Please start seating 5 minutes before the start of the show!

Big Energy Show
Study Materials for Grades K-3

www.letsgoscienceshow.com

The Big Energy 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 (40 minutes).
- Name tags are a great help to Professor Smart and Ms. Knowitall (if possible).
- 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 the 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

(40 Minutes)

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

Demonstrate: To show something and explain how it works.

Electricity: Electricity is the flow of electrical power.
Example: Lights are powered by electricity. 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: There are many types of energy that we use in our everyday lives. We use energy to light our houses and cook our food. Energy can be made from burning gasoline, coal or natural gas to make heat or electricity. In the United States we use 1/3 of our energy for factories, $\frac{1}{4}$ for transportation and the rest for our homes and our factories.

Experiment: A test done to learn whether something works or if it is true.
Example: A race between two runners is an experiment to see which one can run faster.

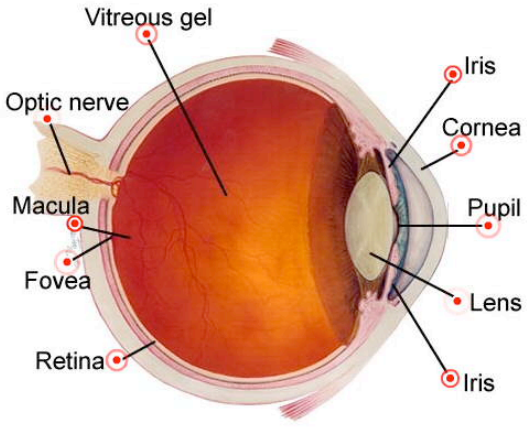
Gas: A thing that does not have a definite shape or size all on its own.
Examples: Air and helium. When air or helium leaves a balloon, it has no shape or size. Did you know that a cup of helium is lighter then a cup of air? That is why a balloon filled with helium floats in air.

Imagination: The ability to form mental images or 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.

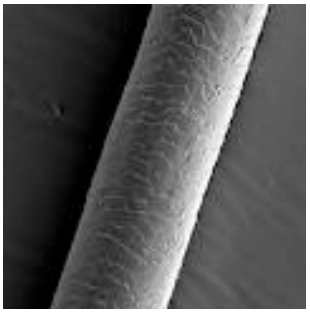
Lens: A piece of glass or something see-through with curved sides that can bend or focus light.
Examples: A magnifying glass, microscope, and binoculars. Also, the part of the eye that focuses light so you can see.



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!

Magnetic: Having the properties of a magnet.
Example: Magnets have 2 ends that are called poles, one attracts iron and one one pushes iron away. The Earth is magnetic. It has two magnetic poles, one near the north pole and the other near the south pole. The Earth's magnetic field, called the magnetosphere, can be felt far into space.

Microscope: A machine that uses lenses to make small objects look big.
Example: This is how a human hair looks using a microscope.



Physics: The study of objects (matter) and of 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.

Properties: A quality or description of an item or thing.
Example: Gold is shiny and has a golden, butter yellow, metallic color.

Quantify: To measure the size or amount of something or the amount of an activity.
Example: You can quantify and compare two things by measuring their temperature, speed, and size.

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 some day lives will be saved.

Scientist: A person who studies science.
Examples: 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

Screw: A rod usually made of steel that has an inclined (slanted) plane wrapped around it.

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

Solar: Relating or referring to the sun.
Example: The Sun is a star that is at the center of our solar system. The Sun is about 864,000 miles across (1,390,000 kilometers), about 109 times the wider than the Earth.

Solar Energy: Energy coming from the Sun in the form heat and light.
Example: The Sun has a temperature of about 5,500 degrees C (10,000 degrees F). We are learning how to use solar energy that the sun produces instead of using oil, gas and coal to produce electricity to light homes and heat water.

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

State: A physical condition that describes an object.
Examples: Words like solid, liquid, and gas can be used to describe the state of an object.

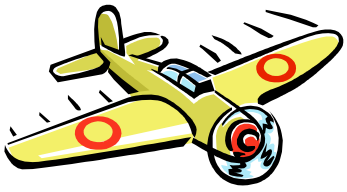
Static: When something is motionless or does not change.
Example: When you pause a movie the image remains static on the screen.

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.

