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

Materials:

3 eggs
3 - 400 mL beakers
225 mL water
225 mL of 3 M hydrochloric acid (You may substitute vinegar for the hydrochloric acid)
225 mL salt water (60 g of sodium chloride dissolved in 225 ml water)
Long pair of tongs or a spoon

Procedure: Fill three beakers with water, HCl, and salt water mixture. Ask the audience what will happen in each beaker. In the water it will sink, in the salt it will float (if not add more salt), and in the HCl it will swim. The HCl will dissolve the egg shell. Gas bubbles will form. This is carbon dioxide.

#3. ATMOSPHERIC PRESSURE

Directions:

1. Put two three holes (about the diameter of the lead in a pencil) on one side of a plastic pop bottle, one near the bottom, one about the middle of the bottle, and one near the top.
2. Put a piece of tape on each of the two holes.
3. Fill the bottle with water, you can dye the water in order to see it better.
4. Screw the cap back onto the bottle.

(During the demonstration)

5. Take the tape off the first hole closest to the bottom of the bottle. Observe what happens. (The water should not come out of the hole. Now unscrew the cap and the water should come out of the hole. Screw the cap back on again and the water should stop coming out again.
6. Uncover the next hole and then the next, observe what happens. The results may vary. Either nothing will come out of either hole or there will be bubbles of air going into the top hole and the water leaking out of the bottom.
7. Unscrew the cap, observe what happens to each of the holes. This time there will be water coming from all three holes. Which hole produces the stream of water that shoots out the furthest? The middle hole should have the water squirting out the furthest.

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 sinks and the other pieces of clay floats. The reason for this is that the total area of the object that makes contact with the water is large enough that the object floats due to the object displacing an equivalent amount of water as to its volume. The object is placing a downward force on the water, and the water is placing an upward force on the object. The amount of water displaced must be equivalent to the weight of the object. Since the ball doesn't have as much volume, then it doesn't displace enough water to stay afloat.

Demonstrations by William Berry
Biology (Post Bach.)

#5. RACING THE DINOSAURS: USING TRACKWAYS TO ESTIMATE VELOCITIES

Materials:

A Meter Stick
A Stop Watch

Procedure:

1. Have students walk (or run) down a length of track.
2. Calculate student velocities by using a stopwatch and by determining how long (in seconds) it takes a student to go the length of the track (velocity is in meters/second).
3. Use Alexander's equation:
   $V = 0.25(\text{avg. stride length})^{1.67}(\text{hip height})^{-1.17}(\text{gravitational constant})^{0.5}$
   to find the student's estimated velocity using their stride length (the average distance between two successive tracks made by the same foot), their hip height (from the floor to their acetabulum—i.e., top of their femur), and the gravitational constant ($9.8\ m/s^2$).

Since the velocity values found in (2) and (3) should be similar (in some replicates, I've found a Chi-Square Goodness-of-Fit of > 99% between Alexander's values and actual velocity values), discuss how Alexander's equation can be used to find the velocities of extinct animals from their trackways. Discuss how this relates to behavioral analyses of extinct animals.

Resources: Alexander, R. (1989) Dynamics of Dinosaurs and Other Extinct Giants. Columbia University Press, New York.
Rocky Mountain Dinosaur Resource Center (www.RMDRC.com)

#6. WEIGHING A DINOSAUR (OR OTHER VERTEBRATE) USING ONLY 1 OR 2 BONES

Materials:

Long Bones (Femur for Biped / Humerus + Femur for Quadruped)

Discussion:

As a science teacher, it is important to give students an appreciation for the antiquity of the Earth and its diversity. If the history of life on Earth were a best-selling novel, it would be a murder mystery. Paleontologists estimate that more than 99% of all species that have lived on the Earth are now extinct (Prothero, 1998). For vertebrates in particular, all that we usually find of these extinct organisms is one or two fragmented bones, and it can be very difficult to tell what extinct organism such bones came from, particularly if there are few if any diagnostic characteristics on the bone (e.g., skeletal synapomorphies, etc.). So, if we do find such a bone, what *can* it tell us?

