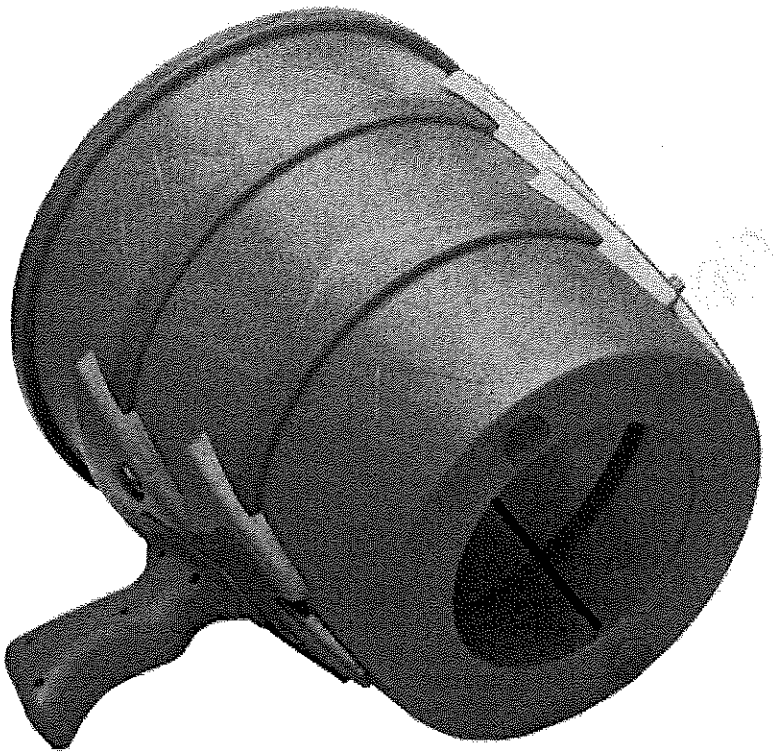


Whiz Bang

Pre and Post Outreach Activities

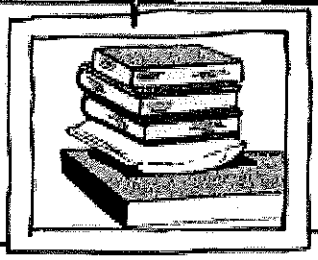
Whiz Bang

Pre Activity #1: Pushy Air Materials: Copy of "Pushy Air" page for each child, pencils, zipper baggies, heavy books, straws.	**Instructions:** 1. Have students read instructions and fill in answers.
Pre Activity #2: Hot Air Balloon Color Page Materials: A copy of the hot air balloon color page for each child, crayons.	**Instructions:** 1. Have students color the hot air balloon.
Post Activity #1. Does Air Take Up Space? Materials: Plastic 2 liter bottles and deflated balloons	**Instructions:** 1. See attached instructions.
Post Activity #2: On Your Mark, Get Set, Blow! Materials: Copies of "On Your Mark, Get Set, Blow" page for each student, pencils, straws, cotton balls, tape measures, markers.	**Instructions:** 1. Have students fill in responses to the questions.
Post Activity #3: Marshmallow Fight Materials: Toilet paper tubes, paper towel tubes, scissors, tape, full size marshmallows, flour, and measuring tapes. Copy of data tables and questions for each student.	**Instructions:** 1. See attached instructions. Have students fill in data tables and answer questions.

PUSHY AIR

Name: Date:

Air is pushy stuff! But can it push up heavy books?



Get Started!

1. Sweep an open zipper bag through the air. Zip it closed. What is in the bag?

   _____

2. Press on the bag. Can you press the bag all the way down? What happens?

   _____

   _____

CHALLENGE #1
PUSHBACK

Can you beat air's push?

Predict: Can your air bag hold up heavy books? ___ **Yes** ___ **No**

Guess: How many heavy books? _____

Try it! Pile books on your bag. How many does your air bag hold up? _____

What is holding up the books?

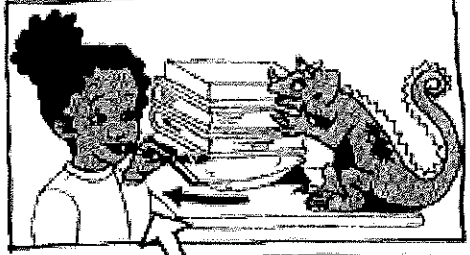
_____

_____

CHALLENGE #2
AIR LIFT

Can you lift three heavy books with your breath alone?

1. Insert a straw halfway into an empty zipper bag. Seal the bag around the straw.
2. Blow through the straw into the bag. Keep blowing as you slip the straw out. Seal the bag FAST as you remove the straw.
3. Did the books lift off the table? If not, try again.



