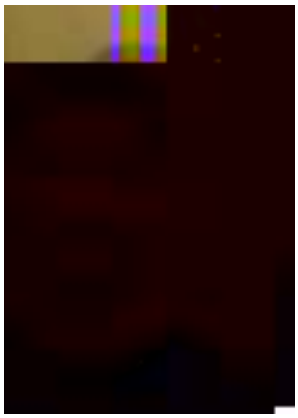
30 demos in 50 minutes
Demos by the UNC Secondary Science Methods Class at the Colorado Science Convention 2006

Contact: Courtney.Willis@unco.edu

Demonstrations by Aragorn Spaulding
Earth Science Major

#1. Magic Ice (Density Demo)



Materials: Two 400 ml beakers, one graduated cylinder, vegetable or corn oil, ethyl alcohol, ice that contains food coloring, water.

Procedure: Fill beakers with water and alcohol. Fill the graduated cylinder with oil. Ask audience what will happen in each instance. In water ice will float, in alcohol ice will sink, and in the oil the ice should float and the water will sink to the bottom.

#2. EGG DENSITY

Demonstration by Morgan Baines
Biology Major

#4. BUOYANCY

Principles:

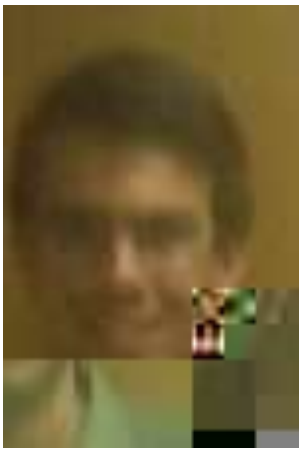
Water displacement, Buoyancy

Materials:

Two identical pieces of clay
Tub of water (preferably clear)

Procedure:

Take one of the pieces of clay and shape into a ball. Take the other and shape into a flat boat shape. Place both pieces of clay into the water and watch as the ball



Prothero, D. (1998) Bringing Fossils to Life: An Introduction to Paleobiology. McGraw-Hill, New York.

Demonstration by Judson Doyle
Earth Science Major

#7. CLOUD IN A JAR

Demonstrations by Erin Lively
Biology Major

#9. PHOTOSYNTHESIS AND RESPIRATION VISUAL FOR GRADES 6-8.

Materials small to medium cardboard box
small bag of sugar
small water bottle
red and blue balloons
lamp
pictures of a chloroplast and a mitochondria.

Method Stand the box on end with the bottom facing the students. Put all of the materials inside of it. Ask the students what the chloroplasts need to start photosynthesis. As they are named, pull out each on and place it next to the box. Then show how the water, carbon dioxide-red balloon, and light energy from the sun go into the chloroplasts/chlorophyll. Then, ask what the end products are. As they are named, pull out the sugar and the oxygen-blue balloon. For respiration, follow the reverse process.

#10

Materials 1/8 inch clear tubing (32 feet)
Stairway that goes up at least 30 feet
water and container (bucket)
clamps for the tubing

Method: Slowly fill the tubing by submerging it into a pail of water. Make sure there are no air bubbles. Once the tube is completely filled, clamp the exposed end so that no water can escape. Have a student walk up the stairway until the water starts to drain back into the bucket. The water should begin to drain at about 30 feet depending on elevation.

Demonstrations by Christina Gasaway
Biology and Chemistry Major (double)

#11. CONSERVATION OF MASS

Purpose: Students need for it to be proven to them the concept of conservation of mass. The Law of Conservation of Mass states that matter cannot be created nor destroyed. And if you start with a specific amount of mass, the mass might change forms, but it will not be lost.

Supplies:
Analytical balance, or a balance that will not be affected by buoyancy.
Carbonates soda
Balloon
Sodium bicarbonate

Method
1. Obtain the mass of unopened soda pop can
2. Obtain the mass of the sodium bicarbonate, including the mass of the balloon holding the sodium bicarbonate
3. Place the unopened can in the analytical balance, and open.

