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Disappearing Styrofoam

1. Materials

- a. Styrofoam
- b. Acetone
- c. Two tin cans

2. Procedure

- a. Set out two tin cans, but fill one with 6 oz. of acetone (make sure both of them are dry inside)
- b. Have the audience count how many pieces of Styrofoam you can fit into the empty tin can.
- c. Have the audience count how many pieces of Styrofoam you can fit into the tin with the acetone (it higher)



3. The Science

Acetone is a strong solvent and breaks the crosslinks between the Styrofoam's polymers. Thus changing the form of the Styrofoam making it appear to be 'dissolving'. This allows more Styrofoam pieces in the tin can with the acetone.

Lava Lamp

1. Materials

- a) Clear soda bottle
- b) $\frac{3}{4}$ cup of water
- c) Vegetable Oil
- d) Fizzing Tablets (Alka Seltzer)
- e) Food Coloring

2. Procedure:

- a) Pour water into the bottle
- b) Add 10 drops of food coloring to the bottle
- c) Slowly add the vegetable oil in to the bottle until it is almost full.
- d) Add 1 tablet to the bottle.

e) Watch the bubbles form and fall back down

3) The Science

The oil and water separate because the oil is less dense than water. Since the oil is less dense than the water the oil sits on top of the water. The bubbles form because when the tablet hits the water in the bottom it creates a gas. The gas then rises and some of the water goes along with the gas. When the bubble reached the top the gas is released and the blob of water sinks back down.

Strawberry DNA (With Liz Rasmussen!)

DNA Extraction Buffer

- 100 ml (3/8 cup) shampoo (without conditioner) or 50 ml dishwasher detergent
- 15 grams sodium chloride (2 teaspoons)
- Water to 1 liter

Materials

- 1-3 strawberries (about the volume of a golf ball). Frozen strawberries should be thawed at room temperature.
- 10 ml DNA Extraction Buffer (soapy salty water)
- About 20 ml ice-cold 91% or 100% isopropyl alcohol
- 1 Ziploc™ bag
- 1 clear test tube
- 1 funnel lined with a moistened coffee filter

Directions

1. Remove the green sepals from the strawberries.
2. Place strawberries into a Ziploc™ bag and seal shut.
3. Squish for a few minutes to completely squash the fruit.
4. Add 10 ml DNA Extraction Buffer (soapy salty water) and squish for a few more minutes. Try not to make a lot of soap bubbles.
5. Filter through a moistened coffee filter set in a funnel, and collect the liquid in a clear tube. Do not squeeze the paper towel. Collect about 3 ml liquid.
6. Add 2 volumes ice cold isopropyl alcohol to the strawberry liquid in the tube. Pour the isopropyl alcohol carefully down the side of the tube so that it forms a separate layer on top of the strawberry liquid.
7. Watch for about a minute. What do you see? You should see a white fluffy cloud at the interface between the two liquids. That's DNA!

The Science

Ripe strawberries are an excellent source for extracting DNA because they are easy to pulverize and contain enzymes called pectinases and cellulases that help to break down cell walls. And most important, strawberries have eight copies of each chromosome

(they are octoploid), so there is a lot of DNA to isolate.

The purpose of each ingredient in the procedure is as follows:

Shampoo or dishwasher soap helps to dissolve the cell membrane, which is a lipid bilayer.

Sodium chloride helps to remove proteins that are bound to the DNA. It also helps to keep the proteins dissolved in the aqueous layer so they don't precipitate in the alcohol along with the DNA.

Ethanol or isopropyl alcohol causes the DNA to precipitate. When DNA comes out of solution it tends to clump together, which makes it visible. The long strands of DNA will wrap around the stirrer or transfer pipet when it is swirled at the interface between the two layers.

Reference:

Developed by Diane Sweeney

http://www.caseciw.org/first_light_case/horn/strawberries/strawbdnproc.html

Dr. Gomez Plant Phys Lab

ELIZEBETH RASMUSSEN
SENIOR - BIOLOGY MAJOR

Sinking Soda Surprise

Materials

- d. Demo tank (clear plastic storage bins work great!)
- e. An assortment of different sodas (standard 12 oz cans)

Procedure – What to Do!