Blow as you remove straw, then seal bag

Wrap-Up:

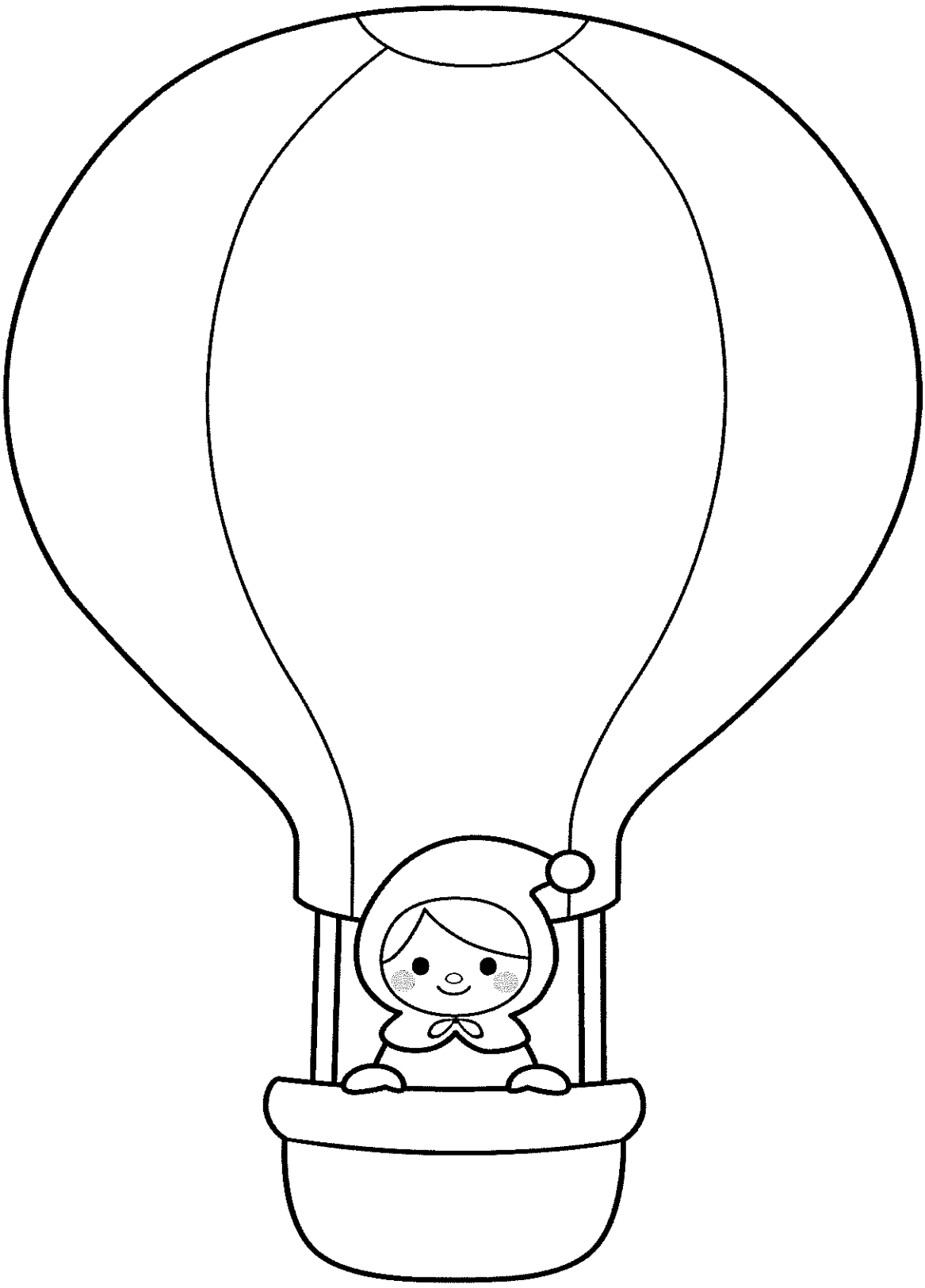
What pushed the books up? _____

_____

The books are pressing down on the air bag. Is the air pressing up on the books? Write what you think on the back.

Take-Home Challenge:

Will a zipper bag of air hold YOU up? Trap air in a new gallon zipper bag, then seal it shut. Sit on the air bag. What happens? Challenge an adult to sit on the bag!



Does Air Take Up Space?

