Balloon Rockets

VOLUNTEERS

1-2

GOALS

- Teach about thrust, or the air pushing back that causes the straw to move forward.
- Relate it to how real rockets work by blasting off using thrust from rocket fuel.

MATERIALS

- Balloons (different shapes if possible)
- Straws
- Tape
- Long piece of string (use the silky string that separates easily in the SWE closet)

PLAN

Explain activity and introduce instructions
Test and set-up rockets for launching and explain physics behind it.

1. Tie one end of the string to a chair, door knob, or other support.
2. Put the other end of the string through the straw.
3. Pull the string tight and tie it to another support in the room.
4. Blow up the balloon (but don't tie it.) Pinch the end of the balloon and tape the balloon to the straw as shown above. You're ready for launch.

Let go and watch the rocket fly!
So how does it work? It's all about the air...and thrust. As the air rushes out of the balloon, it creates a forward motion called THRUST. Thrust is a pushing force created by energy. In the balloon experiment, our thrust comes from the energy of the balloon forcing the air out.

REFERENCES

http://www.sciencebob.com/experiments/balloonrocket.php

Color Mixing Wheel

Volunteers

1-2

Goals

- Observe the result of mixing primary colors (red, blue, yellow)
- Understand the physics concept of momentum as the color wheel unwinds itself
- Understand why we see secondary colors instead of primary colors

Materials

- White cardboard circles (4-6in in diameter)--cut out beforehand because kids have trouble
- Pointed scissors to make holes
- Red, blue, and yellow markers
- String

Plan

Create the color wheels:

- Trace 3 smaller circles on the cardboard disc. Try to make each of the circles equal in width. This will enhance the visual aspect of the experiment.
- Draw a single line through the middle of the disc that spans the entire diameter of the disc. Each of the three circles in the disc should now be divided in half. - See more at:
- Color half of the smallest circle blue and the other half yellow. Color the middle circle half red and half yellow. Finally, color the largest circle half blue and half red.
- Using the pointed tip of the scissors, place two holes in the cardboard disc. Make sure the holes are an equal distance from the center of the disc and are about 1 inch apart.
- Use the scissors to cut a piece of string or yarn that is 4 feet long.
- Thread the string or yarn through each of the holes in the disc and tie the ends of the string together. Make sure the knot you tie is reliable and able to withstand a substantial amount of force. You are going to be tugging pretty hard on it.

Perform the experiment:

-Start by holding the string on both sides of the disc with your hands. Make sure the disc is as

close to the center of the string as possible.
-Spin the disc in a motion similar to a jump rope. This is a quick way to get the string wound up.
-Once the string on both sides of the disc is twisted, pull the string tight to get the Color Mixing Wheel spinning.

Explain what happens:
- Primary colors mix to create secondary colors (green, orange, purple)
- Our brain cannot perceive the primary colors because they are moving so fast, so we see the secondary colors
- Concept of momentum: When the string is pulled tight, it wants to be straight, and because it is wound-up, it continues to unwind in one direction at a fast speed, but momentum causes it to wind up again after unwinding, and it keeps going.

References

http://www.stevespanglerscience.com/lab/experiments/color-mixing-wheel-sick-science

Lemon Volcano

VOLUNTEERS
1-2

GOALS
- Teach students about acids and bases
- Demonstrate a cool reaction between an acid and base
- Acids are sour, bases are bitter!

MATERIALS
- Lemon juice
- Lemon for demonstration
- pH paper for demonstration
- Baking Soda
- Cups for the reaction
- Newspaper
- spoons
- trays

SETUP
Cover table with newspaper for easy cleanup. Give each kid a cup. Keep cups in tray for easy cleanup after explosion.

PLAN
Introduce experiment
Demo lemon volcano with explanations of what's happening (pour lemon juice into baking soda)
- Measure pH for lemon juice and baking soda w/ water
- Explain how acids are low pH and bases are high pH
- Have students guess what would be neutral pH
- Baking soda and lemon juice react to make carbon dioxide
- Soap turns the carbon dioxide bubbles into foam to make a cool volcano!

Have students make their own volcanoes
Clean up

REFERENCES
http://www.sciencebob.com/blog/?p=646

Mars Rover Parachute

Volunteers

1-2

Goals

· Observe how rovers land on Mars
· Understanding of parachute design
· Observe that parachutes slow down movement

Materials

· Many plastic grocery bags (several per parachute for extra stability?)
· Scissors or holepunches
· String
· Small weights –small washers would be perfect
- Sharpies (to decorate with)

Plan

Introduce idea of NASA's parachute that weighs 150 pounds but supports 65,000 pounds to protect the Mars Rover–ask students if they can design that

Explain activity

-Parachutes protect the rover
-Trying to make a parachute to protect a washer
-Parachutes are made with set amount of newspaper/grocery bags (students choose the design/shape and materials)
-Drop them from standing on top of a chair, stairs, or bench
-See how long the parachute takes to land, with the longest time being most ideal

Building parachutes
Dropping parachutes with weights

References

http://www.sciencekids.co.nz/experiments/freefall.html

PH Color Changing Flowers

VOLUNTEERS

2

GOALS

- Learn how to make origami carnations!
- Learn about pH indicators.