- d. Ask your audience the question, “Will this can of regular soda float or sink in the bucket of water?” After gathering everyone’s answer, place the can of regular soda in the water and notice that it sinks to the bottom. If the can of regular soda floats, you might have an air bubble trapped under the bottom of the can.
- e. Pick up a can of diet soda and pose the same question. Be sure to point out the fact that the cans are exactly the same size and shape and contain the same amount of liquid (compare the number of milliliters... probably 355 mL). Place the can of diet soda in the water. It floats! Wobble the can from side to side to show your audience that there are no bubbles trapped under the bottom. It still floats. Why?
- f. **LET YOUR GROUP EXPERIMENT WITH DIFFERENT KINDS OF SODA. WHY DO THE DIET SODAS FLOAT AND THE REGULAR SODA CANS SINK, NO MATTER THE BRAND?**



Safety Precautions

- f) This experiment is safe and fun for all ages, but try not to drop any of the cans of soda on your foot, ouch!

How Does It Work?

This demonstration is an excellent way to learn about density. We are all familiar with the basic concepts of sinking and floating. Objects less dense than water float, and those more dense than water sink. Empty cans float, rocks sink. This is only possible because of differences in density.

If both diet and regular soda cans are placed on a double pan balance scale, it would be clear that the regular soda is heavier than the diet soda. This demonstrates the difference between mass and volume. Mass refers to how much stuff exists within an object. Mass is measured in grams.

Volume, on the other hand, refers to how much space an object occupies. Since both cans have the same volume, the heavier can must have a greater mass. We can now conclude that the heavier can is more dense than the lighter can.

Diet sodas usually contain aspartame, an artificial sweetener, while regular sodas use sugar. Most regular sodas have about 41 grams of sugar. How much is 41 grams? Try 18 packets of sugar like the ones you might find at a restaurant! Yikes! That's a lot! Diet soda is flavored with a relatively small amount of an artificial sweetener (like aspartame) which is 200 times sweeter than an equal amount of sugar. Therefore, only a tiny amount of aspartame is needed.

Both sugar and aspartame are more dense than water, which can be easily demonstrated by adding small amounts of each to a container of water (they sink). So it is actually a matter of how much of each is used. The 41 grams or so of sugar added to a can of regular soda make it sink, while the relatively tiny amount of aspartame used in diet sodas causes the can to float.

[HTTP://WWW.STEVESPANGLERSCIENCE.COM/LAB/EXPERIMENTS/SINKING-SODA-SURPRISE/](http://www.stevespanglerscience.com/lab/experiments/sinking-soda-surprise/)

The Leak-Proof Bag – Science Trick

Materials

- f. Sharpened pencils
- g. Zipper-lock plastic bags
- h. Water
- i. Paper towels

Procedure – What to Do!

- g. If you have your pencils, make sure they are sharpened to a point. The sharper, the better. If they're already sharpened... move to step 2!
- h. Fill a zipper-lock bag between 1/2 and 3/4-full with water. Cold or warm...
- i. Now for the fun part, ask your audience what would happen if you tried to push one of these pencils through the water-filled bag? Odds are that you'll have more than one look of fear or skepticism. You might even have some people running for their ponchos and galoshes.
- j. Here comes the real scary part! Hold the pencil in one hand and the top of the bag in your other hand. Slowly, but firmly, push one of the sharpened pencils through one side of the bag. Look, no water came gushing out!
- k. Push the pencil through the other side of the bag, too. Nothing happens. Sweet!
NOTE: Do not, I repeat, do not push the pencil all the way through either side of the bag. As soon as the eraser gets past the bag, you'll have a big, wet mess on your hands... er... floors.
- l. From here, you can keep demonstrating your science "spear-it" by repeating this feat with the other sharpened pencils!
- m. Once you're finished, hold the bag over a sink and remove the pencils. The water will come pouring out of the holes.

Safety Precautions

- f) It would probably be best to practice this over a sink, outside, or at a friend's house. Just don't make Mom mad by allowing her to come home to water puddles in the living room.
- g) Remember, these pencils are really sharp! Be careful not to stab yourself or someone who is helping you when you push the pencil through the bag.