Procedure:

1. It is a general rule of thumb (or toe) that the larger a vertebrate is the bulkier its bones must be to support its weight. In fact, the circumference of long bones relative to the mass of the animal follows a predictable, linear trend. Thus, the mass of an animal (in kg) can be found using the circumference (in mm) of its femur (C_f) and/or its humerus (C_h):

For quadrupeds:

$$\text{Mass in kg} = 8.4\text{x}10^{-5}(C_f + C_h)^{2.73}$$

For bipeds:

$$\text{Mass in kg} = 1.6\text{x}10^{-4}(C_f)^{2.73}$$

2. For my demonstration, I will be using a fossil bone fragment that I found in Southeastern Colorado. I will be seeking to answer the question: What is this bone from?
   (a) I found this fragment in fluvial (river) channel deposits dumped into the Western Interior Seaway (overlying and intergrading with the Pierre Shale). This suggests it was from a terrestrial rather than a marine animal, and its age is roughly 70 million years old (My). At this time and in this environment, the only creatures large enough to leave behind such a bone were, of course, the dinosaurs.
   (b) At the end of the Cretaceous 70 Mya, the most common dinosaurs were the hadrosaurs and their relatives ("duckbilled" dinosaurs), the ceratopsians (e.g., *Triceratops*), and the large carnivores (e.g., *Tyrannosaurus*). Is it possible to distinguish between these alternatives using only this bone fragment?
   (c) Given the bone's relative size and "bulk," it is clearly a fragment of a long bone. It is badly abraded (as expected from its depositional environment), but its relative size and shape is consistent with this hypothesis.
   (d) It is possible to distinguish between the alternative dinosaurs based on total body mass, but I must first decide whether this bone represents a quadruped or a biped.
   (e) Ceratopsians are unique in that they represent (in all of Earth's history) the animals with the largest heads. Because of this, they had particularly stout forelimbs that were slightly sprawled, and the circumference of the humerus and the femur are approximately equal. Thus, I can determine whether this bone is from a ceratopsid by using the equation

$$\text{Mass in kg} = 8.4\text{x}10^{-5}(2C_f)^{2.73}\ .$$

   (f) If my mass is reasonable (within the range of expected values for a ceratopsid dinosaur), then I can conclude that this bone may have been from a ceratopsid.
   (g) Here I run into a slight problem. I only have a fragment of the bone. I do, however, have an outer edge (arc) of the bone preserved. By picking two points along this arc and drawing two lines tangent to each of these points, I can find a line perpendicular to each of these tangent lines. Incidentally, where these perpendicular lines intersect is the radius of my bone. Or, alternatively, I can use the angle created by these intersecting lines and the arc length (distance between my two points along the arc) to solve for the radius (r) using the equation: Arc Length = $r\theta$ (where θ is in radians).
   (h) By using this radius (82.55 mm), I can find the circumference ($2\pi r$).
   (i) Plugging this into the equation given in Step (2e), I find my mass to be about 14.4 metric tons (to find metric tons, multiply kg by $1\text{x}10^{-3}$). This is much too massive to be a ceratopsid (ceratopsids are roughly 6 – 10 metric tons).
   (j) Since I have eliminated the hypothesis that this bone is from a quadruped, I now plug C_f into the biped equation. This is roughly 4.1 metric tons, the mass of a largish hadrosaur or a typical *Tyrannosaur*.

Resources: Alexander, R. (1989) Dynamics of Dinosaurs and Other Extinct Giants. Columbia University Press, New York.

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

Materials: Rubbing Alcohol- Evaporate
Chalk Dust- Condensation Nuclei
Glass Bottle (abput the size of a wine bottle
Air Pump with a Needle Through a cork or stopper

Procedure:

Place a small amount of alcohol in the bottom of the bottle and a little chalk dust in the bottle as well. Apply pressure to the bottle with the pump and increase the pressure and temperature inside the bottle. Once the cork is ready to pop off the top, take the cork and needle off and quickly place your thumb on top of the bottle to trap the cloud. The sudden decrease in pressure and temperature will cause the liquid to condense on the nuclei and form a cloud. Also, place the cork and needle back on top while the cloud is still visible and the increase of pressure and temperature will cause the cloud to dissipate.

