Mekala Woods
Senior – Chemistry Major

Demo 1: Crushing Can

1. Materials
    a. Water
    b. Ice
    c. Aluminum can
    d. Heat source
    e. Large bowl
    f. Tongs
2. Procedure
    a. Place ice in a large bowl and fill the bowl halfway with cold water (add a small amount of salt to increase the temperature drop)
    b. Add 1/3 cup of water inside of the aluminum can
    c. Place the can onto a heat source set to medium-high
    d. Wait for the water to boil inside of the can
        i. This can be seen by white smoke being ejected from the can
    e. Let the water boil for 15-30seconds
    f. Take the tongs, grab the can, and quickly invert and submerge it into the ice water mixture.
3. The Science?
    a. While the water was boiling inside of the can, water vapor built up. By inverting the can and quickly submerging it into cold water caused the water vapor to condense rapidly causing a vacuum effect. This effect happens when the pressure inside of the can is less than the surrounding air.

Demo 2: Disappearing Styrofoam

1. Materials
    a. Styrofoam
    b. Acetone
    c. Two tin cans
2. Procedure
    a. Set out two tin cans, but fill one with 4 oz. of acetone
    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 acetone tin can (it should be much higher)

3. The Science
    a. Acetone is a strong solvent. The acetone dissolves the Styrofoam allowing more pieces of the Styrofoam to fit into the tin can.

Demo 3: Fire Balloons

1. Materials
    a. At least two latex balloons
    b. Water
    c. Air aka your lungs
    d. A lighter
2. Procedure
    a. Fill one balloon with water and tie it off.
    b. Fill one balloon with air and tie it off.
    c. Hold the lighter, while lit, under the air balloon (it pops!)
    d. Hold the lighter, while lit, under the water balloon (it doesn't pop!)

    TIP: move the lighter back and forth so that the balloon doesn't melt
3. The Science
    a. The water balloon doesn't pop because the specific heat of water is greater than air. The water in the balloon draws the heat away from the latex causing the balloon not to melt or pop.

Demo 4: Disappearing Styrofoam

4. Materials
    a. Styrofoam
    b. Acetone
    c. Two tin cans
5. Procedure
    a. Set out two tin cans, but fill one with 4 oz. of acetone
    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 acetone tin can (it should be much higher)
6. The Science
    a. Acetone is a strong solvent. The acetone dissolves the Styrofoam allowing more pieces of the Styrofoam to fit into the tin can.

Taylor Plantt
Senior Physics Major

Rising Water

Materials:

- Candle
- Plate
- Water
- Clear Cup
- Matches

Procedure:

1.) Fill plate with water
2.) Put candle in the middle of the plate
3.) Light the candle and cover it with the clear cup
4.) Watch the water level rise in the cup

Explanation:

The candle heats up the gasses inside the cup. This causes the gasses to move faster and thus expand in volume. Some of this expanding gas escapes out of the cup through the water. Then, when the candle goes out the gasses cool down inside the cup and stop escaping through the water. This means there is a higher pressure inside the cup than outside the cup, creating a vacuum which draws the water into the cup.

Balloon on a Bed of Nails

Materials:

- Small bed of nails (block of wood with nails driven through)
- Single nail
- Two balloons

Procedure:

1.) Blow up two balloons
2.) Press one balloon against the point of the single nail. It will pop.
3.) Now, press the other balloon against the bed of nails. It will be much more difficult to pop (WARNING: DO NOT attempt to push the balloon against the bed of nails with only your hand. The balloon will eventually pop and you could impale your hand. Another piece of wood can be used to 'sandwich' the balloon.

Explanation:

When the balloon is poked with one nail, all the pressure of the nail on the balloon is focused on a very small surface area, the tip of the nail. When the balloon is pressed against the bed of nails, the pressure is spread out over all the nails. This means you can push the balloon much harder against the bed of nails before it will pop.

