

FIZZY ROCKETS

Have a blast with this gas-powered flyer!



Curriculum topics

- Air Pressure
- Chemical Reactions
- Forces and Motion
- Momentum
- Newton's Laws

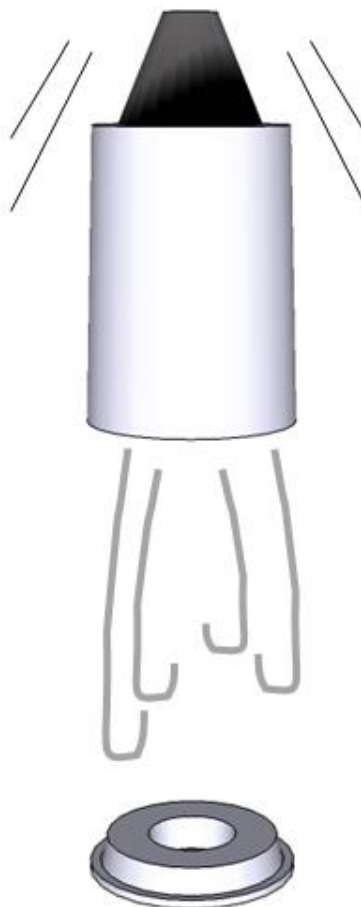
Subjects

- Engineering
- Physical Science

Grade range: 3 – 8

Who we are: Resource Area for Teaching (RAFT) helps transform the learning experience by inspiring joy through hands-on learning.

See Newton's Laws of Motion in action by experimenting with chemical reactions to launch a rocket!



Share Your feedback!
<http://bit.ly/RAFTkitsurvey>

Materials

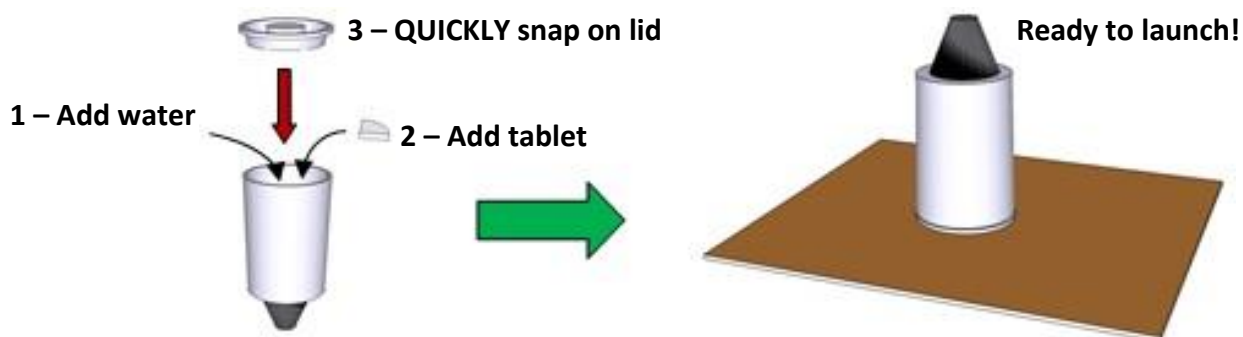
Materials in the kit may vary but generally, this kit contains the following:

- Plastic film can w/ tight fitting, dimpled lid (1)
- Effervescent tablet (1)
- Foam cylinder, self-adhesive (1)
- Not included/optional: Eye protection, water, scissors, timer, catch basin/tray

WARNING: The strengths of effervescent tablets may vary. Use a sample to test the reaction strength before using.

