It’s A Blastoff!

Grade Level: 6

Time Required: one class period

Countdown:

2 Index Cards per student
35 mm film canister Those with inside snapping lids that are transparent such as Fuji film work best. Ones with outside snapping lids that are opaque such as Kodak will not work. Canisters are usually available from camera shops or where photographic processing takes place. This is a great recycling project.
Scotch tape
Scissors
Markers, crayons or colored pencils
Effervescent antacid tablet (like Alka-Seltzer)
Aluminum pie plate or piece of aluminum foil
Tape Measure or meter sticks
Paper towels
Tablespoon Measuring Spoon
Water
Eye protection
Student Worksheets

Ignition:

Newton’s First Law of Motion states that unless something exerts a force onto an object, the object will stay at rest. Newton's Second Law states that an object will move with constant velocity until a force is exerted on the object. Newton's Third Law states that for every action there is an equal and opposite reaction. The rocket lifts off because an unbalanced force (First Law) acts upon it. This is the force produced when the lid blows off by the gas formed in the canister. The rocket travels upward with a force that is equal and opposite to the downward force propelling the water, gas, and lid (Third Law). The amount of force is directly proportional to the mass of water and gas expelled from the canister and how fast it accelerates (Second Law).

Students will construct a rocket powered by the pressure generated from an effervescent antacid tablet reacting to water. Rockets that use excessive paper and tape are likely to be less effective fliers because they carry additional weight.
**Liftoff:** Students may work in pairs or individually. It can take up to 45 minutes to complete this activity. Make sample rockets in various stages of completion if you have students who may need help visualizing the construction steps.

Distribute the materials to each student, along with the instruction sheet and worksheet.

Using index cards, students should plan how they are going to construct their rocket. Students will decide whether to cut the paper in the short or long direction to make the body tube of the rocket. This will allow for rockets of different lengths for flight comparison during liftoff.

Remind students to:

1) Decorate one of the index cards. This will form the body of the rocket.
2) Roll the index card into a tube. Slide an empty film canister into the tube so that the canister opens at one end of tube. The lid needs to be far enough from the paper tube to allow for ease in snapping the lid. Tape the tube to the canister securely.
3) Tape along the tube seam.
4) Cut the other index card in half. Use half the index card to make the rocket nose cone. Use the other half of the index card to make fins. Secure to the rocket tube.
5) Have the student record predictions of what will happen when the rocket launches:
   1) How high do you think your rocket will go?
   2) How much water will you use for launch (record in Tablespoons)?
   3) Does the amount of water matter?
   4) When launching, place the rocket on the pie plate or a piece of aluminum foil. Predict what will happen to this launch “pad”.
   5) When performing the countdown from the number 15, on what number will your rocket launch?

6) After making predictions, have all students proceed outside. Launch on a concrete surface next to a wall if available. Tape a tape measure or meter stick to the wall to see how high the rocket flies. Each student will come forward, turn rocket upside down, remove canister lid, measure the number of Tablespoons of water into canister, add 1/2 effervescing tablet, snap lid, turn rocket upside down, and place on the launch pad. Student quickly backs away from the rocket. Countdown begins. 15 – 14- 13…Have the student record when their rocket launched and how high it went.

When the students return to the classroom, compare their predictions to what actually happened. Were the predictions accurate? Why or why not?

Have the class make a simple graph of height vs. amount of water. Such a graph gives a clear visual record of the observations and can be used as evidence to support interpretations of different “fuel” mixtures.

Add variables to the experiment and have the students try it again.

1) Does the amount of water placed in the cylinder affect how high the rocket will fly?
2) Does the temperature of the water affect how high the rocket will fly?
3) Does the amount of the tablet used affect how high the rocket will fly?
4) Does the length or empty weight of the rocket affect how high the rocket will fly?
5) How would it be possible to create a two-stage rocket?

Evaluation:
- Ask students to explain how Newton’s Laws of Motion apply to this rocket.
- Compare the rockets for skill in construction (i.e., those with reinforced fins work better and those with excessive paper and tape are likely to be less efficient because of the additional weight).

More ideas …
- Remake the rocket. What geometric shapes are present in the rocket?
- Conduct an altitude contest to see which rockets fly the highest.
- Design another experiment with the rocket.
- Experiment to see how the weight of the rocket affects the height it travels keeping the amount of water and alka seltzer constant each time.
- Design a rocket powered by two, three, or more film canisters.
- Design a rocket that launches in two stages.
Rocketeer Name______________________________

Predictions:

How high do you think your rocket will go?
__________________________________________

How much water will you use for launch (record in Tablespoons)?
__________________________________________

Does the amount of water matter? Why?
__________________________________________

When launching, place the rocket on the pie plate or a piece of aluminum foil. Predict what will happen to this launch “pad”.
__________________________________________

When performing the countdown from the number 15, on what number will your rocket launch?
__________________________________________

List three ways you can improve your rocket performance.
1. ______________________________________
2. ______________________________________
3. ______________________________________

Test your theory!
IT'S A BLASTOFF

1

Wrap and tape a tube of paper around the film canister. The lid end of the canister goes down.

2


3

Tape fins to your rocket.

4

Roll a cone of paper and tape it to the rocket's upper end or use a cone shaped paper cup. Cut one side, overlap and tape to fit the rocket.

5

Ready for flight.