MATERIALS

- Green pipe cleaners (cut them in half)
- White tissue paper
- Large paper clips/binder clips
- Scissors
- Perfume bottle of phenolphthalein (so that flowers won't get soaked)
- Perfume bottle of windex

PLAN

-Explain activity and introduce instructions
-Make carnations

1) Fold sheet of white tissue paper into squares (use about 8 layers per flower)
2) Cut all sheets into a circle
3) Stab through middle with a pipe cleaner while holding the circles together with binder clips. Then fold over the short end and stab through again to keep all of the circles together.
4) Separate topmost circle one at a time and crumple towards top

-Spray with Windex, and then with phenolphthalein. Observe!
-Explanation: windex is a base, and phenolphthalein is a base indicator, so it turns pink in the presence of a base. The color then fades away because the windex evaporates quickly.

REFERENCES

http://foldingtrees.com/2008/08/flower-week-tissue-paper-carnations/
http://www.stevespanglerscience.com/product/color-changing-magic-flower

Pop Rocks Expander

VOLUNTEERS
2

GOALS
- Teach about carbon dioxide
- Learn about the science of Pop Rocks and soda, two favorite snacks!

MATERIALS
- Pop rocks
- Balloons
- Funnel
- Smaller bottles of soda

LESSON PLAN
-Explain activity and introduce instructions
-Testing and setting up the pop rocks balloon expanders

1) Using a funnel, pour an entire packet of Pop Rocks into the balloon
2) stretch balloon over mouth of soda bottle but DON'T DUMP THE POP ROCKS IN YET
3) all together, dump pop rocks in and watch the balloon inflate!

**The secret behind the famous "popping" of Pop Rocks candy is pressurized carbon dioxide gas. Each of the tiny little candy pebbles contains a small amount of the gas. These tiny carbon dioxide bubbles make the popping sound you hear when they burst free from their candy shells. **

REFERENCES
http://www.stevespanglerscience.com/experiment/poprocks?utm_source=Steve+Spangler+Science&utm_campaign=f48ab462a9-EOW_20130130&utm_medium=email

Candy Chromatography

VOLUNTEERS
1-2

GOALS
- Teach about the dyes that go into making colored foods (like jellybeans)!

MATERIALS
- filter paper
- water
- plate
- black jellybean

PLAN
Activity instructions
1) Put a piece of filter paper so that it lays flat on the plate.
2) Drop the black jellybean into a cup of water for about 5 seconds.
3) Place the black jellybean in the center of the filter paper and allow it to sit for about 10 minutes.
4) Observe colors

Scientific Explanation
Although the black jellybean appears to be black, the dyes that comprise the color are actually many. You can see the different dyes as they move up the filter paper. These dyes separate from each other because some dyes are more attracted to the paper while others are more soluble in water. These differences result in varying distances from the jellybean.

REFERENCES
http://www.stevespanglerscience.com/lab/experiments/candy-chromatography?utm_content=b&utm_source=Steve+Spangler+Science&utm_campaign=b505937f0f-EOW_20140212&utm_medium=email&utm_term=0_6a4a9301bf-b505937f0f-394148701&goal=0_6a4a9301bf-b505937f0f-394148701&mc_cid=b505937f0f&mc_eid=99fe8d117b#

Here is a SWEet Science Experiment that you can do at home!

MITSWEOutreach

Extract DNA from Strawberries

Materials:

- *Strawberry*
- *Isopropyl alcohol (5 mL)*
- *Dish soap (10 mL)*
- *Salt (1/4 tsp)*
- *Zipper-lock bag*
- *Sieve*
- *Water (90 mL)*
- *Measuring utensils*
- *Beakers or similar containers*
- *Tweezers*
- *Pipette (optional)*
- *Spoon*

How does it work??

The thick fibers you see are the strawberry DNA. Strawberries are ***Octoploid**,* which means they have 8 sets of DNA (humans only have 2 sets)! To extract the DNA, each component of the extraction solution plays a part. The soap helps to dissolve the cell membranes. The salt is added to break up protein chains that hold nucleic acids together, releasing the DNA strands. Finally, DNA is not soluble in isopropyl alcohol, and even less so when the alcohol is ice cold.

http://www.stevespanglerscience.com/lab/experiments/strawberry-dna

1. Put a bottle of isopropyl alcohol in a freezer. We'll come back to it later.
2. Measure 90 mL of water into a beaker or similar container.
3. Pour 10 mL of dish soap into the 90 mL of water.
4. Add 1/4 tsp of salt to the liquid in the beaker.
5. Mix it all up and now you've got a homemade extraction solution!
6. Place one strawberry in a plastic zipper-lock bag.
7. Pour your extraction solution into the bag with the strawberry.
8. Remove as much air from the bag as possible and seal it.
9. Use your hands to mash, smash, and mush the strawberry inside of the bag until there are no large pieces remaining.
10. Pour the resulting strawberry and extraction solution mixture through a sieve and into a beaker or similar container.
11. Use a spoon to press the strained bits of strawberry against the sieve, forcing even more of the solution into the beaker.
12. From the container it is currently in, transfer the solution into a smaller beaker or similar container that holds around 50-100 mL of fluid.
13. Add 5 mL of your chilled isopropyl alcohol to the solution and hold the mixture at eye level.
14. Can you see how there is a separation of white "stuff" atop the rest of the solution? That's the DNA of the strawberry.
15. Gently remove the DNA from the solution using tweezers.

Visit us at swe.mit.edu/outreach/outreach_home.html to learn more about the awesome STEM programs we have for girls!