Please arrive early.
Start seating at least 15 minutes before the show starts.

Let's Go Science Show
Study Materials for Grades K-3

www.letsgoscienceshow.com

The Let's Go Science Show Goals:
Have fun learning about science.
Increase your students' science vocabulary.
Learn several physics concepts.
Introduce the concept of the scientific method.
Encourage kids to study science.

FOR THE TEACHER

BEFORE THE SHOW

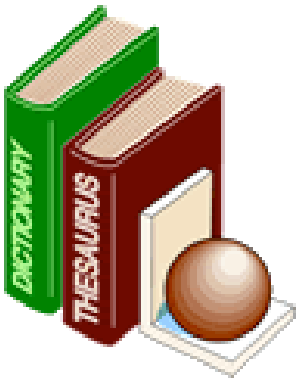
- Introduce the following science vocabulary words (50 minutes).
- Name tags are a great help to Professor Smart and Dr. Knowitall.
- Please remind students about good audience behavior;
  no talking to their neighbors, hands to themselves, and participate
- Have fun discovering how things work and get ready for a great show!

ENJOY THE SHOW!

AFTER THE SHOW

- Review Vocabulary. Ask students which words relate to each demonstration.
- Review science demos with class and have them pick 3 to do.
- Point your students to following websites & books then have them report back to their classmates.
- Evaluate the science show and turn in the attached form to the office.

TABLE OF CONTENTS



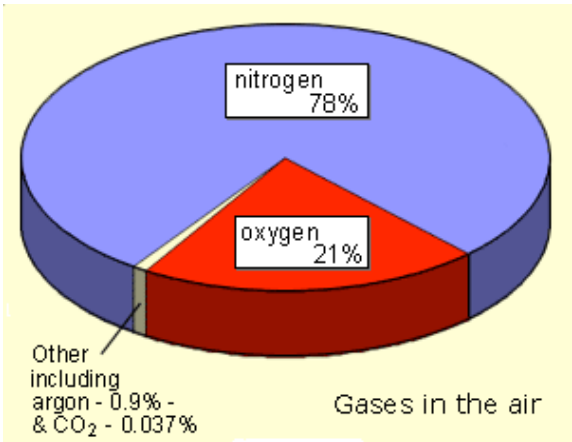
VOCABULARY

(50 Minutes)

Air: A gas that blankets the earth, made up mostly of nitrogen and oxygen.
Example: We breathe the air's oxygen to stay alive. Did you know that oxygen is everywhere inside our bodies (65% of a bodies elements)?

Atmosphere: The layer of gases that blanket the earth.

Example: The earth's atmosphere is made up of 78% nitrogen, 21% oxygen, and 1% argon, carbon dioxide, and other trace gases.



Attraction: To pull someone or something closer.
Example: A magnet is attracted to objects with iron in them.

Balance: The point where two things are equal in weight or force.
Example: Two teams pulling on a rope with equal force.

Demonstrate: To show something and explain how it works.

Electricity: Electricity is the flow of electrical power.
Example: Lights are powered by electricity. The computers, printers, and video games in your houses use a lot of the electricity in your home (13%).

Energy: The ability to do work or give power.
Example: We use energy to light our houses and cook our food.

Experiment: A test done to learn whether something works or if it is true.

Force: A push or pull that can move an object.
Example: Jet engines use force to move airplanes through the sky.

Gas: A thing that does not have a definite shape or size all on its own.
Examples: Air and helium. When air or helium leaves a balloon, it has no shape or size. Did you know that a cup of helium is lighter then a cup of air? That is why a balloon filled with helium floats in air.

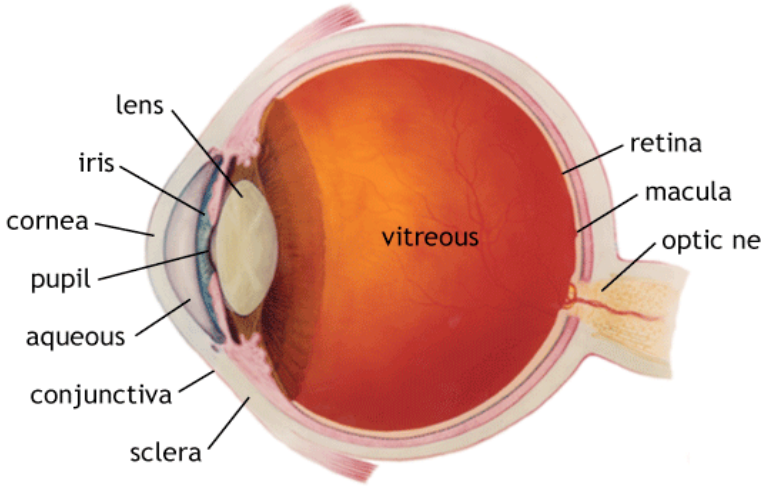
Gravity: A force that attracts objects to one another.
Example: Gravity holds everything to the earth by attraction. Without gravity, everything would float away.

