**Bottle Rockets**

**OBJECTIVE:**

Have campers create their own rockets made out of soda bottles and experiment the amount of water:air is best for height.

**TERMS TO GO OVER:**

Carbon dioxide

Pressure

Drag

Thrust

Lift

**PRE-LAB DEMONSTRATION MATERIALS:**

* Balloons
* Film canisters (with tops that go inside the canister)
* Baking soda
* Vinegar
* Dry ice
* Water
* Alka-Seltzer
* 2-liter bottles of Coca-Cola
* Mentos
* Plastic thingy that you put on top of of the soda bottle that deposits the Mentos with a pull of a string and has a small hole for the escaping soda

**PRE-LAB DEMONSTRATION PROCEDURE:**

1. Fill one balloon with baking soda and vinegar and tie-off
2. Fill one balloon with Alka-Seltzer and water and tie-off
3. Fill one balloon with dry ice and water and tie-off
4. Repeat steps 1-3 except place inside the film canisters to demonstrate the carbon dioxide can be used to create enough force to propel an object
5. Go outside and attach the plastic thing to the Coke bottle
6. Add the Mentos to create a fountain

**WHAT IS HAPPENING?**

Each of these combinations of ingredients causes a chemical reaction that releases carbon dioxide, which is going to provide the thrust for the bottle rockets.

**LAB MATERIALS:**

* Dry ice
* Water
* Soda bottles
* Laminated paper
* Plastic cup large enough to hold a water balloon
* Permanent markers
* Scissors
* Clear tape
* Corks
* Funnel
* Beaker
* Launch pad
* Clipboard
* Paper
* Timer

**GROUP LEADER/VOLUNTEER/TLC ROLE**

Help students assemble their rockets, tape dispensing, and dry ice handling.

**SETUP PROCEDURE**

1. Make a launch pad
	1. Make a wooden platform with a hole in the middle where the bottle’s mouth and cork fit into so then it’s upright
	2. Make holes equal lengths around the hole and insert small dowels or shish kabob sticks
2. Laminate paper
	1. Draw out fin patterns on some
	2. Cut out 2 inch strips that can wrap around a bottle. Then cut 3 slits equal spacing apart.
3. Fill up water balloons

**LAB PROCEDURE**

1. Cut out 3 fins
2. Insert the fins into the slits of the strip of paper and tape securely
3. Take the strip and tape it at the bottom of the rocket so then the top of the strip matches with the bottom-most line on the bottle (if this is a bottle, with the E being the top of the rocket and D being the bottom [the opening of the bottle]: E|\_\_\_|D then you will place the strip starting at the last |. Make sure that the bottom of the strip does not go beyond the opening of the rocket.
4. Decorate the cup
5. Tape the edge of the cup to prevent it from breaking upon impact as often
6. Tape the cup to the top of the rocket so then the opening of the cup is facing upward.
7. Have the students make a data table like this *Figure 1*
8. Go outside with rocket, water, dry ice, launch pad, beaker, funnel, cork, and water balloons.
9. Have the students measure out the various amounts of water and the teacher will put the dry ice into the rocket, put in the cork, and place the rocket onto the launch pad.
10. Have a student time the rocket from launch to landing and record.
11. Have a class discussion on which water amount made the rocket go the highest, then have the students measure out the water and choose a water balloon to put into their rocket.

*Figure 1. Data table*

|  |  |
| --- | --- |
| **Water (mL)** | **Time (s)** |
| 100mL |  |
| 200mL |  |
| 300mL |  |
| 400mL |  |
| 500mL |  |