

**30 demos in 50 minutes**  
**Demos by the UNC Secondary Science Methods Class**  
**at the NSTA Regional Denver Convention 2007**

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**Callender, Ashley M**  
**Senior – Biology**



**Color of Osmosis**

**Materials Needed**

One saucer, one clear cup, a rubber band, water, food coloring, and parchment paper.

**Procedure:**

Dissolve a teaspoon of salt into the cup of water that is completely full and cover it securely with the parchment paper and rubber band. Take the saucer and fill it up with water. Then place a few drops of food coloring in the saucer. Next place the cup with parchment paper in the saucer so that the cup is upside down. Wait to see the water in the cup change color.

**Science Behind it:**

The parchment paper is considered to be a permeable membrane. The colored water will flow through the membrane coloring the clear water in the glass.

**Dowdy, Tandy M**  
**Senior – Chemistry**



**Dry Ice with Universal Indicator Demonstration**

**Topic:** Acid/Base Chemistry and Neutralizations

**Materials:** Eye Protection  
Large Graduated Cylinder (2L)  
Tongs (for transferring dry ice)  
Heavy Gloves (for transferring dry ice)  
Dry Ice  
Household Ammonia  
Water  
Universal Indicator  
Long stirring rod

**Safety Concerns:** Wear eye protection and use gloves to handle the dry ice because it can cause severe frost burns.

**Procedure:** Fill the 2L graduated cylinder with water and add enough universal indicator to have an easily visible color. Then add a few mL of ammonia to make the solution alkaline. Stir with stirring rod to mix solution thoroughly. Add several chunks of dry ice to the solution. It will sink and will start to give off CO<sub>2</sub> gas. As the CO<sub>2</sub> is given off the solution will begin to change in color as the pH changes. The CO<sub>2</sub> reacts with the water in the solution to produce carbonic acid. The gradual change from a weak base to an acid will take the universal indicator through a range of colors.

This can be used to talk about neutralization when acids and bases are mixed. It could also be used to talk about what happens in titrations of weak acids and strong bases (buffers).

**Underwater Volcano Demonstration**

**Topic:** Density This demonstration illustrates the concept of density. Because the hot water at the bottom of the jar is less dense than the surrounding cold water, it rises to the surface of the cold water and appears to be an underwater volcano.

**Materials:** One liter beaker  
One small Erlenmeyer Flask (that fits completely inside the beaker)  
Cold water (cooled with ice and let melt)  
Hot water with dark food coloring  
Foil  
Pencil  
Piece of string

**Procedure:** Fill the liter beaker with melted ice water (cold).

Fill the Erlenmeyer flask with hot water and add food coloring to the water.

While the flask is hot put foil over the top.

Tie the string around the top of the flask leaving enough of a tail to be able to lower the flask into the beaker.

Place the flask, using the string, at the bottom of the beaker.

When the flask is sitting on the bottom, use the pencil to poke a hole in the top of the foil. Make this hole as big as the pencil so the liquid can get through.

The hot water will then rise to the surface as if it were smoke from a smokestack.

**Explanation:** An liquid with less density will layer on top of a more dense liquid. It gives the appearance of “floating” above the more dense liquid. Hot water is less dense than cold water so when submerged in cold water it will rise to the top of the more dense material. Other applications: weather, air conditioners, hot air balloons.

**Safety:** Be careful when handling hot liquids, use tongs.

## Hartung, Cody Senior – Biology

### Needle Through a Balloon

**Concept:** To show the characteristics of polymers, using the balloon as an example of large polymer chains.

**Materials:** Two Balloons  
One Skewers or sharpened piece of coat hanger or sharpened knitting needle  
Cooking Oil  
Q-tip

**Directions:** Inflate both balloons and tie them off. Do not blow them up too big. Use one balloon for first part but keep the other one on the side. Dip the tip of one skewer in cooking oil and use a q-tip to spread oil up and down the skewer. Using a gentle twisting motion push the skewer into the nipple end of the balloon (the rubber is thickest here). Keep twisting the skewer until it comes out the tied end. If possible use yellow or clear balloons. The students can see the skewer going in and so can you. After the skewer comes out, show students that it went all the way through. Then pick up the second balloon and skewer. Pierce the other balloon on its side and the balloon will pop. Note: if two skewers are not available, you can use one. The balloon might loose a little air when you take the skewer out to pierce the side.

