

# Dancing Kernels

## 4<sup>th</sup> Grade

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### References:

- “Matter, Physical and Chemical Changes” lesson plan from 4<sup>th</sup> grade curriculum guide

### Benchmarks:

PS-1 & PS-2 (Benchmark A): Identify characteristics of a simple physical and chemical change. SI-1 (Benchmark A): Select the appropriate tools and use relevant safety procedures to measure and record length, weight, volume, temperature, and area in metric and English units. SI-3, 4, 5, 6 (Benchmark C): Develop, design, and safely conduct scientific investigations and communicate the results. SWK-3 (Benchmark B): Explain discrepancies in an investigation using evidence to support findings.

### Objectives:

This lesson allows the students to experiment with chemical changes by mixing a weak acid and base, resulting in the formation of gas bubbles. The students will determine what part of the reaction is a chemical change and a physical change. Students will record their observations and use the data to analyze and interpret the reaction.

### Materials:

Initial Demonstration:

- Candle
- Lighter or Matches
- Watchglass

For the Experiment: (Materials are per pair of students)

- 30mL baking soda
- 60mL vinegar
- 100mL water
- Large container or cup
- Beakers
- Graduated cylinder
- 250mL Erlenmeyer flasks
- Popcorn kernels
- Safety goggles
- Student lab sheet (**Found in Student Journal**)

### **Initial Demonstration:**

Begin by reviewing the signs of a chemical change. Once they have been established, light the candle with the match. Allow the candle to burn for a minute to melt some of the wax. Explain to the students that both chemical and physical changes are occurring with the candle. Ask for volunteers to describe those types of changes. Students will probably tell you that the wax burning is a change, but they must be more specific. Depending on the candle, you will want to demonstrate the physical change by turning the candle upside down and letting the wax drip down. Students can see the state change. This can also be done by holding the watchglass above the candle, and after a while, the wax vapors will collect on the glass as the wax cools back to a solid. Discuss all of the changes observed in a candle to reemphasize the difference between chemical and physical changes.

### **Target Observations:**

- Light and heat are signs of a chemical change.
- The wick burning is a chemical change.
- The wax melting and reforming a solid is a change in state; therefore, a physical change.
- After a while, the shape and size of the candle changes, thus a physical change.

### **Target Model:**

- A chemical change requires the interaction between two substances, where at least one new substance is formed. The new substance has chemical properties and it is difficult to reverse the change. Several clues indicate a chemical change, including: color changes, release of heat or light, and the formation of a gas.

### **Procedure:**

Per pair of students, have them collect all the materials needed, as listed above in the materials section. Each student should be wearing their safety goggles during this experiment to prevent any splashing to the eyes. They will first measure out the volume of water required in an Erlenmeyer flask and pour it into the cup. Next, the students are to carefully pour the proper volume of vinegar into their graduated cylinders. The vinegar can then be poured into the water. By swirling the cup, be sure to thoroughly mix the two solutions together. Place 4-5 popcorn kernels in the bottom of the cup. The last substance to be measured is the baking soda, and this can be done either in the flask or the cylinder. Once they have the proper volume, have the students put all the supplies down on the desktop and proceed to ask them what they think will happen when the baking soda is added to the other mixture. Their predictions should be recorded on the lab sheet. Remind them that there are several clues that indicate a chemical change is taking place.

Once the students have made their hypothesis, they may continue with the experiment by adding the baking soda. Remind the students to keep their faces away from the top of the cup, as the solution will bubble over. Once the reaction occurs, have

them observe what happens in the cup over the next five minutes. Students should discuss their results with their partner and record their observations on their lab sheet. They should be able to identify any physical or chemical changes that took place. Explain any discrepancies in the experimental data and why they think they occurred.

**Target Observations:**

- When the baking soda is mixed with the water/vinegar, gas bubbles are formed, which overflow out of the cup.
- The kernels are surrounded by little air bubbles.
- The kernels rise to the top of the solution, then fall back down as the air bubbles pop at the surface.
- Not all of the baking is reacted, leaving some in the bottom of the cup.

**Summary:**

After having studied physical changes, students should be able to determine that chemical changes require the interaction between two substances, where at least one new substance is formed. The new substance has chemical properties that are permanent and difficult to change back into the original substance. Students will also learn that the formation of gas from a reaction is a good sign that a chemical change has occurred. The presence of gas can also be seen by the action of the popcorn kernels as they proceed to “dance” up and down inside the cup.