

## Activity #2 'BANG' -The Effect the Convection Process has on Patriotic Water

*Activity Time: 75 minutes*

### *Advance Preparation*

#### *Ice Water*

The night before, freeze a large block of water (or several trays of ice cubes) dyed with blue food coloring. In the morning, place blue ice in a pitcher and pour a small amount of water over ice. Allow ice to melt into a liquid state but keep as close to 0°C as possible. When pouring out ice water for each group, it is recommended that you use Styrofoam® cups.

#### *Room Temperature Water*

In the morning, fill enough clear plastic cups 2/3 full so that each group has two cups as well as each individual student having one cup. (Example: If you have 30 students, you will need 30 cups, plus enough for each group to have two additional cups.) Water needs to be at room temperature and not right out of the tap.

*Note:* It is suggested to make several extra for those students who need a "do over."

#### *Hot Water*

Just prior to the activity, bring a pitcher of water to a boil and add red food coloring to it. Caution students to be careful!! When pouring out hot water for each group of students, it is recommended that you use Styrofoam® cups.

### *Procedure*

1. Give each group two plastic cups filled with room temperature water, a container of ice water, and a container of hot water. Have students take the temperature readings for the ice water and the hot water and record their data.
2. Give each group a syringe and discuss the appropriate use of this instrument. Use the syringe to measure out 30ml of ice water from the container and slowly put in one of the plastic cups containing room temperature water. Have students make and record observations of what happens to the ice water.
3. Have another person from each group use the syringe to measure out 30ml of hot water from the container and slowly put in one of the plastic cups containing room temperature water. Have students make and record observations of what happens to the hot water.

### **Materials**

For each group:

- Set of two clear plastic cups
- Thermometer
- Container of ICE cold water (0°C)
- Blue food coloring
- Container of ROOM TEMPERATURE water (23-25°C)
- Container of BOILING water (90-100°C)
- Red food coloring
- Paper towels

For each student:

- Clear plastic cup (5 oz.)
- Small syringe

4. Discuss in detail student observations on how the ice water reacted and the hot water reacted in room temperature water. Ask students why each type of water reacted the way it did. Use this opportunity to connect with the convection process and the movement of particles.
5. Explain to the student that they will be making a patriotic cup with layered red, white, and blue water. Emphasize to the students that each layer is just water and that the amount of heat energy is the only difference in the water's behavior.
6. Discuss effective strategies on how to use the syringe to get the best results. (Creating purple water is not the objective.)
7. Before students begin layering their water, have them take the temperature reading of the room temperature water and record this data.
8. Once students have their water layered in red, white, and blue, have them draw diagrams of their observations in four 15-minute intervals.
9. After each 15-minute interval, have a short discussion about what students are observing. Direct their focus on how the ice and hot water's behavior is changing over time. Ask students why the blue ice water is rising. Why is the red hot water sinking? What will your water look like after 45-minutes? What effect is the convection process having on layered patriotic water?
10. After 60-minutes, have students take the temperature of their now 'purple' water. Have students explain this temperature reading relating it to the convection process.