**Introduction:** How many of you have ever popped a balloon? It doesn't take much to pop it; a needle or something sharp does the trick. Well, today I am going to show you a way to get a sharp object through a balloon without popping it.

**Explanation:** The word poly- means many of something. A polymer means molecules with many atoms. A balloon is made up of lots of polymer chains. These polymer rubber chains are may exist isn random loose clups in the unstretched state. The reason I was able to get the skewer through the balloon had to do with where I put it in. At the nipple end of the balloon, there is lots of rubber and therefore many, many polymer chains - still loosely coiled. These chains are very close together. They can be pierced without popping the balloon because the the chains can still be stretched. This is because they allow the skewer in between the chains without breaking the chains or the bonds that connect them. But on the sides of the balloon, these chains are stretched almost to their limit and very far apart. The piercing is too much for the stretched chains and they break apart., and the balloon pops.

**Safety:** Don't pop balloons near children faces.

**Waste:** Throw balloons away and wash off skewer cleanly.



## Hayne, Margaret Senior - Biology

### Sock Cell Division (Mitosis)

**Objective:** To give a hands-on illustration of mitosis on a large scale. You can also do this as a group activity with your students and have them come up with different objects that represent each part of the cell.

**Materials:** Egg beater  
Long thin strip of fabric  
3 pairs of striped socks stuck together with a small piece of velcro  
6 pieces of yarn about 1m in length  
1 piece of yarn about 3m in length  
Something to attach the yarn to that acts as centrioles  
1 gallon size zip lock bag  
6 rubber bands to attach the yarn to the socks



**Procedure:** Attach one end of the fabric to the beater and shrink (chromatin to chromosome).  
 Show one of the sock pairs and talk about chromosomes, sister chromatids, and centromeres.  
 Stripes on socks can be discussed as gene placement on chromosomes.  
 Show all pairs inside the ziplock (acting as nuclear envelope).  
 Take the three out of the ziplock (nuclear envelope dissolves) and attach them to the long piece of yarn attached to the wall/white board (line up on midplate).  
 Pull the yarn from the centriole and attach them to the socks (one to each sock- spindle fibers attach to chromatids).  
 Ask two volunteers to pull them apart (pulls chromatids apart into chromosomes).  
 Talk about cytokinesis.

### **Surface Tension Boat Racing**

**Objective:** Help students understand surface tension of different substances and the effect of a surfactant.

**Materials:** 3 "Race tracks"

Water

Vegetable oil

Rubbing alcohol

Dish soap

Syringes or pipette

Boats (cardboard bottom wrapped with plastic wrap or laminated)

**Procedure:** Fill each track with about 2 cm of liquid (1 oil, 1 water, 1 alcohol).

Place boats about 3 cm from the back of the race track (enough room to drop soap).

Ask 3 people to each fuel a boat.

Give them a pre loaded syringe or pipette with dish soap.

Have them drop the soap behind their boat on the count of three.

Watch the race!

**Results:** The surface tension of oil is not affected at all by the surfactant and that boat will not move. The rubbing alcohol, although it is partially water, does not have a very high surface tension and the boat may even start to sink. There will be little movement from this boat too. The water boat will quickly shoot down the track. The surfactant has a hydrophilic and hydrophobic end. This causes it to break the surface tension and send the boat on its way.

## **Hogan, Emily Senior – Biology**

### Teabag Thermal

**Materials:** teabag(s), matches, saucer/plate, water/wet towel (for safety)

**Procedure:** 1) Empty contents of teabag. 2) Open bag up so that it can stand upright on the plate. 3) Light the bag and allow it to burn down.

**What happens:** When the tea bag is being burned, the heat is being released which creates a narrow column of warm rising air. This is a miniature thermal current. When the bag burns down enough, it becomes light enough to be lifted up by the thermal current.



### Marble Gravitron

**Materials:** A glass that is narrower at the top (ex. wine glasses), marble

**Procedure:** 1) Trap a marble under the glass on a smooth surface. 2) Wiggle the glass so that the marble will start rolling around and eventually the marble will roll up the sides a bit. 3) When the marble is really rolling, lift up the glass and the marble will be rolling on the sides for at least a few seconds

**What happens:** The reason the marble is able to stay in the glass when it is lifted up is because centripetal force is being applied. This is the "sideways force" that pushes one sideways in a car when going around a sharp corner. An object in motion tends to stay in a straight line motion unless something else is acting upon it. The marble wants to keep going in a straight line but the curve of the glass makes it change direction. This results in the marble pushing against the glass.