Radio in a Faraday Cage

Materials:

- Small hand radio
- Plastic cup
- Glass cup
- Metal (conducting) cup
- Faraday cage

Procedure:

1.) Turn radio on to some station
2.) Place the radio in the plastic cup
    a. Music will still play
3.) Place the radio in the glass cup
    a. Music will still play
4.) Place the radio in the metal (conducting) cup
    a. The music will stop playing
5.) Place the radio in the Faraday cage
    a. The music will stop playing

Explanation:

Radio waves are a type of electro-magnetic wave. This means when they come into contact with certain materials, conductors, they induce a charge on the material. That is they move the electrons around in the material. All the charge then sits on the very edge of the material. This charge and/or arrangement of electrons create an electric field that cancels the radio waves out inside of the cups. For plastic and glass cups, which are poor conductors, the electrons are not really moved around, so the radio waves are not canceled out. For the metal cup and Faraday cage however, the radio waves are canceled out.

Wait, the Faraday cage has holes in it! Don't worry, the Faraday cage works even though there are gaps in the wire because those gaps are smaller than the incoming radio waves. This means that when the electrons get moved to the surface of the cage, they can still create an electric field that cancels out the radio waves.

Rachel Lenh
Senior Biology Major

Demo 1: Egg in a bottle

Materials:

1. An egg/ water balloon
2. A bottle or vase with the neck smaller than the egg/ water balloon
3. Paper
4. Lighter

An egg will be sucked into a bottle after the air inside is heated up. A burning piece of paper will cause the air inside of bottle to increase in temperature, expand, and snd cause some of the air to leave the bottle. When the egg is placed on the mouth of the bottle it prevents air in the room from re-entering the bottle. So as the air in the bottle begins to cool, the pressure of the air inside decreases. Since, the air pressure inside the bottle is less than the air pressure on the outside of the bottle, and the egg is pushed/sucked into it.

Demo 2: Opening a paper flower in water:

Materials:

1. A paper flower
2. Bowl of water

A paper flower will open if it is placed in water. This is due to the capillary movement of water through the paper.

Demo 3: Is it alive? :

A drop of Duco cement is dropped in water. Due to the hydrophobic interactions of the glue it will try to get away from the water and moves. The movement is usually associated with a living thing. This is explained that the glue or “thing” isn’t living but it actually doesn’t like water and is trying to get away from it, and it slows down when it is dry.

Demo 4: Lift an ice cube with a match without touching it:

Materials:

1. Match stick
2. Ice cube
3. Salt
4. Bowl of water

When salt is put on ice it causes the ice to melt, which is why we put salt on icy roads. As the liquid salt water becomes more diluted the water can then refreeze. If a match or piece of string is resting on the ice when the salt is sprinkled on, then the match or piece of string will be stuck to the ice and you will be able to lift the ice without touching it.

Michelle Busick
Senior Biology Major

Hole-y Water

This demonstration requires a clear cup, hot water, powdered sugar, and a teaspoon. Fill the clear cup to the brim with hot water until the water creates a dome at the top of the cup. One teaspoon at a time, add the powdered sugar to the top of the water. Rather than the water spilling out of the cup, the powdered sugar dissolves and fills the empty spaces between the water molecules.

Float Your Metal Boat

This demonstration requires a large, clear plastic container, water, aluminum foil, and dish soap. Fill the plastic container with the water. Fold the aluminum foil into the shape of a small boat. Place the foil boat on the surface of the water and stabilize so that the boat is at a stand still. Add a drop or two of dish soap behind the boat. This will propel the boat forward because the soap is breaking the surface tension of the water.

Blow Out

This demonstration requires a candle, a lighter/match, and a plastic funnel. Light the candle and place on a steady surface. Hold the funnel so that the wide opening is facing the flame. Blow into the narrowing opening and notice that the flame will not blow out. This is due to the air spreading out around the edges of the funnel, creating a pathway that goes around the flame. Now face the funnel to where the narrow opening is facing the flame and blow into the wide opening. This gives the air a direct pathway to the flame, causing it to blow out.