The challenge is to be able to maintain the mass contained in the soda including the gas put the sodium bicarbonate in the in the pop can using the balloon for delivery obtain the mass following the experiment this is easier said then done because there is a tendency to lose with because of the inability to get a weight without being affected by the buoyancy.

#12. PROPERTIES OF CHARGES

Purpose: Students will be able to grasp the concept of like charges repel and opposite charges attract in this sun experiment that can be done by the instructor, individual students, or small groups. Properties of Electron

Demonstrations by Andrew Huntsman
Physics Major

#15. LIVE WIRE OR MEMORY WIRE

Materials:

room temp: 22.4C Exotherm: 23.4C Endotherm: 35.1C It would be interesting comparing various endothermic temperatures within each other to see the variances in core body temp and hypothesizing why that might be. I think that this simple demo has great potential to lead into many different avenues of discussion.

Demonstration by Jennifer VanGundy
Earth Science Major

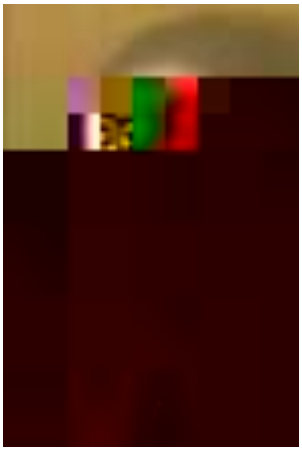
#18. MAGIC SAND

Materials: Magic Sand (available commercially in toy stores). Might try spraying very fine sand with some "Scotch Guard" or "Teflon".

Procedure: 1. Fill a cup 3/4 full with water.
2. Slowly pour Magic Sand in a continuous stream into the water. Look closely at the sand. What is that silver-like coating on the sand?
3. Pour off the water from the sand into a second container. Let them touch the sand and see what they find. To everyone's amazement, the sand is completely dry!

Demonstrations by Rebecca Hipp
Senior Biology

#19. SHRINKING AND EXPANDING MARSHMALLOWS



Scientific Principles: Effects of Pressure
How levels of pressure can be effected by volume

Materials: A large (needle less) syringe
2 or 3 mini marshmallows

Procedure: 1. Place marshmallows into the syringe.
2. Replace the plunger.
3. Push the plunger all the way down to the marshmallows, getting as close as you can without squashing them.
4. Place a finger or your thumb on the open end of the syringe creating an air tight seal.
5. Slowly pull plunger out, stopping before you reach the end of the syringe.
6. Notice as the plunger is being pulled; the marshmallows begin to expand, because you are significantly decreasing the amount of pressure inside the syringe, by increasing the volume within the enclosed space.
7. Release your thumb or finger to equalize the pressure again.
8. Pull the plunger to the end of the syringe just before it loses its air tight seal.
9. Again place your thumb or finger over the open end of the syringe, creating an air tight seal.
10. Slowly push the plunger toward the marshmallows
11. Notice that the marshmallows are shrinking. This is due to the fact that the level of pressure within the enclosed syringe has increased greatly by the decrease in volume with in the syringe.

When to use this:

This is a great visual for students to wrap their minds around how pressure affects matter, and how volume plays into the whole equation. Pressure levels can be a very abstract thought process, and by showing the children this visualization, they will have a better understanding of what happens as different factors are changed or introduced.

Scientific Principles: Demonstrating the function of the selectively permeable membrane of cells.
Demonstrating how molecules move from high concentration to low concentration (diffusion).

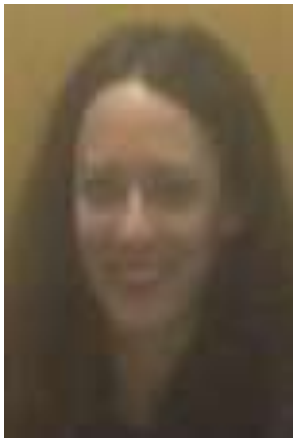
Materials: One balloon
One shoebox with lid

Masking tape
Any type of extract (vanilla, cinnamon, mint, etc.)