### Sodapop and Salt

**Materials:** Can of Soda, Glass container, Salt, Teaspoon, basin to catch fizz

**Procedure:** 1) Pour soda into glass without producing much fizz. 2) Pour about a teaspoon of salt into the pop. 3) Observe

**What happens:** There is already a lot of gas dissolved in the sugar water of pop. Salt is more soluble in water than the gas is so when the salt is added the water can't hold so much stuff dissolved in it so the gas escapes causing fizzing.  
~Temperature and pressure also determine the solubility of gas in water. ex. pressure change of divers and fish

## Johnson, Kirsten Senior – Biology



### Bio-poison patrol: Liver Catalase reaction

**Materials:** Goggles  
Liver  
(3) 150 mL beakers  
Knife or scissors (to cut liver)  
Glass stirring rod  
Tray to catch mess  
Forceps (to pick up liver)  
Liver (cut into chunks about 3 cm x 3 cm)  
1 bottle 3% or higher Hydrogen Peroxide (H<sub>2</sub>O<sub>2</sub>)  
Lighter/matches  
Wooden splint  
Materials for extension:  
Temperature: Thermometers, ice and boiling water  
pH: Lemon juice, ammonia and pH paper

**What I'm going to do:** The possibility of life exists because of chemical reactions. Life would cease if reactions were too slow, which is why there are such things as catalysts. Catalysts speed up reactions by lowering the activation energy of the reaction, but are not altered or used up in the process. Enzymes, which are proteins, are a special form of catalyst found in living organisms. This piece of liver (hold it up) contains a high concentration of the enzyme Catalase. This beaker contains a substance poisonous to our bodies, hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>). When I drop the liver in, what will happen? *The substrate is catalyzed producing bubbles and heat.* What are the products of this reaction? *Water, Oxygen and heat.* How could you test that oxygen is the gas being produced? *Glowing splint will relight in the presence of oxygen because of its flammability.* How can you be sure that the liquid left is water? *Test the pH of the liquid, and/or add a new piece of liver to see if any reaction occurs (there shouldn't be one).* Could a used piece of liver be used to catalyze another reaction? *Yes because the enzyme is not used up in the reaction.*

### Extension: Testing the effect of temperature and pH

To determine whether or not temperature has an effect on Catalase activity place one piece of liver on the ice and one in the boiling water for five minutes. Then take the clean beakers and pour 50 mL of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) in each. Take the liver from the package (control liver) and place it in the beaker, then place the liver from the ice in another beaker and the piece from the boiling water in the last beaker. Observe what happens. What happens to the reaction times when the body has a fever or gets too cold? To test whether pH has an effect on Catalase activity clean the beakers and place 10 mL of lemon juice in one with 40 mL of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), plain hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) in the second and 10 mL of ammonia and 40 mL of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) to the last beaker. Using the pH paper measure the pH of each beaker and record it on the board. Place three fresh pieces of liver in the three beakers and observe the reactions. At what pH does the Catalase (liver) react best with the substrate (H<sub>2</sub>O<sub>2</sub>)?

### Heart Trouble

**Materials:** Quart container  
Vinyl tubing  
1ft section of tubing with an inside diameter of ½ inch  
1ft section of tubing with an inside diameter of ¼ inch  
2 Nylon barb adapters  
½ inch x ¾ inch  
¼ inch x ¾ inch  
2 1000 mL beakers  
Water  
Red dye (food coloring, koolade, etc.)

**Safety:** Goggles  
Lab coat to protect clothes from splash of red dye

**What I'm going to do:** Have an assistant plug the ends of the tubing then fill quart container with 1000 mL water dyed with red dye to look like blood. Explain that the larger diameter tubing represents a regular artery and the smaller diameter tubing represents an artery constricted due to stress or plaque buildup. Ask students what they think will happen? How much water will come from the larger tube, how much from the smaller? Ask assistant to place the ends of the tubes into the two separate

beakers and release tubes. Colored water should flow out both ends. The smaller tube should fill less of its beaker than the large tube by about half. Ask students why this happens. Tell students that flow is inversely proportional to resistance so if resistance is greater (like in the smaller tubing) then flow will be less.