Hypothesis: An explanation for something that has not yet been proven.
Example: A guess as to why or how something happens.

Imagination: The ability to form mental images, or the ability to see things within your own mind.

Invent: To make or create something that no one else has.
Example: To create the first cell phone.

Inventor: A person who has invented something that no one else has.
Example: Thomas Edison invented the light bulbs that we use in our houses.

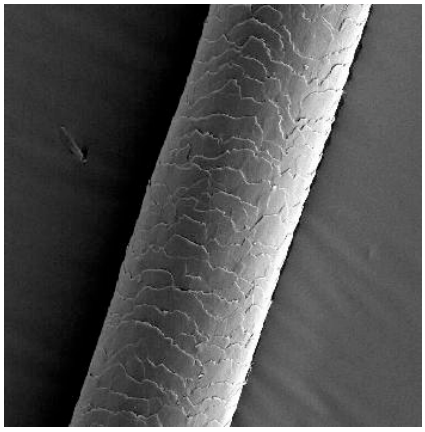


Lens: A piece of glass or something see-through with curved sides that can bend or focus light.
Examples: A magnifying glass, microscope, or binoculars. Also, the part of the eye that focuses light so you can see.

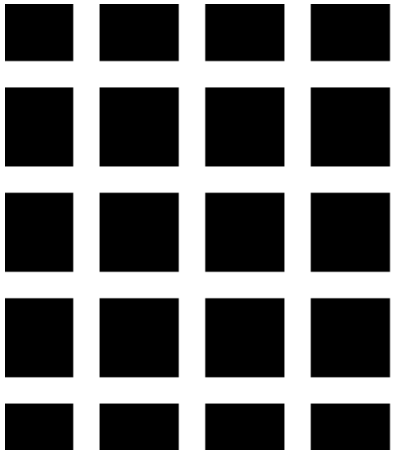
Lever: A simple machine consisting of a solid material that rocks on a fixed point and is used to move an object or thing.
Examples: A teeter-totter. The great pyramid of Giza was built 4000 years ago. It was over 50 stories tall. Levers were used to lift the huge stone blocks. Some blocks weighed 160,000 pounds. That's more weight than 50 cars!

Lift: To raise something up.
Example: The Liebherr LTM 11200-9.1 crane can lift heavy objects 300 feet in the air. That is taller then a 30 story building!

Liquid: Something that has a definite volume but not a definite shape.
Example: Water, milk, and oil are examples of liquids. They spread to fit whatever holds them. Did you know that the earth has over 326 million trillion (326,000,000,000,000,000,000) gallons of water on it?



Microscope: A machine that uses lenses to make small objects look bigger.
Example: This is how a human hair would look under a microscope.



Optical Illusion: Something you think you see, but you really don't.
Example: Look at the image below. Dark patches appear where the white lines meet, except the ones that you are directly looking at. Cover up some of the black patches and the dark patches disappear.

http://www.eyetricks.com/illusions.htm
http://www.exploratorium.edu/exhibits/f_exhibits.html
http://www.echalk.co.uk/amusements/OpticalIllusions/illusions.htm

Physics: The study of objects (or matter) and energy and how they act with each other.

Pressure: The force used when something pushes against something else.
Example: Steam engines use the pressure from boiling water to produce energy that can move objects.

Repel: To push someone or something away.
Example: Skunks repel animals by spraying a foul odor from scent glands in their bodies. This keeps them from getting eaten by larger animals. Also, magnets either repel or attract each other depending on how they are turned.

Research: To study or investigate to find out facts and learn new things.
Example: Medical scientists are studying and researching cures for cancer with the hope that someday lives will be saved.

Scientist: A person who studies science.
Example: Albert Einstein, Benjamin Franklin, Aristotle, Galileo, Benjamin Banneker, and Marie Currie are all famous scientists. Their studies and discoveries are still considered the basis of modern science.
Here are some websites of women in science:

www.iwaswondering.org
www.women-inventors.com
www.astronautix.com/articles/womspace.htm

Skills: Having the ability or expertise to do something well.
Example: Tiger Woods has excellent golfing skills.