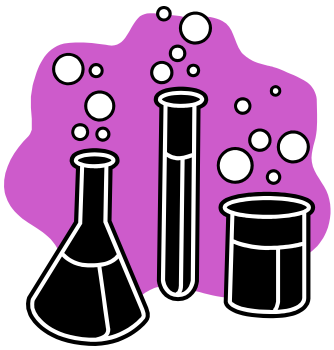
Waves: The pattern that some types of energy use to travel.
Examples: Sound, heat & light travel in waves. Visible light waves are waves we can see. We see these waves as the colors of the rainbow. Each color has a different wavelength. Red has the longest wavelength and violet has the shortest wavelength. When all the waves are seen together, they make white light. Other examples of waves include sound waves, ocean waves, and waving "hi" to your friends.

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. Airplane wings have air rushing over and under them when their propellers and jet engines move them forward. The air pressure that rushes under the wings lifts the plane up into the air.



In Class Science Demos



#1 - BOUNCING BALLS (20 minutes)

Description: Learn about energy transfer by bouncing two balls together.

Materials:

- -1 Large Ball (Basket Ball, Soccer Ball, Volley Ball…)
- -1 Small Ball (Baseball, Rubber Ball)
- -6' Step Ladder
- -Room With a High Ceiling (outside is even better!)

Procedure:

1. Climb the ladder. Drop balls, one at a time, from a consistent height of 6'. Measure the height of the first bounce of each ball.
2. Stack the two balls with the small ball on top of the large ball.
3. Drop the balls together. What happens?

Discussion:

When you drop the two balls together, the larger ball hits the ground first. It bounces off the ground and into the smaller ball that is still dropping to the ground. The larger ball hits the small ball and the energy from the larger ball is transferred to the smaller ball sending it flying through the air!

#2 - ROOT BEER FLOAT (15 minutes)

Description: Watch as two items that look and feel the same react differently when submerged in water.

Materials:

- -Can of Root Beer
- -Can of Diet Root Beer
- -A Deep Sink or Container Full of Water

Procedure:

1. Pick up the two cans, one in each hand. Do they feel the same? Is one heavier then the other?
2. Now put the cans in the water. What happens?

Discussion:

Even though the cans are the same size and volume, one floats. Why? The densities of the cans are different. One is not as dense as the other. There is the same amount of liquid and bubbles inside of each can so why does one sink and not the other? The difference in the density is from the different sweeteners used in the sodas. The sugar in the regular root beer makes it more dense (heavier) then the sugar substitute in the diet root beer. Therefore, the diet root beer floats while the regular root beer sinks.

#3 - FLOATING EGGS (30 minutes)

Description: Discover how water density affects whether items will float or sink.

Materials:

- 1 Clear Plastic Cup
- 1 lb Salt
- 1 Egg
- Teaspoon for Measuring
- Tap Water

Procedure:

1. Fill the plastic cup 2/3 full of water.
2. Place the egg into the water. What happens?
3. Carefully measure two teaspoons of salt into the water and stir gently around the egg. Does the position of the egg change when the salt is added?
5. Keep adding salt, two teaspoons at a time and stirring and watch what happens.

Discussion:

Salt water is denser than fresh water. When water becomes salty enough, the egg weighs less than the water, so the egg floats to the top!

#4 - BALLOON ROCKET (40 minutes)

Description: Make a balloon rocket and witness Newton's Third Law of Motion in action.

Materials:

- Balloon (longer oblong style works best)
- Kite String
- Straw
- Tape

Procedure:

1. Tie one end of the kite string to a chair, door-knob, or other supported object.
2. Thread the other end of the string through the straw.
3. Pull the string across the room. Make sure it is tight and tie it to another support in the room.
4. Blow up the balloon. Pinch the end of the balloon (but don't tie it) so that the air does not escape.
5. Tape the balloon to the straw. Tape in two places so that the straw and balloon are parallel.
6. Let go of the end of the balloon and watch it fly!

Discussion:

The balloon, which is made of an elastic material, presses on the air in the balloon. The the air in the balloon has higher pressure than the air in the room. When the mouth of the balloon is held closed, the air has nowhere to go, so it stays in the balloon. When you let go of the balloon the air has somewhere to go. Out! Since the air is now moving rapidly out of the balloon, it creates a thrust or push, which pushes the rocket balloon on the string. This is a demonstration of Newton's Third Law of Motion- "for every action there is an equal and opposite reaction". The "action" is the air flowing out of the balloon. The "reaction" is the balloon flying across the room like a rocket.

