

2008 Colorado Science Convention
“30 Demos in 50 Minutes”
Univ. of Northern Colorado Secondary Science Methods Class

Jackie Paris – Senior Biology Major

Adaptations:

Opposable thumbs are one of the physical adaptations that humans have that most other animals do not have. Other animals move about in their environment smoothly without this adaptation, but how would humans do without thumbs? To simulate this in the classroom a roll of masking tape will be used to tape students hand so that they no longer have use of their thumbs. Have them make the number 4, so that they are placing their thumbs across the palm of their hands, making the tape wrap around the palm, about the level of the first knuckle, making sure to include the thumb. Enough pieces of a small candy in a wrapper, such as Starburst, Tootsie Rolls, Kisses for each student to have and small combs will be needed for each student. Once the students are taped up, have them open the candy and comb their hair with only their 4 fingers. After a little bit of trying, tell them that they can use other tools, like their mouth and other body parts, but let them explore the other options without much direction. If they are feeling ambitious, have them untie and re-tie their shoes, again with no thumbs. After the activity talk with them about how they had to make modifications to do these everyday things that are typically very easy, because of thumbs. Ask if them if

Lenae Anderson – Senior Chemistry Major

Universal Indicator with a Basic Solution and Dry Ice

Materials:

- Universal Indicator
- Dry Ice
- Ammonia
- Water
- Beaker
- Tongs to handle

Procedure Add universal indicator to half a beaker of water. Add ammonia until the solution turns purple. If the color becomes washed out looking at this point add more universal indicator. Put a piece of dry ice in the solution.

Explanation: The dry ice sublimates into carbon dioxide. As this bubble through the solution it reacts with water according to the following reactions



This causes the solution to become more acidic,

- Spend a few minutes building a card house
- Put back on the socks with your eyes closed, and try to locate the tips of your socks by pointing at them
- Keep your socks on and build the house again for awhile
- Now try to point to the tips of your socks

Discussion:

- Shake and then let separate
- Crack open the egg and put in a small dish
- Take the eye dropper and suck out some of the yoke squirt drops into the oil and water mixture.
- Wait for the reaction of the egg surrounding the water and oil to form cells

Discussion:

In this demonstration it will show how cell membranes can be formed. This demonstration should help students realize how cell membranes can split and multiply.

Dillon Glatther – Senior Earth Sciences Major

Rate of Evaporation

This demo shows that evaporation removes heat only using three thermometers. One thermometer is the control. One is wrapped in a water soaked paper towel. And the last is wrapped in an alcohol soaked paper towel. Since alcohol evaporates the fastest the thermometer should show the fastest temperature drop. The water one will show less of a drop and the control should change very little.

El Nino

This demo uses a clear tub with warm, red water over clear cold water to depict normal Pacific ocean layers and compare to El Nino.

Sara Robida – Senior Biology Major

Newton’s First Law

In this demonstration, the teacher puts an empty glass bottle on the tabletop, balances a large embroidery hoop on top of this, and balances some object smaller than the bottle (i.e. coin, marker) opening at the top of the hoop. When the hoop is quickly slipped out from between the bottle and the marker, the marker will drop straight down into the bottle. When the hoop is yanked out of the system, it needs to be grabbed from the inside of the hoop. If the hoop is grabbed from the side, the force will distort the circle of the hoop and the marker will be thrust upward, and it will not fall in the bottle. This demonstration illustrates Newton’s first law (inertia). So, to begin the whole system is at rest. When we remove the hoop, gravity works on the marker, thus it falls straight down into the bottle.