How Does It Work?

Despite what it looks like, the zipper-lock bag isn't covered in a magical sealant that blocks leaks. Well... not exactly. Plastic bags like these are made out of our favorite kind of materials, polymers! Polymers are long chains of individual molecules, called monomers. (See that? Mono = one. Poly = many. Mers = molecules.) When you puncture these bags with a sharpened pencil, you're essentially separating polymer chains without breaking them. The long chains of molecules then squeeze in tight around the surface of the pencil preventing any sort of leak. Polymers continue to prove an indispensable part of life.

[HTTP://WWW.STEVESPANGLERSCIENCE.COM/LAB/EXPERIMENTS/LEAK-PROOF-BAG/](http://www.stevespanglerscience.com/lab/experiments/leak-proof-bag/)

Derek Bennard

Senior - Physics Major

Laser Microscope

Materials:

- A green laser pointer (5 mW)
- A clean syringe with pond water
- 2 Ring stands with clamps
- Surface to project image on

Procedure:

1. Fill the syringe with pond water (a couple days old will promote protozoan growth).
2. Align ring stands so that a path from laser to syringe to viewing screen is established.
2. Clamp the syringe to a ring stand with the tip pointing down and slowly depress the plunger until a small droplet hangs from the tip.
3. Clamp the laser to a ring stand at a height so that the beam is close to striking the surface of the droplet. (Leave the laser off to prevent accidental shining on bystanders).
4. Turn on the laser (adjust height so that the beam strikes the surface).
5. Observe the image projected on the wall/screen



Explanation:

The spherical surface of the water droplet acts as a bi-convex lens due to refraction. Shadows of the protozoa and bacterium will appear in the viewing area.

Safety:

Lasers can damage the human eye. Avoid pointing the laser at the crowd.

Lenz's Law and Electromagnetic Induction

Materials:

- A PVC pipe of approximately 6 feet
- A copper pipe of approximately 6 feet
- A spherical or button Neodymium magnet

Procedure:

1. Hold the PVC pipe vertically and drop the magnet down it. Note the time of flight.

2. Hold the copper pipe vertically and drop the magnet down it. Note the time of flight.

Explanation:

As the magnet falls down the PVC pipe, it doesn't interact on an electromagnetic level. However, the copper pipe is a conductor. As the magnet falls, a changing magnetic field is created which induces a current in the copper pipe. This current creates an electric field in the opposite direction of motion and thus creates a force that pulls the magnet up, against gravity.

Safety:

No general concerns.

The Ketchup Cartesian Diver

Materials:

A 2 liter plastic soda bottle
A ketchup packet
Salt

Procedure:

1. Make sure all labels are removed so the inside of the bottle is clearly visible.
2. Fill the bottle with room temperature water.
3. Place a ketchup packet in bottle of water.
4. If the ketchup floats, move on to the next step. If the ketchup sinks, add salt 1 teaspoon at a time until it floats.
5. With the lid on, squeeze the plastic bottle. The packet should fall to the bottom.
6. Let go of the bottle. The packet should rise back to the top.

Explanation:

Inside the packet is a little pocket of air. When the packet floats, it means that it's less dense than the water in the bottle. When you squeeze the bottle, you increase the pressure inside the bottle and inside the packet. The increase in the pressure inside the packet will cause the air pocket to become denser. The packet will reach a tipping point where it will become denser than the water in the bottle and will then sink to the bottom.

SAFETY:

No general concerns.

Deshann Harewood

Senior - Biology Major

Music Box

MATERIALS:

A flat wooden surface
Music box apparatus

PROCEDURE:

First I will demonstrate playing the music box apparatus while holding it in my hand, however, it will be very hard to hear. Next I will then place the apparatus on a flat wooden surface and play it again. The sound will be much clear and easier to hear now.

EXPLANATION:

This works because the apparatus makes the wood on the table vibrate, thus making more air move. The sound that we hear is the air moving the apparatus on its own does not create enough vibration to move air loudly enough for every one to hear it.

SAFETY:

There are no safety precautions with this demo.