#5 - THE SHEET AND THE EGG (40 minutes)

Description: Can you break an egg by throwing it at a sheet?

Materials:

- -1 Raw Egg
- -1 Bed Sheet
- -Eye Protection

Procedure:

1. Have two students wearing eye protection hold up a sheet between them. The sheet should not be quite taut and the students should hold the sheet at the top and the bottom making it in the shape of a "j" so that the egg will have a soft place to fall into. The sheet should not touch the ground.
2. Give each student a turn to throw the egg at the sheet and try to break it. (For younger grades, the teacher can throw the egg.) Can anyone make the egg break?
3. Crack the egg into the sink or garbage can to prove that it was raw and not hard-boiled.

Discussion:

Why doesn't the egg break? When the egg hits the sheet, the sheet "gives" changing the force needed to stop the egg by increasing the contact time and the distance needed to stop the egg. Also, the force on the egg is spread over the entire shell, not just one point, as the sheet absorbs and cushions the impact. This is also how the air bags in your car work to help prevent serious injury when an accident occurs.

#6 - GOOD VIBRATIONS (30 minutes)

Description: Explore the way sound moves and how it affects what sounds we hear.

Materials:

- -Roll of String
- -Table
- -Rubber Band
- -Spoon

Procedure:

1. Cut a 2-foot piece of string from the roll of string.
2. Using the rubber band, attach the spoon to the middle of the string.
3. Wrap each end of the string around the index fingers on both of your hands.
4. Swing the spoon so that it hits the edge of the table. How does it sound?
5. Now, with the string still around your fingers, put your fingers into your ears.
6. Swing the spoon so that it hits the edge of the table. What does it sound like?

Discussion:

Tapping the spoon on the table creates sound waves. The sound waves travel on the string that you attached to the spoon. When the string is in your hands, and not in your ears, the sound waves travel through the air and into your ears. Placing your fingers in your ears allows the sound waves to travel up the string and directly into your ears so the sound you hear is louder.

#7 - SOUND VIBRATIONS (30 minutes)

Description: Make a homemade kazoo and learn how vibrations change your voice.

Materials:

- -Empty Toilet Paper Roll
- -Wax Paper
- -Rubber Band

Procedure:

1. Cut a piece wax paper large enough to fit over the end of the toilet paper roll.
2. Secure the wax paper on one end of the toilet paper roll using the rubber band.
3. Hum a tune using a normal voice, without the kazoo.
4. Now hum a tune using the same voice, but hold the open end of the kazoo to your mouth. What happens?

Discussion:

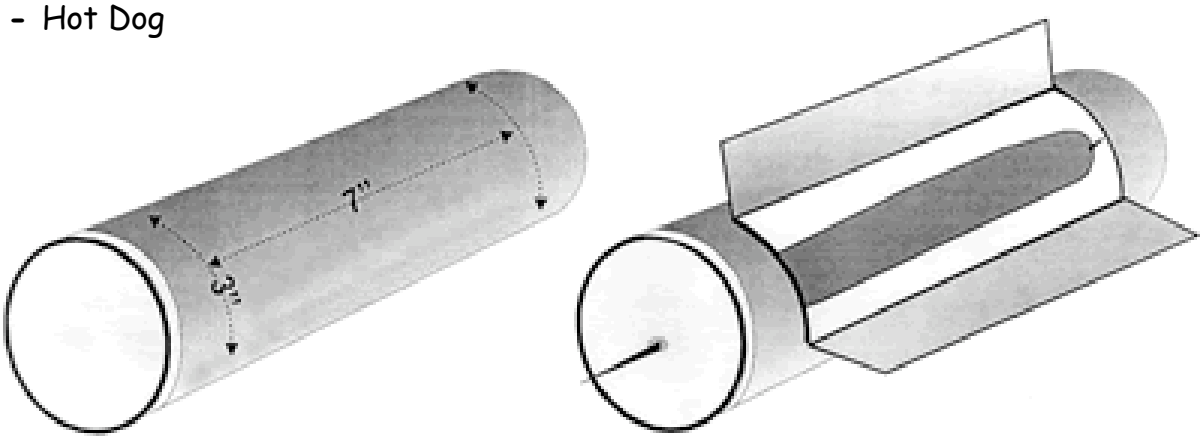
The sound of your voice gets louder when you hum into the kazoo because the kazoo vibrates the sound of your voice. As your voice travels down the toilet paper roll and reaches the wax paper, the wax paper vibrates the different tones of the tune you are humming, making your voice louder. Not all of the tones are amplified at the same time, so the kazoo actually changes how your voice sounds. Sound waves travel across the air into our ears.