Demonstration by Kathryn Dai
Earth Science Major

#8. THE ICE CUBE LIFTER!

The objective of this demo is to show that salt lowers the melting and freezing point of water.

Materials:

Ice cubes, a cup of cold water, a piece of yarn or thread and a salt shaker.

Procedure:

Place the ice cube in the cup of cold water and let it sit for a minute. Show the audience the salt and the thread and ask "How can I lift the ice cube out of the water using these two things without going under the ice and lifting it out? Place the yarn on top of the ice cube and sprinkle a good shake over the ice cube and string. Leave for a minute to two minutes and then lift the ice cube gently out of the water by the string.

Some questions to ask…

1. What does salting the roads in the winter time do to the snow and ice on the road?
2. What temperature does ice melt?
3. How does salt affect the melting point?
4. Where else in our lives do we find the use of salt to lower the freezing point of water?

Salt water has a lower melting or freezing point than fresh water. The addition of salt to the ice makes it melt where the salt hits it. Placing the string where the salt was sprinkled (on the melted part of the ice) sticks because the temperature above the ice cube is below 0 degrees C. When the salt dissolves more of the ice cube, the solution gets more dilute which will increase the freezing point slightly. As the water's temperature is increased and falls then below 0 degrees C it will freeze again. This attaches the string to the ice cube. When making homemade ice cream, crushed ice and salt are mixed in the ice cream maker to lower the temperature below the freezing point of water.

A real life application is obviously snow and ice removal on streets with salt and making ice cream at home.

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. THERE IS NO "SUCKING" IN SCIENCE!!!

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 and Protons are essential in the mastery of the concepts concerned with matter, and the elements that make up the matter.

Supplies

Balloon(s) minimum two

Light weight string

Method

1. Blow up both balloons and tie them
2. Tie the light weight string onto one of the balloons
3. Take the untied balloon and rub it on anything, cloths, walls, floor
4. Take and approach the untied balloon with the tied balloon, and if the charged are alike the balloon on the string will go away, and if the charges are opposite, the balloon on the string will be attracted to the untied balloon. (Generally a rubber balloon rubbed with a paper towel becomes + charged while an overhead acetate rubbed with a paper towel becomes – charged)

Demonstrations by Heather Parker
Biology Major

#13. MIRACLE THAW

Materials- Miracle Thaw or any cast iron pan

Many ice cubes

Procedure- Place ice cube on Miracle Thaw and at the same time place an ice cube on another surface close to the Miracle Thaw. Observe how quickly the ice melts on the Miracle Thaw compared to the other surface. Use many ice cubes to demonstrate that more than one cube can be melted quicker on the Miracle Thaw than on the other surface.

Why it works- The ice melts quicker on the Miracle Thaw because of conduction. Metals are great conductors because the metallic bonds have free-moving electrons and they form a crystalline structure, which aids in the transfer of the heat. Heat is always moving from areas of high temperature to areas of low temperature, which is why the ice cube melts. The surrounding temperature of air is higher than the metal which inturn is higher than the ice cube so the heat travels from the air, to the metal, to the melting the ice cube.

#14. WHY DO WE NEED TO TAKE CARE OF OUR SOIL?

Materials- One apple

A small knife

(Next items are

Soil medicine examples (antibacterial gel, facial masks)

Soil art examples (sand painting, pottery)

Soil building examples (red brick, adobe)

Makeup (foundation, blush)

Plant

Procedure- Take apple and explain that it is the earth. Ask how much of the earth is covered by water, cut apple in quarters and get rid of three quarters. That is the amount of water (oceans lakes and streams) that covers the earth (75%). Now show the one quarter piece and tell them that it represents the dry land. Cut this piece in half and throw it away. Tell them that this represents desert, polar or mountainous land which is not productive (too hot, too cold or too high). Cut 40% of the apple and tell them that this piece of dry land is limited by terrain, fertility, or lots of rainfall (too rocky, steep, shallow, poor or too wet to grow food). Tell them what is left is 10%. Peel the skin from this portion and pass it around. While passing it around explain that this is the soil we depend on for the world's food supply. Tell them that it has to compete with other needs (housing, cities, schools), and discuss ways in which we could help our problem of soil shortage.