Orbiting Marbles

This demonstration requires a marble, two paper plates, and a pair of scissors. Start by rolling the marble on a flat surface, such as the surface of a table. Notice that the marble rolls in a straight line. Next, place the marble on the inside edge of one of the paper plates. Give the marble a push and notice that the marble rolls in a circular motion along the edge of the plate. Now take the scissors and cut out a “pie piece” from the other paper plate. Place the marble along the inside edge of that plate, as was done in the previous step. Give the marble a push and notice how the marble will roll in a circular motion along the edge of the plate until it reaches the cut out, where it will then continue in a straight line. All motion is linear until it has another force acting on it, pushing it in another direction, such as the edge of the paper plate. When that force is removed, the motion will continue linearly.

Erika Stripp
Senior Chemistry Major

Elephant Toothpaste

Materials:

- Soda Bottle
- ½ cup hydrogen peroxide (4%)
- 1 packet (1 tablespoon) dry yeast
- 3 tablespoons of warm water
- 1 tablespoon of dish soap
- Food Coloring
- Small cup
- Safety goggles

Procedure:

1. Put on safety goggles and put hydrogen peroxide and dish soap into the bottle.
2. Add 8 drops of food coloring into the bottle.
3. Mix together the contents of the bottle by swishing around.
4. In the separate small cup combine warm water and yeast.
5. Mix together the yeast and water for 30 seconds.
6. Pour yeast water into the bottle and watch the Foam!
7. Clean up by washing foam down the sink.

Why?

The yeast reacts with the hydrogen peroxide. The yeast helps remove the oxygen from the hydrogen peroxide. This reaction happens very fast and it creates a lot of oxygen gas which creates the bubbles as it converts the hydrogen peroxide (H_2O_2) to water (H_2O) and oxygen. While this is happening the bottle becomes warm. This means that it is an exothermic reaction. An exothermic reaction is a reaction that produces heat!

Lava Lamp

Materials:

- Clear soda bottle
- ¾ cup of water
- Vegetable Oil
- Fizzing Tablets (Alka Seltzer)
- Food Coloring
- Flashlight

Procedure:

1. Pour water into the bottle.
2. Slowly add the vegetable oil into the bottle until it is almost full.
3. Add 10 drops of food coloring to the bottle.
4. Add 1 tablet to the bottle.
5. Watch the bubbles form and fall back down
6. Shine flashlight under bottle to get the whole effect.

Why?

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 water and oil do not mix together because the water molecules are only attracted to the other water molecules and the oil molecules are only attracted to other oil molecules. They are not attracted to each other because their atomic structures.

The bubbles form because when the tablet hits the water 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 because the water is more dense than the oil.

Cleaning Pennies

Materials:

- Old (non-shiny) pennies
- ¼ cup white vinegar
- 1 teaspoon salt
- Non-metal bowl
- Paper towels
- Water

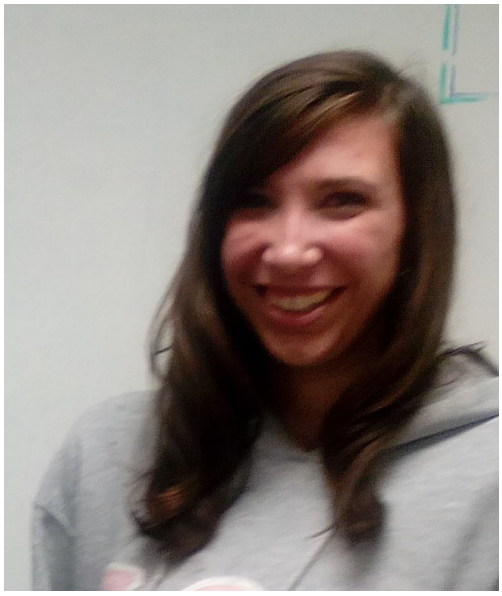
Procedure:

1. Pour the vinegar into the bowl.
2. Add the salt into the bowl and stir.
3. Put a couple pennies into the bowl and count to 10.
4. Take out the pennies and rinse them with water.
5. Look how shiny the pennies are!

Why?

The vinegar is an acid and it reacts with the salt. This reaction removes the copper oxide which makes the pennies dull. This copper oxide comes from the copper of the penny reacting with the oxygen in the air. Copper oxide has its own pigmentation to making the pennies dull.