Solid: Something that has a definite shape and a definite volume.
Example: Metal, wood, and rocks are examples of solids.

Static: When something is motionless or does not change.
Example: When you pause a movie the image remains static on the screen.
Static Electricity: The electrical charge that collects on the surface of something.
Example: When you rub a balloon on your hair the electrons that are on your hair jump to the balloon and stick, making your hair stand on end.

Submarine: A ship designed to operate under the sea for a long period of time.
Example: U.S. Navy submarines can go deeper than 800 feet and can travel almost 30 miles per hour.

Suspend: To hang an object or thing.
Example: A suspension bridge hangs the road from huge cables that go from one end of the bridge to the other. The Golden Gate Bridge in San Francisco is a suspension bridge.

Theory: An explanation of how things work that is proved by science.
Example: Sir Isaac Newton came up with a theory of how gravity works.

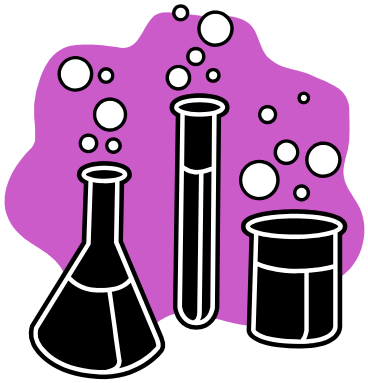
Weight: The measure of the force that the earth has on something.
Example: The scale in your bathroom measures the force of the earth's gravity on your body. Gravity that pulls you to the earth gives you your weight.

Wings: The part of an object used for flying.
Example: Insects flap their wings to fly. Mosquitoes beat their wings 450 to 600 times per second to stay in the air. Aircraft wings have air pushed over and under them by propellers and jet engines that give the aircraft lift.

Do something fun. Students, teacher write a letter to Professor Smart and Dr. Knowitall! Ask them a question, tell them what about your favorite part of the show.

Jest In Time Educational Programs
115 Coronation Dr.
Santa Rosa, CA 95401
ps@professorsmart.info

They will write you back!



IN-CLASS SCIENCE DEMOS

 # 1 - SOLID, LIQUID, OR GAS? (20 minutes)
Description: Students learn how to identify objects as either a Solid, Liquid and Gas.
Materials: balloon full of air, wooden block, a cup of water (or even better, water in a ziploc bag)
Procedure:
1. Write on the chalkboard the properties of solids, liquids and gases. Example:

Solid	Liquid	Gas
Feels hard	Can you feel it	Can't see it
Shape stays the same	Moves easily	Moves easily
Doesn't float away	Changes shape	Can't feel it

2. Have the students determine which category the block, water, and air inside the balloon would fit under.
3. Looking around the room, find other things to classify into solids, liquids, or gas.

Discussion:
1. Can an object change from a solid to a liquid to a gas? Name an object that can do this. Why do you think this happens?
2. Is sand a liquid because you can pour it? Or is sand a solid because it is made of solid pieces?

#2 - DOES AIR HAVE MASS? (30 minutes)
Description: Discover the properties of air using balloons and a yardstick!
Materials: 1 yardstick, 2 balloons, tape, string
Procedure:
1. Inflate the balloons to equal size. Tie and knot securely.
2. Tape the balloons by the knot, to each end of the yardstick.
3. Locate the point on the yardstick where the two balloons balance. Wrap string two or three times around this point and tape.
4. Have a student balance the yardstick by suspending it out in front of them.
5. Have students predict what will happen if the air in one balloon is released.

Discussion:
1. Before puncturing the balloon ask the class the following questions:
2. Is there something inside the balloon? (Yes) What? (Air)
3. Does air take up space? (Yes)

Procedure:
1. Have a student stick a pin into one balloon at its base so the air escapes slowly.
2. Have students describe their observations.

Discussion:
1. After puncturing the balloon ask the class the following questions:
2. Why is one end of the yardstick lower? (One balloon has less air in it.)

#3 - BENDING WATER WITH A COMB (15 minutes)
Description: Is it possible to bend water using only a hair comb? Try this experiment and see the effects of static electricity on water!
Materials: 1 plastic comb or balloon, sink with a water faucet
Procedure:
1. Turn on the faucet so that the water runs out in a small steady stream.
2. Run the comb through long dry hair several times. If using a balloon, rub the balloon against long dry hair for 30-40 seconds.
3. Slowly move the comb or balloon toward the stream of water. As you get closer, the stream the water will bend toward the comb or balloon.

