

## Thanksgiving Day Parades and Balloon Science

In 1927, the Thanksgiving Day Parade, sponsored by the New York City department store Macy's, introduced giant balloons for the first time. In 1927, a Felix The Cat balloon and others were inflated with air and guided along the parade route. In 1928, helium was used for inflating to keep balloons floating high above the spectators. That year, parade planners decided to release the balloons into the sky after the parade. It hadn't occurred to anyone that helium expands at higher altitudes and as science would have it – the balloons burst. The next year, balloons were designed with a safety valve to allow the helium to escape slowly. Prizes were given to people who found and returned the balloons to Macy's. This created quite a commotion with people competing to capture the balloons and eventually Macy's stopped the practice of releasing them in the interest of public safety.



These two experiments allow students to use another gas to inflate balloons - carbon dioxide ( $\text{CO}_2$ ).

This activity can be used to meet Ohio revised science standards for Grades 3,4,6,7, and 9.

### Experiment #1

#### What you need for each group:

- A balloon
- About 40 ml of water
- 16-24 oz. empty soft drink bottle
- Drinking straw/long stirrer stick
- Half a lemon
- 1 teaspoon of baking soda
- Tape measure
- A timer

#### What to do:

1. Divide students into groups of four and have each group gather a tray containing the above ingredients. Instruct students to stretch out the balloon to make it as easy as possible to inflate.
2. Have students pour around 40 ml of water into the soft drink bottle.
3. Add the teaspoon of baking soda and stir it around with the straw until it has dissolved.
4. Now have a student squeeze some juice from the lemon into the bottle and quickly put the stretched balloon tightly over the mouth of the bottle so that no air is leaking out.
5. Have students use their timer to record how long it takes the balloon to inflate.
6. Then measure the circumference of the balloon in regular intervals to see how large it gets (e.g. every 5 minutes).
7. Share each group's results as a class.

### **What happens?**

Adding the lemon juice to the baking soda creates a chemical reaction. The baking soda is a base, while the lemon juice is an acid. When the two combine a chemical reaction is produced that releases among other things carbon dioxide gas (CO<sub>2</sub>). The CO<sub>2</sub> gas rises up and pushes on balloon, blowing it up.

## **Experiment #2**

### **You Will Need:**

- A balloon
- About 40 ml of water
- 16-24 oz. empty soft drink bottle
- Drinking straw/long stirrer stick
- A teaspoon of yeast
- A tablespoon of sugar
- Tape measure
- A timer

### **What to do:**

1. Divide students into groups of four and have each group gather a tray containing the above ingredients. Instruct students to stretch out the balloon to make it as easy as possible to inflate.
2. Have students pour around 40 ml of water into the soft drink bottle.
3. Add the sugar and yeast and stir until it dissolves.
4. Now quickly put the stretched balloon tightly over the mouth of the bottle so that no air is leaking out.
5. Have students use their timer to record how long it takes the balloon to inflate.
6. Then measure the circumference of the balloon in regular intervals to see how large it gets (e.g. every 5 minutes).
7. Share each group's results as a class.

### **What happens?**

When yeast metabolize sugar, they produce carbon dioxide as a by-product of metabolism (humans also do this but we exhale it). The production of carbon dioxide is not immediate, but as yeast begin to use the sugar, bubbles will appear. These bubbles are carbon dioxide and just as in **Experiment #1** they rise and inflate the balloon.

### **Questions to Consider**

*Which experiment worked faster? Which chemical reaction seemed to release the most carbon dioxide gas to inflate the balloon? Compare each group's answer. Were all answers similar? Why or why not?*

### **Inquiry Extension:**

*What would you like to try next?*

Have student groups design a new inquiry experiment using what they learned from this one.

*Some ideas to try:*

- See what combination of juice and baking soda more quickly inflates the balloon?
- What about trying a different acid (instead of lemon juice) like vinegar?
- See what combination of yeast and sugar more effectively inflates the balloon?
- Does the balloon with yeast inflate faster if it is heated?