**Follow up questions:** After the demonstration ask the students:

What would happen to the heart of a person who has constricted vessels?

What other systems in the body would this effect?

## Kipf, Rebecca Senior – Earth sciences



### False Lift

**Materials:** 1 latex balloon filled with helium, ballast (quarter and paperclip), yarn, 2 drinking straws

**Procedure:** Fill the balloon and attach the yarn to the balloon and then to the quarter using the paperclip. The balloon should be almost buoyant but unable to lift the quarter. For the demonstration use the straws to blow on the upper area of the balloon. The wind you create should move over the top of the balloon and cause the balloon to lift.

**Explanation:** This is an example of Bernoulli's principle and how the air going over an aircraft wing causes the lift that allows the plane to fly. In hot-air ballooning this is referred to incorrectly as false lift because it is not lift created by the pilot. Once the balloon reaches the speed of the wind this lifting force is no longer created and unless the pilot compensates for it, the balloon will descend.

## Miwa, Ryan Senior – Chemistry



### Salt "Glue"

**Materials:** A small block of ice  
Beaker of Water  
Salt (NaCl)  
Piece of cotton/wool thread or string

**Method:** Moisten one end of the thread. Place the moistened end of the across the block of ice floating on some water. Sprinkle the ice with salt and wait for a moment and then pull the thread up. The thread will be attached to the ice, which can be lifted from the beaker.

**Explanation:** The salt causes a phenomenon called freezing point depression. The salt causes the freezing point of the ice to be depressed because another compound is added, thus meaning that the ice has a lower freezing point than pure ice. The freezing point depression is a colligative property, which means that it is dependent on the presence of dissolved particles within a solution.

### Powder Glove

**Materials:** 600ml Beaker  
Baby Powder

**Method:** Fill the 600ml beaker about  $\frac{3}{4}$  of the way full. Then sprinkle a small layer of baby powder on the top of the water. Push three fingers into the powder, and wiggle around a bit so everyone can see, and pull them straight out. There will be powder on your finger, but no water. To prove this snap your fingers and watch the dust fly.

**Explanation:** The baby powder will not mix with the water because it is hydrophobic or water hating. Actually the water is polar, and the powder is nonpolar. These properties mean that the two substances will not dissolve or mix with each other. The molecules of the powder try to stay away from the molecules of the water. In addition, the powder is mostly less dense than the water and will float on the top.

When you stick your hand into the powder and water, the force of your hand makes the powder particles stick to your fingers and push the molecules of the water away, therefore the powder is like a water repellent. **NOTE:** This works better with a more nonpolar powder like Lycopodium powder



## Patton, John Senior – Biology



### Five Dollars Free! But there's a catch...

- Procedure:**
- 1) Find someone that would like to win five dollars
  - 2) Hold out the bill and have the volunteer hold their thumb and forefinger "at the ready" just below the bottom of the bill.
  - 3) Explain that if they anticipate the drop, they owe you five dollars.
  - 4) Drop the bill for them to catch
  - 5) Repeat to prove that they can not catch the bill
  - 6) Explain that this time you will tell them when you are going to drop the bill with the word "Go." This may take one or two tries, but the volunteer will most likely catch the note.
- Concepts:** This demonstration is three-fold. One, it demonstrates the amount of time required for your eyes to send the message to your brain to send the message to your hand to grab the bill. Two, if the volunteer catches the bill with the auditory cue, it demonstrates the difference in reaction time when comparing visual to auditory cues. Three, it demonstrates the acceleration due to gravity.
- Things to Consider:** Make sure that your hands are dry so that the bill does not stick to your finger, but will fall freely.

### Eye See a One-Eyed Human

- Procedure:**
- 1) Cut a hole in the middle of a piece of cardstock or paper
  - 2) Have a volunteer hold the paper in front of their face with arms outstretched.
  - 3) Tell the volunteer to slowly bring the paper closer to their face while focusing on an object through the hole.
  - 4) Have the volunteer bring the paper to their face so that it is touching their nose.
  - 5) Ask if the volunteer is looking through the paper with both eyes. (their answer will most likely be 'yes')
  - 6) Show the volunteer to the students, proving that the hole in the paper is really only over one eye.
- Concepts:** This demonstrates that we all have a dominant eye, and though we believe that we are looking through both eyes to focus on an object, one eye is more dominant than the other.