Kaitlyn Zoesch
Senior Biology Major



Demo 1: Virus lifecycle

Materials: balloon
several small pieces of paper
something sharp to pop the balloon

Procedure: fill a balloon with the small pieces of paper, leave one out to show what's inside of the balloon. Blow the balloon up and tie it off. Explain how viruses are much smaller than the body's cells by comparing the balloon to one of the small pieces of paper. Next show how the virus connects to the outside of cells and sends in a code to have the cell make copies and shake the balloon to show copies being made. This causes the cell to die, or the balloon to pop, and disperse new copies into the body to do the same thing again.

Demo 2: Diving eggs

Materials: 3 eggs
3 cups
water
salt

Procedure: fill all three cups with water. Put half a cup of salt in the second cup and a full cup of salt in the third cup. Dissolve the salt as much as possible. Place one egg in each cup. The first egg will sink because the density of the egg is more than the water. But the second and third egg will float varying amounts. This is caused by the increased density of the water by the salt.

Demo 3: “Floating” paperclip

Materials: several paperclips
1 cup of water
Dish soap

Procedure: Show how paperclips are denser than water by putting one in the water and watching it sink. Then bend a paperclip into an ‘L’ shape and use it to rest another paperclip on the surface of the water. Water has a high surface tension that allows the paperclip to rest on the surface of the water. Next, put a drop of dish soap in the water. The paperclips will drop because the surface tension has been broken.

Demo 4: Reaction times

Materials: a dollar bill
a volunteer

Procedure: ask the volunteer to hold their thumb and pointer finger out, ready to grab the dollar bill. Hold the dollar bill a few centimeters above the volunteers fingers and drop it, randomly, and see if the volunteer can act fast enough to grab it. This should prove to be an impossible task, because it takes more time for your brain to send a single down to your arm than it takes the dollar bill to fall past your fingers.

Tyler Hufford
Senior Biology Major

Electric Pickle

Materials:

* `1 Brine Pickle

* 2/4 Board

* stripped standard extension cord with exposed wires

* 2 Nails (preferably screws) not galvanized preferred

* Safety goggles

*Safety Gloves (shock Proof)

Procedure:

1. Put on safety goggles and ensure proper adherence of wires to individual nails spaced about a pickles length apart.

2. Attach pickle to nails and plug in cord.

3. Pickle Will light up and will continue to light while burning until reaction is complete in which plug should be removed.4. In the separate small cup combine warm water and yeast.

The Pickle is soaked in a brine of salt and vinegar, when a current is passed through as it is currently full of water a large amount of electricity is able to flow through allowing the sodium ions to gain energy and lose energy giving off heat and light.

Penny Battery

Materials:

* 10-15 pennies with one side sanded relieving zinc core (pennies have to be made after about 1970)

* 10-15 discs soaked in vinegar (better quality means more acetic acid)

* 1 Standard LED light with wires still attached

* Safety goggles

Procedure:

1. Stack pennies and cardboard soaked in vinegar together in a penny > Cardboard> penny fashion in order to make a stack of about 10-15.

2. Attach LED light to start and finish of the penny stack where a penny starts and a penny ends.

A basic circuit is a metal which can give electrons and a metal that can accept them, by adding vinegar electrons are stripped from the zinc of the penny and given to the copper of the penny.

Bull Roar

Materials:

* 1 Meter Length of Cord

* 1 Paint Stick

* Safety goggles

Procedure:

1. Attach cord to paint stick securely

2. grab end of cord about 5-7 inches from the attachment point of the cord to the paint stick

3. swing device around being careful to watch as not to hit others or self

As the paint stick is swung it is able to spin freely chopping up the air and creating a fair amount of sound.

The Bernoulli Bag

Materials

* 1 Windsock which is closed at one end of about 1-2 meters in length and about 5 inches in diameter.

Procedure

*Straighten out the bag as to increase the chance the bag will inflate.

*hold the bag 5-6 inches from face and blow hard in the direction of the bag.

As the breath you exhale is of a lower pressure then the inside of the bag or the rest of the atmosphere a situation occurs where the high pressure atmosphere wants to correct the low atmosphere conditions and air is pulled into the bag inflating it.