Demonstrations by Andrew Huntsman
Physics Major

#15. LIVE WIRE OR MEMORY WIRE

Materials: Nitinol Wire (Available from Flinn Scientific Inc. ≈ $1.20/inch)
Pot of cold water
Pot of hot water

Procedure: -Place the wire in the pot of cold water and bend into any shape you wish.

-Place the bent wire into the Hot water pot and watch the wire go back to its original structure.

Explanation: The wire has a specific crystal structure of all of it molecules, and when the wire is heated the molecules can move easier into its original shape.

#16. SURFACE TENSION

Materials: Aluminum Coins (1 yen coins)
Bowl
Water
Paper clip

Procedure:Bend the paper clip in the middle so there is a ninety degree angle in it. Use the paper clip to slowly lower the coins (or other paper clips) onto the water. Watch the coins rest on the surface (they do not "float").

This is when I will ask the students some questions like: Why is the metal paper clip resting there? What mechanism is allowing this? After discussing the possibilities is when you place a single drop of dish soap into the water. Immediately the clip should sink because there is a distraction to the surface tension. This brings up another round of questions. Why does the soap cause the paper clip to sink? Could this be done with a larger object? What could a different object be?

Explanation:This demo will show students that surface tension exists. After explaining the properties of water molecules and their attraction to each other, we can prove that there is a layer on the surface that is almost skin- like. Adding something like dish soap disrupts this attraction and makes the clip sink. A real life example of a living organism that uses surface tension would be a Water Strider (little insects). This could be used in chemistry, biology and science in general.

Demonstrations by Paul Jaeger
Biology Major

#17. ENDOTHERMIC VS. EXOTHERMIC TEMPERATURES USING NON-CONTACT THERMOMETERS.

Materials: Madagascan Hissing Cockroach (Exothermic Specimen)
Human (Endothermic Specimen)
Non-Contact Thermometer (The one I used was obtained from Harbor Freight. Price about $20)

Procedure: This demo is a very good way to demonstrate, in tangible terms, that there is a difference between endothermic and exothermic organisms. I suggest using more than one species but for the time constraints of the event I chose only two. Organisms like reptiles, amphibians, and large arthropods are great examples of exotherms. (My pet cane toad for example worked great and didn’t mind being scanned) Any mammal or bird will work for an endothermic species. First, get a reading from the surrounding area, a table works fine and record the reading, this will be your ambient temperature. Next take your friendly little roach and take his temperature, it should be very close but slightly above room temperature. Then scan the mammal, its temperature should be considerably above room temperature and the exotherm test subject. My results were as follows: Ambient 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.

#20. WHAT'S A SELECTIVELY PERMEABLE MEMBRANE AND HOW DOES IT WORK?

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 based on the fact that there is a high concentration inside, and a low concentration outside, the gaseous molecules of the extract are able to diffuse through the microscopic holes in the balloon, until it reaches equilibrium. So why is the smell getting through the balloon, but the balloon is still inflated (the air can't get through)? This is how the model demonstrates selective permeability. The molecules of the extract can move through the balloon's microscopic holes, because they are much smaller than the air molecules that are keeping the balloon inflated, just like certain molecules can get through the membrane of a cell, but others cannot.

Demonstrations by Katherine (Mariko) Ryer
Earth Science Major

#21. MICROBURST

Materials: Blue food coloring, bluing
Clear plastic container shoebox size
A small container for blue water

Procedure – Fill shoe box half full of room temp water. In small container (Styrofoam cup or film canister) Add colored water with ice. Cup or container will have a hole in the bottom to release the blue water into the shoebox. The resulting cold water into the warm water will represent a microburst (cold dense air).

Acknowledgement for idea from Meg Jacobson, Windsor H.S.

#22. CANDY TECTONICS

Material Handout
Candy bar – dark milky way works best

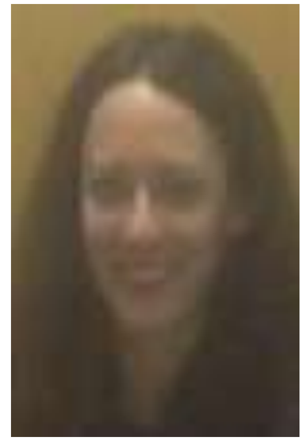
Procedure – hand out candy…..