## Peoples, Andrew Senior – Physics



### The Returning Can

- Materials:** One coffee can, some rubber bands, a couple of paper clips and a weight with a hole in it.
- Demonstration:** This is a demo to show stored or potential energy to a group. The can is constructed by punching a hole in the middle of the I demonstrator rolls the can across a table and the can returns to him or her. To show the audience that the table is level, the demonstrator turns the can around and rolls it the other direction and the can still returns to the demonstrator. To help the can move along, it is a good idea to turn the can one or twice before rolling it.
- The Science:** As the can rolls, the weight causes the rubber band to wind itself up, thus storing energy for the return trip. The can comes to a stop, and the rubber band releases that energy which causes the can to roll in the opposite direction. Analogies that could be used to describe what is going on is the charging of a battery or the winding of a clock.
- Hazards:** There are no major or minor hazards to list.

### The "Heavy Newspaper"

- Materials:** Paint stirrer sticks, a table and a couple of sheets of newspaper.
- Demonstration:** This is a demo to show the audience the awesome power of pressure. The demonstrator will place 1/2 of the wooden sticks hanging off the edge of a table. He or she will place one or two sheets of newspaper to cover the half on the table. Be sure to spread the paper down in order to make sure there is no air under the sheets. The presenter then may proceed to break the stick in half by hitting the hanging edge downward hard. The paper should stay in place while the stick breaks.
- The Science:** The force acting on an object is equal to the area of the surface times the pressure. The surface area of the sticks are very small when compared to the surface area of the newspaper. Then the newspaper is spread out and the air underneath it is removed, the only other force from pressure is exerted on the top of it. When the stick is hit quickly enough, there is not enough time for air to enter the underside of the newspaper and the forces being exerted on the stick is enough to break it in two.

**Hazards:** Other than a possible splinter, there are no major safety concerns

## Rewerts, Tamara Graduate – Chemistry

### The Dissolving Cup

**Materials:** A pie plate  
50 mL water in a 100 mL glass beaker  
50 mL acetone in a 100 mL glass beaker (this can be replaced by fingernail polish, but 100% acetone is available at some stores) styrofoam cups

**Procedure:**

1. Hold one cup over a pie plate and pour water into the styrofoam cup (nothing happens).
2. Pour acetone into another of the styrofoam cups (the bottom will fall out) into the pie plate.
3. Finish by putting the cup into the pie plate and watching it disappear.

**Alternative Procedure:**

1. Start with two pie plates and put about 1/2 inch of acetone in the bottom of one and the same amount of water in the second one.
2. Have a race to see who can make the tallest tower of cups.
3. The cups in the acetone will slowly dissolve and shrink into the acetone, while the ones in the water will remain intact.

#### Two ways to discuss this demonstration in your classroom:

**Safety** - never drink anything in lab. This is a good example of this, two colorless liquids that appear to be water, yet one is not. The results show you why you should not assume that something in the lab that looks like water, is water! You may introduce this by pouring the water into the styrofoam cup and drinking it. Then pour the acetone into the other cup, pretend you are still thirsty and attempt to drink out of it. The results show you why no one should assume that something in the lab that looks like water, is water.

**Like Dissolves Like** - styrofoam is a polymer consisting of a long chain of monomers that are held together by non-polar bond interactions, thus styrofoam is non-polar. When acetone - a non-polar solvent - is poured into the cup, it dissolves because they are both non-polar. The cup did not dissolve in the water because water is polar and will not dissolve a non-polar substance. Make sure to clarify to your classroom that the cup is not melting in the acetone (the acetone is not hot!), it is dissolving because of their similar polarities.

**Safety:** No particular cautions are needed

**Disposal:** The gooey solid can be disposed of into the trash can. You can leave the acetone in the pie plate and allow it to evaporate and then wash out the pie plate, or you can pour off the extra liquid down the drain.