To Do and Notice

- 1** Assembling the Fizzy Rocket: Remove the backing from the adhesive foam cylinder. Press the foam cylinder with adhesive side down firmly onto the flat bottom of the film can. Trim the foam into a cone shape using scissors.
- 2** Preparing for the Experiment: Find a large outdoor space in which to conduct the experiment. Wearing eye protection is highly recommended! Break the effervescent tablet into **fourths**.
- 3** Conducting the Experiment: Hold the film can in one hand with the nose cone pointing down. Fill the can about $\frac{1}{4}$ full of water. Working quickly, drop a piece of effervescent tablet into the film can, snap on the lid and turn the can over and place it on a flat surface (see illustrations below).
- 4** Immediately start a timer or look at a watch/clock/phone to determine how long it takes for the rocket to launch. After “lift-off”, Estimate how high the rocket flies and note where it lands.
- 5** Rinse and dry off the lid and rocket. Crush a piece of the tablet into a powder. Repeat the experiment using the crushed tablet piece and the same amount of water as before. Use your observations to determine if there is a difference in launch times between whole and crushed effervescent tablets.
- 6** Launch the rocket again using more water and remaining tablet pieces, varying the amounts of both. Observe and note any differences in the launch times and/or landing sites.
- 7** Share student learning with RAFT! Submit photos/video via email at education@raft.net or on social media ([Facebook](#), [Twitter](#), [Instagram](#)).



Core Content Skills:

Science & Engineering (NGSS)

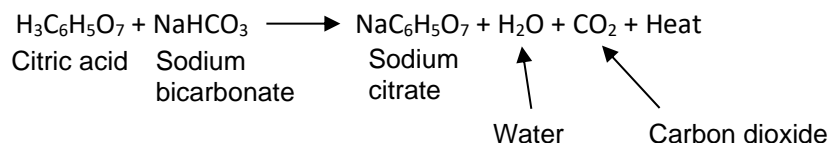
Developing and Using Models, Planning and Conducting Investigations, Forces and Motion, Definitions of Energy, Types of Interactions, Properties and Structure of Matter, Cause and Effect

Social Emotional Learning

- Self-awareness
- Self-management
- Responsible decision-making

The Content Behind the Activity

Effervescent tablets contain sodium bicarbonate and citric acid. When the tablet is exposed to water it begins to dissolve and the sodium bicarbonate and citric acid then react with each other and produce sodium citrate, water, and carbon dioxide gas. It is the carbon dioxide gas that builds pressure inside the film can and eventually pops the seal between the can and lid. The reaction shown below is **exothermic** (meaning that heat is released as the products are formed). This heat increases the pressure exerted on the film can by the gas.



When the gas pressure reaches the lid sealing pressure the lid blows off and the rocket is acted upon by an unbalanced force. This is Newton's 1st law of motion. The force propelling the rocket upward is equal and opposite the downward force acting on the lid, water, and gas (Newton's 3rd law). The magnitude (strength) of the upward force on the rocket depends on the mass and velocity of the gas being expelled from the rocket. This is Newton's second law ($F=ma$). Therefore, different amounts of water and/or effervescent material should yield observable differences in launch time. Another factor that affects launch times is the surface area of the effervescent material exposed to the water. Crushing the tablet into a powder increases its exposed surface area that can immediately dissolve in the water. The chemical reaction will occur faster, reducing that the time required for the carbon dioxide gas to build pressure. The limiting factor on altitude is the mechanical sealing pressure required to snap the lid onto the film can, which sets an upper limit on the pressure that can build in the can.

Reuse

This kit uses 100% reusable materials designed for other uses. To continue making a positive impact in reducing waste, reuse these materials in other projects. Additionally, any unused materials can be collected and delivered back to RAFT.

Feedback

Please comment on this kit by taking this short survey: <http://bit.ly/RAFTkitsurvey>. Let us know of any material concerns (missing, broken, or poorly fitting parts) as well as any suggestions for improvement.

Visit <https://raft.net> to view related activities!

Air – A Pressing Matter
Air Pressure – Feel it!
Puff Rockets

Resources

- RAFT Fizzy Rocket assembly video - <https://bit.ly/3n4jaXk>
- Khan Academy, Balanced & Unbalanced Forces - <https://bit.ly/3a7bElr>