Discussion:
Water has a neutral charge. The water is attracted to the comb (or balloon) which has a positive electrical charge, which makes the water bend toward the comb (or balloon)

#4 - SOLAR AIR BAG (40 minutes)
Description: As the temperature of air changes, watch as its properties change.
Materials: solar air bag (or lightweight large black trash bags), kite string
The Solar Air Bag can be can be purchased for $17.95 at:
http://www.google.com/products?hl=en&resnum=0&q=Solar+Air+Bag&um=1&ie=UTF-8
Procedure:
1. Unfold the bag and have students run with the opening of the bag facing forward so that the bag fills with air.
2. Once filled with air, tie the end of the bag so the air cannot escape.
3. Tie kite string to the end of the bag and put it in the warm sun.
4. Watch the bag slowly rise and float in the air like a balloon.

Discussion:
The black color of the bag absorbs the energy from the sun and heats the air inside the bag. As the air in the bag heats, it expands and becomes less dense then the cooler air outside the bag. Once the air trapped inside the bag heats up, it acts as a hot air balloon and floats!

#5 - MENTOS® AND DIET COKE® (30 minutes)

Description: Discover how potential (stored) energy in Diet Coke is transformed into kinetic energy using Mentos mints.

Materials: 2-liter bottle of diet coke, pack of Mentos mints (soft or hard can be used), two pieces of paper

Procedure:

1. Take one piece of paper and make a roll. The roll should be small enough to fit in the mouth of the Diet Coke bottle, but big enough for the Mentos to pass through.
2. Fold the other piece of paper into fourths.
3. Place the bottle of Diet Coke in an open area outside
4. Carefully open the bottle of Diet Coke.
5. Place the piece of paper folded in fourths over the open mouth of the Diet Coke bottle.
6. Position the roll on top of the folded paper.
7. Drop the whole roll of loose Mentos into the paper roll.
8. Slide the folded piece of paper allowing the Mentos to be dropped into the Diet Coke, all at the same time and then STAND BACK quickly!

Discussion:

Is this reaction physical or chemical? It could be a combination of both, but most scientists are saying that the reaction is physical due to something called nucleation sites. A nucleation site is simply a place where a gas is able form a bubble. Diet Coke is pumped full of CO_2 gas to make it fizzy. When the CO_2 is mixed with the water or the liquid in Diet Coke it becomes stable because there are no nucleation sites on the liquid. When you drop the Mentos into the Diet Coke you are providing the CO_2 with thousands of nucleation sites to form bubbles that rise and cause the explosion. Why? Because the surface of a Mentos is made up of lots of pits and microscopic nooks and crannies, all of which act as nucleation sites for the CO_2 to form bubbles. The more Mentos you use, the more nucleation sites available for the CO_2 to form bubbles; therefore, the bigger the explosion. See: http://www.youtube.com/watch?v=kMXPOqovSBs

You can also look at it this way. When the CO_2 is in the bottle with the coke, it is has the characteristics of potential (or stored energy). Dropping the Mentos in the Diet Coke causes the energy state of the CO_2 to change from potential energy to kinetic (active) energy resulting in the explosion.

#6 - MAGIC BOTTLE (30 minutes)

Description: Discover how air pressure can control the flow of water through a hole in a bottle.

Materials: 2-liter soda bottle-empty, small nail or straight pin, pliers, water

Procedure:

1. Fill the bottle with water and screw the cap on tightly.
2. Using the pliers and the small nail or pin, make a hole about halfway down on the side of bottle. Plug the hole with your finger.
3. Hold the bottle over a sink and remove your finger. What happens?
4. Still holding the bottle over the sink, unscrew the cap. What happens?
5. Tighten the cap again. What happens?

Discussion:

When the cap is tight and does not let air in the bottle, water will initially flow from the hole until the air pressure and weight of the water inside the bottle have the same force as the air pressure outside of the bottle. The water will then stop flowing. When you squeeze the bottle, the pressure inside the bottle increases and becomes greater then the pressure outside the bottle, so water flows out of the hole. Likewise, if you remove the cap from the bottle, air enters the bottle. Then the weight of the water and the air pressure inside the bottle is greater than the air pressure outside of the bottle. The water will flow easily through the hole.