ATP Energy Release

For this demonstration the teacher needs four blocks of wood sized so that they can be bound together with a regular rubber band. Three of the blocks should be labeled as “P”s, and the fourth should be labeled as an “A”. The A block and two P blocks should be bound together with glue, tape or rubber band in the following order: APP. The fourth block should be rubber banded to this complex next to the P. This assembly represents a molecule of ATP. When we discuss ATP as the energy source for cells, the students can have a hard time envisioning how the cleavage of a phosphate group releases energy. In this demonstration, we discuss ATP and then snip the outer rubber band, releasing one of the P blocks. The rubber band will fly off the assembly, its kinetic energy analogous to the energy released from ATP. This gives the students a visual reference of this

Kayleigh Wellington – Senior Biology Major

Curved Space

For the first demo i want to use jell-o to deomstrate how space bends around planets and stars. For this demonstration i will need a bowl of jell-o and a variety of fruits, candies and nuts. The fruits, candies and nuts represent the planets and

- * Draw an eye on the bottom of the Petri dish with permanent marker. Crack the egg and separate the whites from the yoke. Place the egg whites in the Petri dish on overhead projector.
- * Discuss similarities between egg white and the human eye.
- * Using Beral pipet, place drops of acid on the egg white (it will immediately become opaque). You can rinse the egg with water to show it does not “undo” the damage.
- * Repeat with new egg whites and other acids.
- * Nitric acid turns egg whites bright yellow. Strong sodium hydroxide will not discolor egg whites but solidifies them. Acids less than 6M can work, but results are not as dramatic.

Laura Marschke – Graduate Earth Sciences Major (undergrad. Physics Major)

Candy Cratering

Purpose:

The purpose of this demonstration is to show, in a simplistic way, the nature of impact crater formation. This demonstration can be easily expanded to a laboratory exercise for students to learn more about impact crater formation and the relationships between mass, velocity and crater size.

- As a lab activity, the “meteorites” will be moving too slowly to create all the observed features of impact craters. This can be discussed before or after doing the lab.

Materials:

this is the material list for a lab activity; not as much is needed for a demonstration; multiply the supplies by the number of groups if doing a lab

- Deep plastic container (shoe box size)
- 6-8 cups of flour
- Chocolate drink powder
- Sifter or small strainer
- Powdered sugar
- Candies of multiple shapes and sizes to be used as “meteorites”
 - o Recommended: peanut M&Ms, jelly beans, whoppers, milk duds
 - o Corn, beans, marbles, and beads would work as well
- Meter stick
- Garbage bags
- Scissors
- Smooth object to smooth out layers
- Spoon/tongs/large tweezers (to retrieve meteorites)
- Stop watches (optional)
- Goggles are recommended if you are doing this as a lab activity

Procedure:

- Cut open a plastic trash bag and lay out on the counter or tape to the floor
- Place the plastic container on top of the bag and fill approximately 2/3 full of flour
- Tap the container gently on the table or floor to settle the flour and smooth if necessary
- Using the sifter, place a coating of powdered sugar on top of the flour (this helps to provide a barrier so the candy isn’t flour-coated when the activity is done)
- Use the sifter and sprinkle a thin layer (a

- Retrieve meteorites, smooth and re-powder the top layer when a clean start is needed (i.e., when you can't see which craters you are currently making)

Additional measurements and information that can be discussed in a lab setting:

- Diameter of crater
- Depth of crater
- Velocity of projectile (would need stop watches)
- Diameter of ejecta
- Mass of projectile
- Width of crater at largest point
- Sketches of crater and crater patterns made by different "meteorites"
- Which craters are "older" and "younger" and why
 - o Crater counting activities can be used in conjunction with this information

Note:

This demonstration was adapted from the activity Dr. Shauna Sallmen (University of Wisconsin – La Crosse) and I taught at a "Girls in Science" conference. However, the following are terrific websites to help expand the demonstration into a lab:

http://www.rpls.ws/ligiat/2007/READ/Lunar_Crater_Lab.pdf (candy lab plus cratering notes)

http://www.spacegrant.hawaii.edu/class_acts/CratersTe.html (same lab concept with different materials, blank data table pages, blank graph paper, and teacher note pages all linked to this page)

Dry Ice Eruption

Purpose:

