



Bottle Rockets

Three... Two... One... Lift off! Design your own bottle rocket and launch it high into the sky. Learn how the scientific force described in Newton's 3rd Law of Motion makes your rocket launch possible.

TEKS:

8.6C Investigate and describe applications of Newton's law of inertia, law of force and acceleration, and law of action-reaction, such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.

How To:

1. First, decorate your bottle. You can use stickers, markers, construction paper, etc. Note: the opening of the bottle will be the bottom of your rocket.
2. Cut the piece of card stock in half "hamburger style."
3. Create triangular wings out of one half of the cardstock. Fold the cardstock into two equal sections and draw a diagonal line across each section, creating four triangles. Cut them out, flip the bottle with the opening side down, and tape the wings to the base, approximately 2 inches above the nozzle of the bottle.
4. Use the second half of your cardstock to create a cone and tape it so that it covers the top of your rocket (bottom of the water bottle).
5. Now that you have finished creating your rocket, it's time to test it! Fill the rocket $\frac{1}{4}$ of the way up with water.
6. To make your rocket launcher, stick the needle of a bicycle pump into one end of the cork. Stick the other end of the cork into the opening at the base of your rocket (the bottle opening).
7. Make sure the bottle is pointing away from anyone or anything, hold the end of the pump on the ground, and pump the rocket launcher until your rocket takes off!

Materials:

- 1 plastic water bottle
- 1 sheet of cardstock cut into fourths
- Scotch tape
- Scissors
- Things to decorate your rocket with like Sharpies or stickers
- Bicycle pump
- Cork (it must fit snugly inside the opening of the water bottle)
- Pitcher with water

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The STEM Explanation:

As air is pumped into the bottle using the bicycle pump, the air pressure inside the bottle built up enough to propel the rocket off the launcher. You may have noticed that when you launched the rocket, the rocket went in one direction while the water went in another. There was an equal force in both directions, which is explained by Newton's 3rd Law of Motion: for every action, there is an equal and opposite reaction. Once the air pressure built up in the rocket, the gasses exerted an equal but opposite force on the rocket, which then forced the rocket up into the air as the water was expelled out the bottom. This is described as the reaction force.

Career Connection:

Aeronautical engineers use their knowledge of aeronautics (science of flight) to design aircraft, supervise the construction of the aircraft, and test their designs in controlled flight tests.

Resource:

- <http://www.science-sparks.com/2012/03/12/making-a-bottle-rocket/>

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