#7 - REACTION TIME (20 minutes)

Description: How good is your reaction time?

Materials: yard stick, two people, piece of paper, pen

Procedure:

1. One person holds the yard stick upright from the end with the highest numbers.
2. The second person places their hand at the below of the yardstick, with their forefinger on one side and thumb on the other, but not touching the yardstick.
3. At an unexpected moment, the person holding the yardstick drops it. Try not to anticipate when the yardstick will fall.
4. On a piece of paper note the measurement where the yardstick was caught (reaction time).
5. Repeat steps 2-4 ten more times, trying to catch the yardstick quicker and quicker. Remember, the point of this experiment is to test your reaction time. Try not to anticipate when the yardstick will be dropped, this will skew the results.
6. Switch places with your partner and repeat steps 1-5.

Discussion:

This experiment tests your reaction time, the lower the inches on the yard stick, the faster your reaction time. Reaction time is the time it takes for you to see, hear, or feel something and for you to respond physically to it. In this experiment, you see the yardstick fall then you grab it with your thumb and forefinger. The time it takes for you to catch the yardstick is your "reaction time". Look at the reaction time measurements you recorded. Are all ten of your reaction times similar? Different? What do you think makes them the same or different? What do you think would cause someone's reaction time to be faster than someone else's?

Reading List

101 Physics Tricks
Cash, Terry 530.078

Fascinating Experiments in Physics
Cherrier, Francois 530

Physics Lab in the Home
Friedhoffer, Robert 621

Science Lab in a Supermarket
Friedhoffer, Robert 540.78

Famous Experiments You Can Do
Gardner, Robert 530

Measuring Weight and Time
King, Andrew 530.8

Science School
Manning, Mick 530.078

A Physics Lab of Your Own
Mark, Steven 530

Adventures With a Cardboard Tube
Milgram, Harry 500

Have a Ball
Stone, A Harris 530

The Heat's On
Stone, A. Harris 536

Science on a Shoestring
Strongin, Herb 372.35

Be a Kid Scientist
Wellnitz, William 530.078

Way Cool Web Sites

Unboxing Scientists of the World
www.unboxingscientists.com
Video biographies of 55 world changing scientists with Professor Smart

University of Maryland
http://www.physics.umd.edu/deptinfo/facilities/lecdem/services/demos/mainindex.htm
The BEST index of hundreds of science demonstrations with pictures and brief explanations.

Brain Pop
http://www.brainpop.com/
BrainPOP is an educational web site with Flash-based movies about mathematics, technology, health science, and social studies.

NASA Kids Club Page
http://www.nasa.gov/audience/forstudents/k-4/index.html
NASA-(National Aeronautics and Space Administration) website just for kids.

Science Monster.com
http://sciencemonster.com
Free online Science games and puzzles.

The Science Explorer
http:www.exploratorium.edu/science _explorer/
Many easy to do experiments, from creating volcanoes to tiny sparks.

Let's Go Science Show
http://www.letsgoscienceshow.com
Professor Smart's and Ms. Knowitall's home page.

The Let's Go Science Show Evaluation Sheet

Your chance to grade the Professor and Dr. Knowitall:

School name:_____ Time of Show:_____ Grade:_____

1= Poor 5= Average 10 =Outstanding

1) Did you and your students enjoy the show?

1 2 3 4 5 6 7 8 9 10

2) Were there direct correlations between your school's science curriculum and the subjects covered in the show?

1 2 3 4 5 6 7 8 9 10

3) Could you and your students see and hear the show clearly?

1 2 3 4 5 6 7 8 9 10

4) Was the material presented in a clear and understandable manner?

1 2 3 4 5 6 7 8 9 10

5) Was the show age appropriate?

1 2 3 4 5 6 7 8 9 10

6) Were the study materials helpful?

1 2 3 4 5 6 7 8 9 10

7) Was the vocabulary used during the show grade level appropriate?

1 2 3 4 5 6 7 8 9 10

8) How many hours a week do you spend on science in your class?

0 1 2 3 4 5 6 7 8 9 10

9) Is there anything that you think the show could add?

_____

_____

10) Was there anything the show could have left out?

_____

_____

Additional Comments:_____

_____

_____

Please return to your school office secretary.

Please mail to:

Jest In Time Educational Programs
115 Coronation Dr.
Santa Rosa, CA 95401

For Information: (800) 829-9360 or todd@jestintime.com