

# BLAST OFF

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## Lesson Summary for Grades 4–8

Students use a toy cannon constructed of a film canister to explore the effects of volume and temperature on the pressure of gases.

## Science Activity: Blast Off

*Using a toy cannon powered by Alka Seltzer<sup>®</sup> and water, students observe how changing temperature, pressure, and volume affects the speed at which the cannon pops.*

Key Science Topics:

- pressure
- temperature
- gas laws

Key Process Skills:

- observing
- measuring
- graphing

Ohio Proficiency Learning Outcomes for Science:

Eight Grade

- I-3 identify and apply science safety procedures
- II-7 describe interactions of matter and energy
- III-12 describe chemical and/or physical interactions of matter

## Materials

For Getting Ready

Per cannon

- 6-cm x 5-cm x 2-cm block of pine wood
- drill press with 1-1/4-inch Forstner bit
- film canister (type where cap fits inside)

Optional

- 2 craft wheels
- dowel (to use as axle)
- waterproof glue

For Procedure

Per group

- homemade cannon
- Alka Seltzer tablets
- beaker of water (warm and hot)
- washers (select a size that fits in cannon)

### **Safety**

While in general this activity is not dangerous, the caps can pop off very quickly and with significant pressure. Remind students to point the cannons away from other students. Wearing of goggles is recommended.

### **Getting Ready**

To make the cannon:

1. Cut blocks of wood to dimensions
2. Using drill press, cut a hole in the face of the block, beveled at a 10° angle. Drill the deepest part about 1/2-inch deep. (This will be the front of the cannon.)

If adding wheels:

3. Drill hole through back of cannon wide enough to fit a dowel through. Attach craft wheels to each side.
4. Glue film canister into base with waterproof glue.

### **Introducing the Activity**

Students should be familiar with the differences in states of matter and pressure. Discuss what the students know about Alka Seltzer. What will happen if we trap the gas produced by the tablet? Can we change how quickly the cannon pops? How?

### **Procedure**

Part 1: Blasting Off

1. Fill the cannon one-half full with warm water
2. Drop in one-quarter tablet of Alka Seltzer—no more.
3. Snap the lid tightly into the cannon, point the cannon away from all students.
4. Observe what happens. Why?
5. Repeat steps 1–3 four more times, recording the time it takes for the cannon to pop. Rinse out the cannon in between tries.
6. Make a data table and graph your data. Label it as “control.”
7. Compute the average and place it on your data table.

Part 2: Changing Volume

Repeat the procedure for this experiment, adding washers to the film canister to decrease volume. Label graph as “volume.”

Part 3: Changing Temperature

Repeat the procedure for this experiment, changing the water temperature from warm to hot. Label graph as “temperature.”

When completed with all three parts, lead discussion of what conclusions can be made for each part. Students should write their conclusions at end of activities.

## Math Activity

*Students make graphs of time versus trials/trails. They compare the data from the graphs and compute averages.*

Ohio Proficiency Learning Outcomes for Math:

Eight Grade

- 9-12 read, interpret, and use tables, charts, maps, and graphs to identify patterns, note trends, and draw conclusions.
- 9-14 compute averages

## Language Arts Activity

*Students write an essay describing what it would be like to fly out of a cannon like in a human cannon ball act.*

Students read the essay on Maria Zacchini ([www.goodbyemag.com/jan99/zacchini.html](http://www.goodbyemag.com/jan99/zacchini.html)) and then write their own essays.

## References

- Science Toys You Can Make With Your Kids, September 1, 2001, <http://scitoys.com/cgi-bin/shop.cgi/page>.
- Alka Seltzer Rockets, September 1, 2001, Alka Seltzer.com, <http://www.funology.com/laboratory/lab041.cfm>.
- Chahrour, J.P. “Flash! Bang! Fizz!,” *Barron’s*, 2000, p. 2-19, ISBN# 0-7641-1142-6.

# BLAST OFF

## Student Data Sheet

Name \_\_\_\_\_

### I. Popping the Top

Procedure:

1. Fill the cannon  $\frac{1}{2}$  full with warm water.
2. Drop in  $\frac{1}{4}$  tablet of Alka Seltzer—no more.
3. Snap the lid tightly onto the cannon. Point the cannon away from all students.

What Happened?

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Can you explain why?

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4. Repeat steps 1–3 four times, measuring and recording the time it takes for the cannon to pop. Rinse out the cannon after each use.
5. Make a data table and graph of your data.
6. Compute the average time and place this information on your graph.

Conclusion:

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