- To have some fun in a science classroom!
- Discuss sublimation of dry ice (from solid to gas) and being able to trap this gas in bubbles

Materials:

- Tall graduated cylinder
- Very hot water
- Liquid dish soap
- Tongs/thick gloves
- Garbage bag or towel

Procedure:

- Set the tall graduated cylinder on top of a towel or garbage bag; this will save you some clean-up time later
- Fill 1/3 of the tall graduated cylinder with extremely hot water
- Using gloves/tongs drop in a few good-sized chunks of dry ice
- Watch the release of carbon dioxide
- Squirt in liquid dish soap
 - o If it's colorful, the liquid at the bottom will change colors which is cool to see as well; it adds to the overall look of the demonstration
- Watch the dry ice eruption!
- Play with the bubbles and 'pop' them in your hands and watch them turn back into gaseous carbon dioxide

Safety Precautions:

- Always handle dry ice with tongs or thick gloves, it is extremely cold and can cause frostbite very quickly
- Be careful with using extremely hot water, don't burn yourself!

Source:

- <http://www.youtube.com/watch?v=gNdoUCgRXYo&feature=related>

- o He has a number of excellent science videos on youtube; his ID is mrbrunnerutah

James Neily – Senior Biology Major

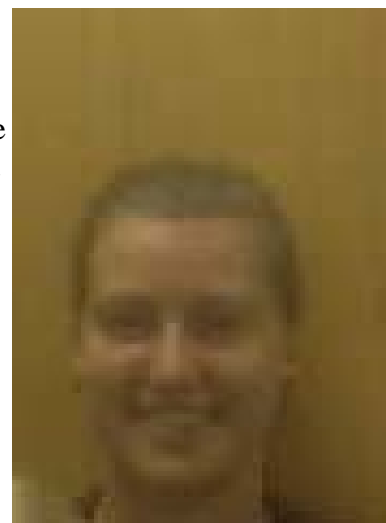
Diffusion Demo

Cells use certain substances to carry on the activities that keep them alive. These substances enter through the cell membrane by a process called diffusion. Substances move from where they are more concentrated to where they are less concentrated. The cell membrane is semi permeable, which mean some things can pass freely back and forth due to their small size.

This lab demonstrates the idea of diffusion through a semi permeable membrane. The plastic bag is reprenting the membran.4(m)7.

Cathrin Fronthaler – Austrian Exchange Student

Cathrin is a Geography Major from Salzburg, Austria. Although she is not a science major she has been attending the UNC Secondary Science Methods class this semester and has given us much insight into the differences between the Austrian and other European educational systems and the US educational system. Cathrin will be helping us with some demos and will be our official “Vanna White” or our official “European Demonstration Model”



Stacie Santoro – Senior Biology Major

Lava Lamp

Introduction

This Demonstration is used to show students the difference between densities of fluids. It's important for students to recognize that more dense fluids will sink, while less dense fluids will float on top.

Materials

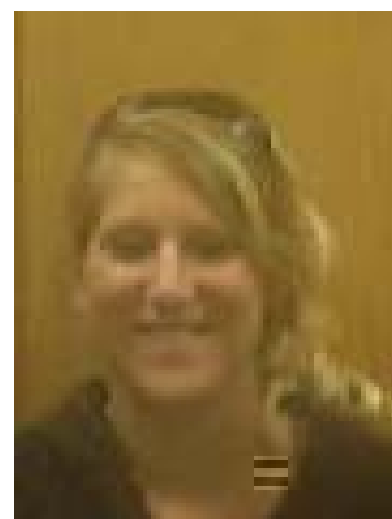
- Water
- Food Coloring
- Vegetable Oil
- Salt
- 1 Large Graduated Cylinder

Procedure

- Mix water and food coloring and pour the mixture into the large graduated cylinder. Make sure the graduated cylinder is clear so the audience can see the fluid.
- Pour some vegetable oil on the surface of the water in the graduated cylinder.
- Pour salt into the graduated cylinder and watch as the oil sinks in the graduated cylinder.