#8 - PRINGLE® CAN SOLAR HOT DOG COOKER (90-120 minutes)

Description: Make your own hot dog cooker using solar energy from the sun.

Materials:

- Pringles Can (you can also use a cardboard box lined with aluminum foil), see:http://www.energyquest.ca.gov/projects/solardogs.html
- Tape
- Wooden Skewer (about 12" long)
- Transparency Film
- Scissors, or Exacto Knife
- Hot Dog



Procedure:
1. Cut a line lengthwise down the Pringles can to about 2"' from the top and 2" from the bottom.
2. Cut a line across the top and bottom of the first cut extending 1-1/2" on either side of the long line.
3. Open both sides of the can out, making a window to the interior of the can.
4. Tape a piece of transparency film inside the can to complete the window.
5. Make a small hole in the top and the bottom of the Pringles can.
6. Insert the wooden skewer through the hole at the bottom of the can.
7. Thread the hot dog onto the wooden skewer.
8. Insert the other end of the wooden skewer (with the hot dog on it) through the hole at the top of the Pringles can.
9. Place the can in the sun for cooking. On bright sunny day with little breeze, it can take 60-90 minutes to cook the hot dog.

Discussion:
The shiny flaps of the Pringles can capture and reflect the energy from the sun onto the transparency film taped on the inside of the can. The transparency film captures the light and turns it into heat. The heat stays inside the can. The can acts as an oven retaining the solar energy (heat) that is reflected into it and cooks the hot dog.
Enjoy!
Note: On a sunny day, the inside of a parked car gets very hot, just like the inside of the Pringles can. The light from the sun enters the car through the windows and the light energy turns into heat energy.

#9 - MAGNETIC CEREAL (30 minutes)

Description: See the iron in breakfast cereal stick to a magnet.
Materials:
- -Total® Brand Cereal
- -Mixing Bowl
- -Glass Rod
- -Large Spoon
- -Magnets
- -Plain White Paper Towel

Procedure:
1. Empty the entire box of cereal into the large mixing bowl.
2. Using your hands crush the flakes into pin head size pieces.
3. Add water and stir with the glass rod. Keep adding water to make the mixture thin and soupy.
4. Tape the magnet to the end of the glass rod.
5. Stir the cereal and water mixture with the magnet end of the glass rod for a couple of minutes.
6. Remove the glass rod.
7. Wipe the magnet clean using a plain white paper towel. What do you see?

Discussion:

Crushing the cereal and adding water to it causes the iron in the cereal to separate from the flakes. The iron flakes then stick to the magnet that is attached to the glass rod. The dark particles you see on the paper towel, are tiny pieces of iron.

Is the iron in the cereal we eat the same as what nails and automobiles are made of? Yes! The iron in the cereal is really pure iron! It is mixed in the cereal batter along with many other additives. The very tiny particles of iron quickly react with hydrochloric acid and other chemicals in our stomachs and intestines, changing the iron so that it can be absorbed by the body.

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

EnergyQuest
http://www.energyquest.ca.gov/
Learn about all types of energy and how energy is used in our world.

Energy Kids Page
http://www.eia.doe.gov/kids/
A fun place to review the history of energy, play games, and discover new facts.

PHYSICS4KIDS
http://www.physics4kids.com/
Motion, heat, electricity, light and much more.

Kids Saving Energy
http://www.eere.energy.gov/kids/
US Department of Energy web site for kids. Energy facts and games for kids.

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

CHEM4KIDS
http://www.chem4kids.com/
Learn about atoms, matter, chemical reactions and much more!

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.

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

Professor Smart's Big Energy Show Evaluation Sheet

Your chance to grade the Professor and Ms. 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