**Source:** Elmhurst College Demonstrations

### The Vanilla Balloon

**Materials:** 1 balloon (medium to large sized)  
Imitation Vanilla extract

**Procedure:**

1. Stretch the mouth of the balloon over the opening of the vanilla extract bottle and pour a little into the balloon, it just can be a quick inversion of the bottle.
2. Blow up the balloon and tie it off.
3. Pass the balloon around your classroom and ask your students if they can smell the vanilla through the outside of the balloon (they can).

#### Discussing this demonstration in your classroom:

This is a great representation of how to show that cells get their nutrients via a process called osmosis. When the balloon is blown up, it causes small gaps in between the rubber molecules of the balloon which allows the vanilla molecules to fit into the gaps of the rubber molecules. This allows someone to smell the vanilla on the outside of the balloon. The vanilla acts on the balloon the same way that osmosis works, a solvent passes through the semipermeable membrane of a cell solvent from an area of high solute concentration to low solute concentration.

**Safety:** No particular cautions are needed

**Disposal:** All of these materials may be put into the trash.

**Source:** Bill Nye the Science Guy

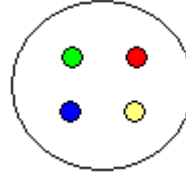


## Riddle, Kate Senior – Earth Sciences

### Tie-Dyed Milk

**Principles:** This demonstration addresses the property of surface tension. Surface tension is the energy required to increase the surface area of a liquid by a unit amount. Liquids like water and milk have surface tension due to the cohesive forces of the liquid's molecules. The demonstration will show how soap can reduce the surface tension in milk.

**Materials:** A shallow clear dish  
Milk (whole or 2%) (room temperature)  
Food coloring (four different colors)  
Liquid dish soap



**Procedure:**

1. Pour a 1-2cm layer of milk into the dish
2. Put one drop of each of the four food colors onto the surface of the milk, separated from each other.
3. Drop one drop of dish soap onto the surface of the milk in the center of the dish. Do not drop the soap on top of the food coloring drops.
4. Observe what happens next!

**Source:** coolscience.org; Dr. David Anderson

### Snicker's Metamorphosis

**Principles:** This demonstration shows the process of metamorphism (changing form). It will show the transformation of a pre-existing rock type into a new rock type using a Snickers candy bar for the rock.

**Materials:** Snickers bar  
Two pieces of wood  
A volunteer

**Procedure:**

1. Cut the snickers bar cleanly in half to show the layers of this "pre-existing" rock.
2. Place one half of the candy bar between the two pieces of wood.
3. Have a volunteer stand or jump on the pieces of wood to represent the pressure it takes to morph one object into another.
4. Cut the smashed snickers bar cleanly in half to view the "new" layers.

**Source:** darylscience.com

## Tallaksen, Lisa Senior – Biology

### The Hydrophobic Nature of Grapes

**Materials:** Grapes, colorless soda (1-L bottle), knife to peel grapes

**Purpose:** This demonstration is used to show the hydrophobic (nonpolar) nature of cell membranes using grapes.

**Procedure:** Pour out approximately 200ml of soda from a newly opened bottle. Have five peeled grapes and ask the students what they think will happen when you add them to the 1-L of soda. Also ask the students what they think will happen to the grapes that have not been peeled. First drop the unpeeled grapes in and watch what happens. Then add the peeled grapes to the bottle and observe what happens. Do not replace the cap after adding the grapes. Have the students explain what happened. After a short discussion about cell membranes ask the students what they would expect to happen if the cap was screwed back on.

**Explanation:** This demonstration shows how the nonpolar carbon dioxide molecules clinging to the surface of the grape while water molecules are being repelled. In the peeled grape, which lacks the hydrophobic skin, the water molecules are attracted to the surface and the carbon dioxide gas is repelled, resulting in the peeled grapes sinking. The unpeeled grapes will float to the surface because of the low density of the carbon dioxide. At the surface the gas is detached and the grape sinks back down.

The process will then continue.

**Note:** When doing this demonstration make sure that students do not get the misconception that the unpeeled grapes are sinking because they weigh less or have a lower density because the skin has been removed.