Procedure: 1. Put 7-9 drops of extract in a balloon.
2. Blow up the balloon, and tie it off.
3. Have a student smell an empty shoebox and the balloon, and have them tell the class what it smells like (should smell like cardboard (shoebox) or latex (balloon) or nothing…)
4. Place the balloon containing the extract in the shoebox, and tape down the lid.
5. Throughout the class, have the same student, or random students come up and smell the inside of the box. Each time, the box should smell more and more like the extract.

When to use this:This model is a great way of showing how certain molecules can cross a selectively permeable membrane, and how some cannot. Also, it is a great demonstration of diffusion. The balloon has microscopic holes in it (selectively permeable just like the membrane of a cell). There is a high concentration of the extract within the balloon, but an extremely low concentration outside the balloon. So

Demonstration by Shannon Winter
Biology Major



#23. DOMINANCE AND RECESSIVNESS

Objective: To show by analogy the difference between dominant/recessive and codominant.

Materials**:** 6 small and 4 larger drinking glasses or beakers
Water
Red food coloring
Bleach
Yellow food coloring

Procedure**:** Fill two small glasses with water colored a deep red with food coloring. Fill two more small glasses with plain water. Point out three apparently empty larger glasses. (In the third of these, there should be 1 ml of bleach, put there before class). Tell the students that the red and clear waters represent genes. Now pour some of the red solution from each of the two glasses (parent genes) into the first large glass (F1 generation). The solution is still red, showing that the phenotype for two homozygous genes is the same as that of the parents. Repeat for the two glasses of clear water, showing that the phenotypes are still the same as that of the parents. Now pour simultaneously from both the red and clear glasses into the third glass (with the bleach). The resulting solution (heterozygous) will be clear showing the trait of only one parent. Ask the class which gene was dominant. Answer: The clear water. The second experiment involves two small glasses, one with red water and the other with yellow water. When the two are poured together into an empty larger glass, the result is an orange-colored solution. This represents codominance or blending inheritance in the F1 generation. Neither of the two genes (colors) was dominant over the other.

This demo can be found at: FIFTY-SIX QUICK DEMONSTRATIONS FOR BIOLOGY CLASSES
Richard Lord, Presque Isle High School
http://web.archive.org/web/19971023004508/http://nesen.unl.edu/methods/biodemo.html#demo17

#24. HIV SIMULATION

Materials: Clear Plastic Cups (small)
Starch in One or Two of the Cups
Water in All Cups
Sexual Behavior Cards
Iodine

Procedure:

Do NOT initially tell the students that this is an HIV simulation. Let their contractions of the virus be a surprise!

1. Give each student a cup and a sexual behavior card.

Sexual Behavior Cards:
Have "Sex" w/ as many persons as you can

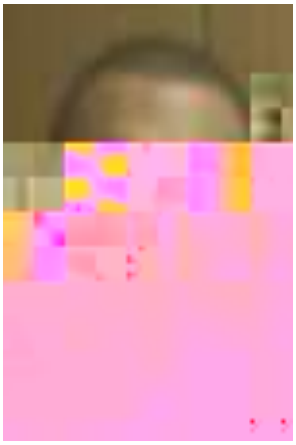
2. Put starch in two of the cups. These will be the HIV carriers. Give the students with the starch cups a sexual behavior card that says they will have sex w/ everyone they can talk into having sex. On ONE of those cards for the HIV carrier, write that they can only ACCEPT water when they mate. They are not allowed to pour their water into anyone else's cups. This will simulate a person who knows they have HIV and practices safe sex by using a condom. The other infected HIV carrier will not know they have HIV and will unknowingly infect others.
3. Allow students to socialize for about a minute or two. When students "have sex" they pour their liquid into each other's cups (unless otherwise specified).
4. Now TELL the students that two people where infected with HIV virus. Explain how one person knew

they were a carrier (and used a condom), and the other person did not know they were a carrier. To test for HIV, use Iodine. A positive test will turn black.