Static Can

MATERIALS:

A balloon
A volunteer
A can

PROCEDURE:

I will blow up the balloon before asking a volunteer to allow me to rub the balloon on their head thus creating static electricity. I will then hold the balloon toward the can which will then move toward the balloon.

EXPLANATION:

This phenomena occurs because the addition of static electricity adds electrons to the balloons. The electrons in the can are repelled to the other side of the can and

the remaining positive ions on the near side of the can are attracted to the negative electrons on the balloon causing the can to move toward the balloon.

Which Way?

MATERIALS:

A large spool with a ribbon wrapped around it.

PROCEDURE:

Once the ribbon is rolled around the spool, I will leave a portion of it out, I will then pull on that portion. The question is which way will the rest of the coil move.

EXPLANATION:

The coil will move in the direction that I pull the material because of Newtons 2nd law which states that the acceleration or movement of an object due to a net force will move in the direction of the net force. The acceleration will be proportional to the magnitude of the net force.

Melanie Guido

Senior - Chemistry Major

Teabag Lift-Off

Materials:

- h) A large, empty tea bag (undo the staple and unfold it)
- i) A lighter

Procedure:

Be sure to be very safe with the lighter and the lit teabag! Set up the tea bag so it stands up like a tower. Then, try to light the top of it as evenly as you can. When the flame burns down to about 2/5ths left, the bag will lift off into the air.

How?

This demo works because the flame creates a convection current around the empty teabag. Once the teabag gets burned down to a low enough mass, this current is strong enough to lift it off of the ground! The height reached by the burned teabag is the top of the convection current.



Water to "Kool-Aid"

Materials:

- Clear cups
- A pitcher of water
- Phenolphthalein indicator
- Ammonia
- Vinegar

Procedure:

This demo works best if you tell it like a story. First, put a few drops of phenolphthalein indicator in one cup. In another cup, put a cap-full of vinegar. Without rinsing the cap, put a cap-full of ammonia in the pitcher of water. In the cup that is empty, pour the water/ammonia mix into it. This will be "water," since it is colorless. Then, pour it in the cup with phenolphthalein in it. It will turn bright pink and this is "Kool-Aid." Then, pour both of the cups back into the pitcher (as if you have decided that you want "Kool-Aid," too). The whole pitcher should be pink now from the added phenolphthalein. You can then pour two cups of "Kool-Aid." Then in

the cup with vinegar in it, the "Kool-Aid" will pour out colorless (as if someone wanted "water," not "Kool-Aid"). Then, pour all three of the cups back (as if you all decided that you wanted water). The vinegar neutralizes the ammonia and the whole pitcher should be colorless now. You can now pour "water" in all three of the cups.

WARNING: Do not let anyone drink the "water" or the "Kool-Aid."

Phenolphthalein acts as a laxative when ingested.

How?

This demo works because phenolphthalein is an indicator that turns pink when in the presence of base, and colorless when in the presence of an acid. The ammonia (a base) in the water, still looks like water. When it gets to the second cup, it turns into "Kool-Aid" because the indicator is in that cup. When you pour them both back into the pitcher, you are adding the phenolphthalein into the whole pitcher, allowing it all to be "Kool-Aid." Then when you pour the solution in the cup with the vinegar (an acid), the solution turns back to colorless. There is enough vinegar in the cup to neutralize the ammonia, making the whole solution turn back to colorless. This allows you to pour three cups of "water."

The Bernoulli Windsock

Materials:

1. A bag which is closed on one end, about 3-5 feet in length, and about 5-10 inches in diameter

Procedure:

Straighten out the bag so that someone could blow into it. Have someone blow into the bag with their mouth close to the opening. They should not be able to blow much air into it. Condense the air at the bottom to show how much actually got into the bag. Then, you blow into the bag. Hold the bag about 5 inches from your face and hold it open. This should blow a lot of air into the bag, making you look like you have super powerful lungs.

How?

When you blow into the bag with the bag close to your face, the only air that gets into the bag is the air from your lungs. When you hold the bag open and away from your face, the air that you blow creates a stream. A stream of air has a low pressure around it. The high pressure in the room around you rushes to fill the low pressure of the stream you created, thus filling the bag with air.