Discussion

This demonstration shows differences in densities between fluids. The oil is less dense so it will float on the top of the water, but as soon as the salt is introduced into the graduated cylinder, the salt and oil adhere and sink to the bottom. This is called the lava lamp because it's similar to a real lava lamp, except those use different materials.



Introduction:

This is a unique demonstration demonstrating density of different liquids. Students will be able to explore the densities of these liquids in a fun, unique way

Materials:

- 150 mL beaker
- 50 mL graduated cylinder
- Standard test tube
- 250 mL measuring cup
- Stirring rod
- pipette/dropper

Water-standard potioning water

Goblin Snot – a yellow and slimy substance commonly used in cooking greasy foods and often obtained from dampened Kleenex. Although a rather nasty substance by itself, Goblin Snot magically prevents food from sticking to its cooking container. (vegetable oil)

Dragon Saliva – A clear yet harshly alcoholic smelling substance that ignites rather quicker in the presence of fire. Although difficult to obtain, Dragon Saliva has powerful healing and cleansing abilities and is often used to aid the injured. (rubbing alcohol)

Leech Juice – A bright red substance that draws its color from a leeches primary diet. Although pure Leech Blood contains many nutrients, Leech Juice has these filtered out resulting in a simple red dye. (Red food coloring)

Stinkbug Stink – A green substance that generally gills a room with noxious and foul smells.

- Drop the piece of paper in the glass jar
- Quickly place the water balloon on the mouth of the glass jar
- Stand back and watch as the water balloon gets sucked into the glass jar

Discussion:

This demonstration shows pressure. It demonstrates that the pressure outside of the jar is so great, that it pushes the water balloon into the jar.

Eileen Duncan – Graduate Earth Science Major

Cloud in a bottle.

Purpose: to show students how to create their own cloud.

Materials:

2 liter plastic bottle, clear (soda type)
Hot/warm water
Matches

Procedure

Fill the bottle about ¼ full with warm water. Light a match, hold the bottle sideways as much as possible without spilling water. Place burning match into the bottle. Cap immediately to capture smoke. Shake bottle to remove condensation from the sides. Squeeze the bottle, then release quickly. A cloud will form, you can then squeeze the bottle again and the cloud will disappear.

Why?

Water provides the water vapor in the air, smoke particles serve as a cloud condensation nuclei (something for the water vapor to condense on to), squeezing the bottle compresses the air within the bottle increasing the temperature (just as high pressure in the atmosphere) causing evaporation (or water to remain in its vapor state), releasing the bottle decompresses the air in the bottle decreasing the temperature allowing condensation to occur (just as it does with low pressure center in the atmosphere) water vapor condenses into liquid form.

Golden Red Sunrises and Sunsets

Purpose: To show students why the sky is blue and sunrises and sunsets are orange/yellow.

Materials:

Large glass jar
Overhead Projector
Flashlight
Creamer

Procedure:

Fill large glass jar halfway with warm water, set on top of an overhead projector. Show how the water is clear and the light reflected on the screen is white (clear – all the wavelengths of light are passing through the water).

Add a small pinch of creamer and stir. Point out that the water in the jar is turning a grey/blue and the light on the screen is beginning to turn yellow/orange.

Add a second small pinch of creamer stir. Point out that the water in the jar is even more bluish/grey and the light on the screen is more orange/yellow.

Last, turn off the lights, shine a flashlight at your audience and point out that the light is white.

Next, shine the flashlight through the jar with the beam of light towards your audience. Point out how it

emits all wavelengths of the visible spectrum. That light is white. However, when it passes through our atmosphere the pollutants scatter the blue wavelengths since they are small and allow the longer wavelengths, yellow, orange, red to pass through. So when we look through the atmosphere at the sun (at sunrise or sunset) the sun appears orange and the sky is a faint blue.