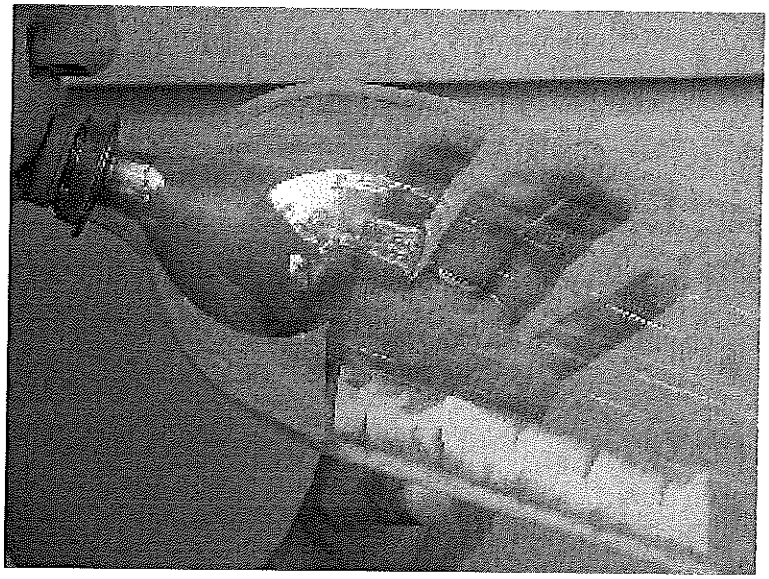
Materials:

Plastic 2 liter bottle

Deflated balloon

1. Push a deflated balloon into a bottle and stretch the open end of the balloon back over the bottle's mouth (see Figure 2).

Question: Have the students guess what will happen to the balloon if you were to try to inflate it inside the bottle. Will the balloon break the bottle, pop or do nothing?



Try to blow up the balloon!

After the experiment, discuss why the balloon did nothing. (Answer: Because air takes up space, the bottle was full of air. When you try to blow up the balloon, the air trapped inside the bottle prevents the balloon from inflating.)

Make the point that even though air is invisible, it still takes up space. Also, discus how engineers need to know how much space air takes up so they can design filtration systems that are large enough to treat the polluted air created by cars, power plants and factories.

Name _____ Date _____ # _____

On Your Mark, Get Set, BLOW!

Today we will experiment with air and how it can push on matter! Gather a straw, (Clouds) cotton balls, a tape measure, and a marker!

Step 1 Place one cloud on the table. Blow a gentle breeze and measure the distance your cloud travels.
My cloud traveled _____ inches with a gentle breeze.

Step 2 Place one cloud on the table. Blow a medium breeze and measure the distance your cloud travels.

My cloud traveled _____ inches with a medium breeze.

Step 3 Place one cloud on the table. Blow a strong breeze and measure the distance your cloud travels.

My cloud traveled _____ inches with a strong breeze.

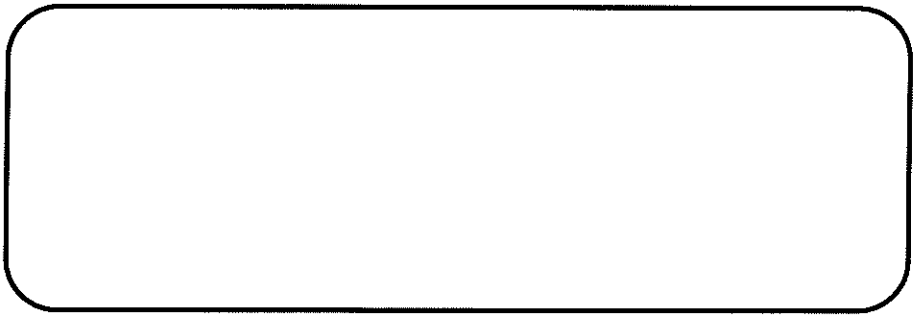
Which cloud and breeze combo traveled the farthest?

_____

Explain why you believe so _____

_____

Draw a quick sketch of you results!

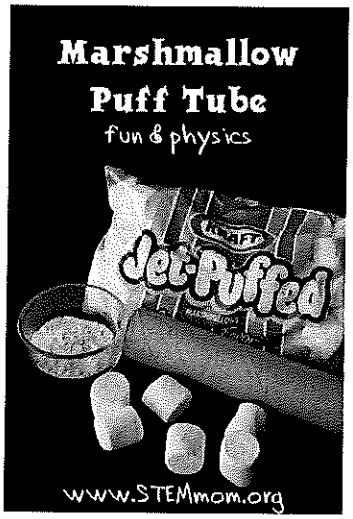


Name _____ Science Course _____

Pre Lab Due _____ Post Lab Due _____ Grade _____

Marshmallow Flight

A Demonstration of Unbalanced Forces



Your Challenge

Experiment with cardboard tubes of different lengths and marshmallow placement within the tube, to see how far you can propel a marshmallow using only your breath.

Materials

- Toilet paper tubes
- Paper Towel Tube or 1 file folder
- Scissors
- Masking tape or transparent tape
- Full Size Marshmallows
- Flour
- Measuring tape

Cardboard Tube Assembly

You need to make or obtain a short cardboard tube (length of a toilet paper tube) and a longer tube (length of a paper towel tube).