**Source:** Borislav Bilash II, and Martin Shields. A Demo A Day- A Year of Biological Demonstrations

### Pressure Demonstration

**Materials:** 12" balloon, aluminum can with the top cut out, tape, 2 beakers, ice, hot plate, tongs, rubber bands, water

**Purpose:** To show how temperature affects the pressure

**Procedure:** Cut the top of a soda can out. Then cut a balloon so you are left with the widest portion. Place the balloon over the top of the can and put a rubber band around the top to insure that the balloon will remain in place. Have two beakers, one filled





with ice water and the other filled with water that has been heated on the hot plate. Place the device into the cold water and watch the balloon sink into the can. Then place the can into the hot water and watch the balloon rise. Continue with a class discussion explaining how temperature, kinetic energy, and pressure are related.

## Travis, Cheryl Senior – Biology

### Rainbow in a Jar

- Materials:**
- (1) Qt. Glass Jar or beaker
  - (1) Small bottle **White Karo Syrup** (approx. 16 oz.)
  - (2) **Polarized Plastic Sheets**
  - (1) **Overhead Projector** or comparable light source

**Procedure:** Place the overhead projector on a sturdy, flat surface and plug in. Pour Karo Syrup into glass jar until approximately 3-4" deep. Place one polarizing sheet on the overhead projector. Turn on light source. Now place the jar filled with the karo syrup on top of this polarized sheet. Next, place the second polarized sheet on top of the glass jar rim. Experiment by moving the top sheet in different directions to observe visual changes. Now try rotating the top sheet in a clockwise direction (the bottom sheet stays stationary). You'll notice all of the colors of the rainbow appear.

**Why this works:** Glucose (Karo Syrup) is a very large sugar molecule. By allowing the light to pass through the polarized sheets, the wavelengths are broken as they pass through the syrup. The colors of the visible light spectrum can thus be observed.

**Source:** Front Range Community College Science Demonstration Dr. Shashi Unnithan



## Voss, Ashley Senior – Biology

### Energy in Chemical Bonds

**Objective:** To show that molecules consist of smaller molecules (or atoms) bound together and that those bonds contain energy that is released when the bonds are broken.

**Materials:** Two wooden blocks, a heavy elastic band, scissors.

**Procedure:** Take two wooden blocks (same or different sizes) and connect them by wrapping the elastic band around them. Explain that this represents two molecules (blocks) being held together by a chemical bond (elastic band). The blocks may have names or symbols, such as ADP and P printed on them. Using the scissors, cut the elastic. The elastic will fly away from the blocks, showing the release of energy. The blocks now represent the two separate molecules.



### How viruses replicate

**Materials:**

- Large round balloon
- About 20 red raffle tickets
- About 4 blue raffle tickets of a different color
- Pin
- Round yellow stickers, 1/2"
- Transparent tape

**Preparation:** Set aside one of the 20 red raffle tickets. Push all remaining raffle tickets (red and blue) into balloon. Blow up balloon, tie off end. Put a circle of tape on the back side of the set-aside raffle ticket. Have remaining materials at hand.

**Presentation:** Explain to class that many diseases are caused by viruses. Viruses are much smaller than the cells in our bodies, and they cannot make copies of themselves. They need to get our body cells to make copies for them. If the balloon represents a body cell, the virus is much smaller, maybe the size of a raffle ticket (hold up balloon and ticket). In order to make copies of itself, the virus attaches itself to the outside of the cell (stick ticket onto balloon). Then the virus directs the cell to make copies of the virus (shake the balloon for dramatic effect, it is "making viruses.") Eventually there will be so many virus copies inside the cell that the cell will burst (using pin, pop balloon with flourish!) and virus copies will spread all over the place (the tickets should have blown all over).

Our bodies fight this by attaching antibodies to the viruses so the white blood cells can wipe them out. (Stick yellow round stickers onto the red raffle tickets to represent "antibodies".) But once in a while, when the virus is reproducing, it doesn't make an exact copy of itself (hold up one of the blue tickets). Then the antibody for the original virus doesn't recognize it, and it goes right past it, it lets the virus go. The new virus can make us sick again.

**Source:** Bill Nye the Science Guy, episode on "The Immune System."

## **True, Nickolas Senior – Biology**

I am going to do the dry ice plus liquid soap demonstration where a piece of dry ice is placed in a cup, water is added followed by liquid soap. A very thick bubble column extends from the cup and will grow very tall without falling, furthermore when the bubbles are touched by skin, they instantly evaporate.