- First begin by pushing up the middle of the candy this represents uplift in the embryonic stage.
- Slowly pull the bar apart, this shows divergence in the juvenile stage
- Continue to pull the bar apart to show the mature stage
- Begin to push the bar together, this shows convergence in the declining stage
- Continue to push the bar together you have convergence and uplift, showing the terminal stage.
- Last the bar is getting pushed totally together showing the suturing, with convergence and uplift.

Acknowledgement for idea from Dr. Hoyt, UNC.

<u>**Demonstration by Shannon Winter**</u>
<u>**Biology Major**</u>

#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
Have "sex" w/ 2 persons
Have "sex" w/ only 1 person
Do NOT have "sex" w/ anyone

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: This is another quick engagement activity to introduce the difference between physical and chemical changes. It can also be implemented in an earth science course explaining the difference between mechanical and chemical weathering. When the match is broken, its physical properties changes, but its chemical properties remain the same. After the sulfur on the match is ignited with help of potassium chlorate (oxygen), the wood is burned and undergoes a chemical change. The match is now a different substance.

Demonstrations by Whitney Kastner
Biology Major

#27. ACIDS AND BASES

Scientific Principles: Acids and Bases, pH

Materials: Head of Red Cabbage (chopped)
Various acidic and basic solutions
Examples:
Milk of Magnesia
Lemon juice
Distilled water
Baking soda
Milk
Orange juice
Let the kids choose some too!

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 their cup with one other person.
4. Repeat step 3 up to four times.
5. Then as the teacher come around with the "magic" solution, the indicator, and put a couple of drops into each cup.
6. If the student has contracted the disease their water should change colors, pink for ammonia and black for iodine.
7. I would recommend the starch and iodine pair, because ammonia has a smell to it, and the students are not dumb they will figure it out.

<u>Demonstration by Rob Liebman</u>
<u>Biology Major</u>

#29 BLOOD SPATTER

Materials: poster board
simulated blood (one recipe to follow)
markers
meter stick
ruler
calculators

Procedure: After teacher preps simulated blood, the students will separate their poster boards into sections containing elevation from which blood is dropped and a section for low angle impact. The simple way to reenact low angle impact, tilt the poster board to approximately 30 degrees and drop blood on to it rather than trying to fling blood at an angle onto board. After doing angled impact students can then drop blood from predetermined heights onto their respective sections. Suggested heights would include 0.5m – 1.0m – and maybe one more substantial height. At the bottom of the board leave a section for calculations. Students will measure length and width of angled spatter and perform calculation that follows. They will also measure diameter of regular impact and calculate average diameter for each height to compare effects of gravity on blood drop diameters.

Calculations:

For low angle impact trigonometry will be used.

sin (impact angle) = width/length
inverse sin (width/length) = angle of impact

Blood Recipe:

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

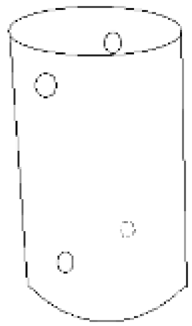
Purpose: Some time it is hard using inductive reasoning to discover simple meachanisms.

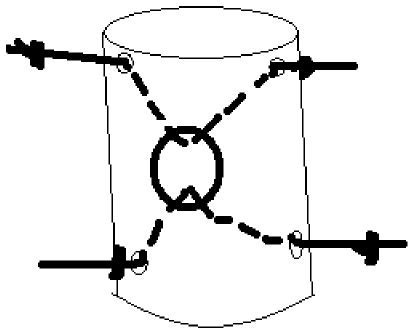
Materials:

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

Make a Woozle:

1) Poke 4 holes in cylinder [see below]





2) Cut string into two equal lengths approx. 4" longer than the diameter of the cylinder, thread string through the key ring.
3) Tread string through the holes in the cylinder. Tie knots at each end so that sting can slide entirely through but can move back and forth. [See below]
4) Seal both ends of the cylinder. Have students in groups try to figure out the mechanism behind this remarkable contraption.