This hole will need to be enlarged enough to allow a standard lab thermometer to be inserted through it. I use a Phillips head screw driver to make the hole in the lid the desired size. Once I have the hole to the desired diameter, I use a hammer or similar object to flatten out the sharp edges of the hole on the inside of the lid so there is no risk of my students injuring themselves on sharp edges.

When you have the jars and lids set up you are ready to begin the lab. Instruct your students to place a thermometer through the hole in the lid of their jar so the bulb of the thermometer rests on the bottom of the jar, then close the lid. They are to leave the thermometers in their jars for five minutes to record the jars' inside temperature. After five minutes, have your students open their jar lids and take out the thermometers; they are now to read the temperature inside their jar and record this in the Data Section.

Next, instruct your students to add 100 mL of vinegar to their beakers, then make a loosely rolled ball (about 2 cm in diameter) of steel wool and place it in vinegar, making sure the vinegar completely covers the steel wool. This will be left for one minute. At the end of that time, they are to remove the steel wool from their beakers and squeeze out the excess vinegar, then wrap a piece of wool around the bulb of their thermometer, placing the wool wrapped thermometer in the jar and closing the lid. Students are to leave their thermometers in their jars with the steel wool for five minutes. At the end of five minutes they are to remove the lids from their jars and read the temperature on their thermometers, recording this temperature in the Data Section.

This is a simple demonstration of an exothermic reaction, just one type of chemical reaction. Now is a good time to study other types of chemical reactions. A great project is to have your students form teams of two to four people and research simple and SAFE chemical reactions that they can demonstrate to the rest of the class. Be sure that they get their reactions approved by you and that proper procedures are followed. As part of their presentation, have them develop a poster that explains the type of reaction they are demonstrating and the chemical equation (balanced) that identifies the reactants and products.

# Give Me Some Heat

**QUESTION:** What is an exothermic reaction?

**MATERIALS:**

beaker (250 mL)	thermometer
glass jar and lid	vinegar
graduated cylinder (100 mL)	wool (2x5 cm)
steel wool	

**PROCEDURE:**

1. Place the thermometer through the hole in the lid of the jar so that the bulb of the thermometer rests on the bottom of the jar, then close the lid.
2. Allow the thermometer to remain in the jar for five minutes to record the jar's inside temperature. After five minutes, open the lid, take out the thermometer, read the temperature inside the jar and record it in the Data Section.
3. Add 100 mL of vinegar to the beaker.
4. Make a loosely rolled ball (about 2 cm in diameter) of steel wool and place it in the beaker of vinegar, making sure the vinegar completely covers the steel wool. Leave it for one minute.
5. After one minute, remove the steel wool from the beaker and squeeze out the excess vinegar.
6. Wrap a piece of wool around the bulb of the thermometer, then place the wool wrapped thermometer in the jar and close the lid.
7. Leave the thermometer in the jar with the steel wool for five minutes.
8. At the end of five minutes remove the lid from the jar and read the temperature. Record this temperature in the Data Section.

**DATA:**

JAR	TEMPERATURE
Empty	
With Steel Wool	

**QUESTIONS:**

1. What are the indicators of a chemical reaction?
2. Why is it necessary to soak the steel wool in the vinegar?
3. What are the reactants in this reaction?
4. What are the products?
5. Besides the change in temperature that you recorded, what is another indication that a chemical reaction has occurred inside the jar?