

# ALKA SELTZER® ROCKET LAUNCH EXPERIMENT

## SUMMARY

The purpose of the Alka Seltzer Rocket Launch Experiment is to present children with an interdisciplinary approach to solving a real world challenge. Children use the scientific method as the framework for the experiment. In fact, the included worksheet's design seamlessly incorporates the 5 steps. Students should study about Newton's third law before building and launching a rocket so that they are prepared to discuss how Newton's third law applies to rocket launches. Additionally, basic chemistry concepts such as acid/base reactions, can be studied to enhance understanding for actual rocket propellant mechanisms. Art and engineering design come together as students design rockets of different material, sizes, configurations and shapes.

## MATERIALS

- Film canisters with internal lipped lid like Fuji Film canisters (ask your local photo development/print store)
- Colored construction paper or white injet paper
- Scissors
- Compass to draw circle for nose cone
- Ruler or straight edge
- Alka Seltzer tablets
- Water
- Thermometer (optional, if you want to test this variable)
- Stop watch (if you want to determine how much time it takes to pop the lid)
- Clip board, paper, pencil to record results
- Solid surface such as a block of wood for a launch pad
- Safety Goggles

## TEACHING POINTS

**Physics & Chemistry**– Newton's third law, Chemical Reactions, Scientific Method

**Art** – Rocket body construction

**Engineering** – Rocket design

**Math** – Measurement of time & temperature, fractions

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## BACKGROUND

### Newton's Third Law

Sir Isaac Newton (1643-1727) described three laws of motion that we use to describe how objects behave as they move or sit at rest. The third law of motion is the law of interest to launching rockets and is stated as follows:

*For every action (force) there is an equal and opposite reaction (force)*

Newton's third law applies to the Alka Seltzer rocket because as the Alka Seltzer tablet dissolves in water, the Sodium Bicarbonate (base) reacts with the Citric Acid (acid) in the tablet to form carbon dioxide gas. As the gas escapes from the liquid, it fills the space in the film canister, building up pressure as the reaction continues. Finally, enough pressure is built-up inside the canister to pop the cap off of the film canister and provide the thrust needed to propel the rocket into the air. The gas pressure pushes the cap with a downward force and applies an equal and opposite force to the rocket, sending it into the sky.

Real rockets don't use Alka Seltzer to power them into space, but the same principles apply.

### Scientific Method

Sir Isaac Newton used the scientific method to discover the laws of motion. The scientific method is a procedure for finding out if an idea is correct when investigating or experimenting. There are 5 parts to the scientific method

1. **Observation** – In the experiment, patterns and effects are observed. Observation is very important to scientists, because new discoveries sometimes occur when a scientist notices or observes a new or unique pattern during an experiment.
2. **Hypothesis** – A guess or idea of how the scientist thinks an experiment might be affected when changing variables in the experiment.
3. **Experimentation** – Designing and performing tests to either prove or disprove the hypotheses.
4. **Results** – A record of the results of the tests, such as data tables, notes, graphs of data as well as notes of experimental conditions such as air temperature, humidity, wind speed, wind direction, etc.
5. **Conclusions** – An analysis of the experimental results that either prove or disprove the hypotheses. Conclusions are reached when the scientist evaluates the experimental results and may be used to design further experiments.

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## Worksheet

Scientist:

Date:

Wind Speed:

Wind Direction:

**Rocket Name:**

Fuel Amount:	
Water Temp:	
Water Volume:	
Time to ignition:	
Height of Flight:	
Notes:	

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## **HYPOTHESIS**

Describe your guesses or ideas about the outcome of the rocket launch. How can you maximize the height the rocket reaches? What would happen if you added a payload (passengers or cargo)?

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# EXPERIMENTAL SETUP

Draw and/or explain the procedure and setup of your experiment

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## **RESULTS**

Summarize the results from your data sheets

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## CONCLUSIONS

Were your hypotheses correct? Did you get unexpected results? Explain any changes in results due to changes in experimental variables.