To make the longer tube, cut a rectangle from the file folder about 29.5 cm (the entire width of an unfolded file folder) by about 19 cm (11.5 in. by 7.5 in.).

Place one of the long edges of the file folder inside the other, and tighten to form a tube (see Figure 1) that fits around the circular shape of a marshmallow - snug enough so that there's no air space around the marshmallow, but not so tight that the marshmallow won't be able to move. It may be easier to make the tube if you first pull the folder over the edge of a table to establish an initial curvature.

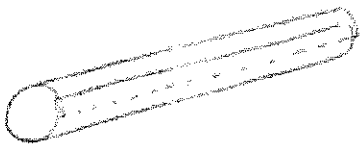


Figure 1

When the tube is rolled to the appropriate size, tape it so it maintains this size. Then place tape along the entire length of the seam on the tube to seal it. Take extra care to be sure that the tube is the same diameter the entire length of the tube.

Let's Get the Marshmallow Airborne

1. Roll the marshmallow in flour, then shake it or tap it to remove any excess. The flour will help prevent any sticky spots on the marshmallow from sticking to the tube.

2. Place the marshmallow in the end of the short toilet paper tube. ***Holding the tube horizontally*** put your mouth over the empty end, and blow hard into the tube (see Figure 2). Measure how far the marshmallow travels and record both the measurement and a few notes about its flight and landing in the data table.

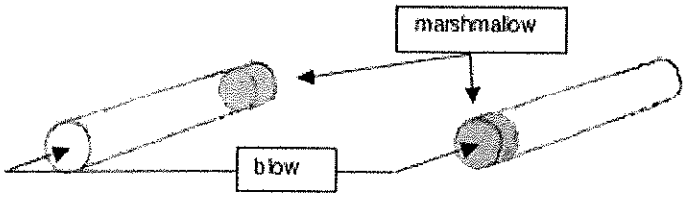


Figure 2 Figure 3

You need to whether you will measure from where it first hits the ground, or its placement after it stops moving, then record all measurements in the same way. You may also want to run several trials and then pick a measure of central tendency...like the average.

3. Again place the marshmallow in the end of the tube, but this time put your mouth around the end of the tube where the marshmallow is located. Keeping the tube horizontal, blow hard against the marshmallow itself, so that it has to travel the length of the tube before exiting (see Figure 3). Be sure to keep the tube horizontal, and keep blowing the whole time the marshmallow is in the tube. Did the marshmallow go farther this time?

Trouble shooting: If you blow and the marshmallow won't move, check the diameter of the tube. The tube may either be too tight (in which case friction prevents it from moving) or too loose (in which case air blows right by the marshmallow instead of pushing it).

4. Repeat steps 2 and 3 using your longer length tube.

Marshmallow Flight Data Table

	Distance(s)	Description of the flight
Short cardboard tube w/ marshmallow at the **far** end		
Short cardboard tube w/ marshmallow at the **near** end		
Long cardboard tube w/ marshmallow at the **far** end		
Long cardboard tube w/ marshmallow at the **near** end		

Post Lab

In the "Expected Results" column of the **Marshmallow Flight Analysis Table**, place a number 1 next the tube that based on the physics, should have propelled the marshmallow the furthest. Continue rating in order so you have 1-4, with 4 representing the tube that should have had the shortest distance. Referring to your Data Table, use the same rating 1-4 in the "Actual Results" column, only rating what actually happened. In the "Explanation" column, if the expected results match the actual results, explain the physics of why that tube performed the way it did. If the actual results did not match the expected results, in the "Explanation" column, describe factors that may have influenced the results.

Marshmallow Flight Analysis Table

	Expected Results	Actual Results	Explanation
Short cardboard tube w/ marshmallow at the **far** end			
Short cardboard tube w/ marshmallow at the **near** end			
Long cardboard tube w/ marshmallow at the **far** end			
Long cardboard tube w/ marshmallow at the **near** end			

1. Using the tubes you already constructed, how could you "cheat" to make your marshmallow go further?

2. Keeping in mind your answer to number 1, write a list of rules for a competition between several people to make it "fair." Come up with at least three.

   a. .

   b. .

   c. .

   d. .

3. Generally speaking, does your data support the physics of unbalanced forces? How could you fix your tubes or how you perform your trials, to match the expected results?

4. Predict: What would happen if you doubled or tripled the length of the tube? Why?

5. Considering all of the factors that make a marshmallow fly, if you could make ONE tube, describe its construction, and how you would run the trials. Draw a sketch too, if that helps.

References
The directions of this lab, including the figures, were copied from the Exploratorium Snacks Website. However, data table, and all post lab questions are original to STEMmom.org. http://www.exploratorium.edu/snacks/marshmallow_puff/index.html (Accessed November 2012)
Marshmallow Puff Tubes from STEMmom.org http://www.stemmom.org/2012/04/marshmallow-puff-tubes.html
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