The original demo can be found at: GeeWhiz Science!
From Mary Chambers, formerly a Science Teacher, Now a principle at Moore Middle School,
http://www.meigsmagnet.org/~franklint/geewhiz.html

Demonstrations by Tanner Linsacum
Biology Major

#25. STEEL ON FIRE



Materials: -Steel rod
-Steel wool
-Matches (flame source)

Procedure: Attempt to light the steel rod on fire. Following the failure to ignite the rod, attempt to light the steel wool.

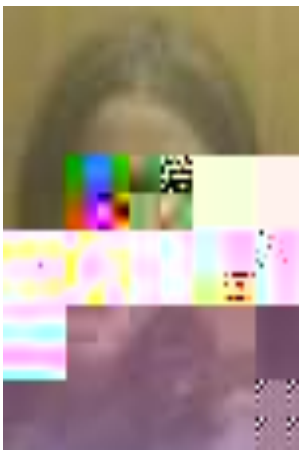
Purpose: This is a quick activity to do when introducing surface area-to-volume ratio in cells. The smaller the cell, the greater surface area-to-volume ratio it has. All substances that enter or leave a cell must cross the cell's surface. If the ratio is too low, substances can not enter and leave at a quick enough rate to meet the cell's needs. Therefore, it's important that the cell remains small so that the surface area-to-volume ratio is large enough for the cell to survive. The steel wool demonstrates this. Because it's much smaller than the rod, the flame is exposed to a larger surface area and is able to ignite it. The rod is much larger and therefore has a smaller surface area-to-volume ratio. The flame is exposed to a much smaller surface area and therefore is unable to ignite it.

#26. MAGIC MATCH

Materials: -Matches
-Matchbox

Procedure: First, explain that there is a difference between physical and chemical changes. The magic match can show both of these changes. Break the match in half. Explain why this is a physical change. Following the break, light the match. Explain why this is a chemical change.

Purpose:



4-6 mason jars, these must be transparent so the students can see what is happening

Procedure: 1. Chop up the head of red cabbage and let it soak, in a pot of hot water, for a couple of hours. (Probably ought to do this step before coming to class).

2.Pour the reddish purple soup into the mason jars.

3. Add basic or acidic substances to make the color of the "soup" change colors, red/pink for acidic substances and blue for basic items.

#28. SPREAD OF DISEASE

Scientific Principles: Disease spread, Acids and bases, Cleanliness, Health safety

Materials: Dixie Cups (one for each student)
Water
Ammonia and phenolphthalein (indicator)
or
Starch solution (water and cornstarch) and iodine (indicator)

Procedure: (There are two ways to do this depending upon the indicator)
Pair: "Ammonia with Phenolthaline" and "Starch with Iodine"

1. Fill all the cups with water.
2. Then depending upon the disease and its statistics (5 out of 100 people, etc.), add either the ammonia or the starch to the appropriate number of cups.
3. Have the students "share" cups by mixing the ingredients of thei

200 mL water
5 tablespoons corn starch
300 mL corn syrup
2 tablespoons cream or whole milk
5 tablespoons red food coloring
3-4 drops green food coloring

Mix water and corn starch thoroughly before adding remaining ingredients.

Demonstration by John Hoke
Biology Major

#30. Relating An Apple To The Livable Space for Terrestrial Organisms

Materials: Apple, Fruit peeler, Trash can

Procedure: 1) Assess prior knowledge by asking, "How much of the world is covered in water?"
2) Proceed to shave off two thirds of the apple leaving the remaining peel.
3) Grab a piece of the peel. Show To students and say this represents the relative thickness of the biosphere this apple.

This is a simple demonstration which can be used as an introduction to lecture on ecology.

#31. The Woozle

Purpose: Some time it is hard using inductive reasoning to discover simple meachanisms.

Materials:

Hollow cardboard Cylinder
String preferably something thick like yarn or hemp
A key ring (for smaller cylinders smaller key rings work better)