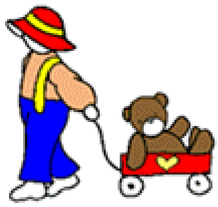
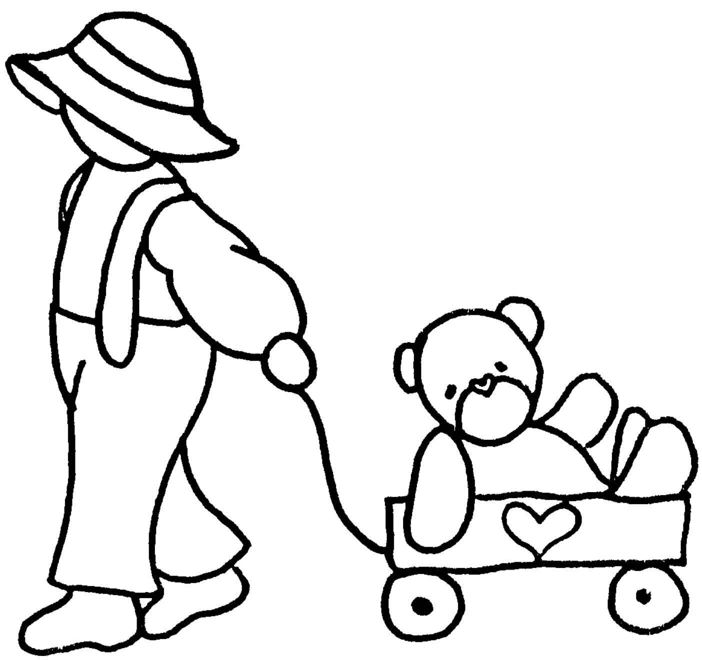


Applied Science

Our Technological World

THIRD GRADE

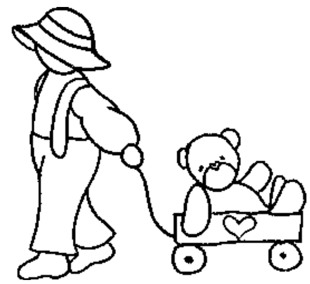
TECHNOLOGY



3 WEEKS
LESSON PLANS AND
ACTIVITIES

SCIENCE AND MATH
OVERVIEW OF THIRD GRADE

SCIENCE AND MATH



WEEK 1.
PRE: *Comparing objects mathematically.*
LAB: *Predicting and measuring objects.*
POST: *Comparing and contrasting objects.*
WEEK 2.
PRE: *Discovering lab equipment.*
LAB: *Measuring volume using a graduated cylinder.*
POST: *Comparing volume, mass, and weight.*
WEEK 3.
PRE: *Investigating a "new" discovery.*
LAB: *Experimenting with peanuts.*
POST: *Comparing inventors and scientists.*

PHYSICS

WEEK 4.
PRE: *Exploring magnetism.*
LAB: *Discovering magnetic force.*
POST: *Comparing objects that are magnetic and non-magnetic.*
WEEK 5.
PRE: *Comparing static and current electricity.*
LAB: *Exploring the origin of static electricity.*
POST: *Investigating lightning.*

TECHNOLOGY

WEEK 6.
PRE: *Exploring DC and AC current.*
LAB: *Comparing series and parallel circuits.*
POST: *Discovering how machines operate using electricity.*
WEEK 7.
PRE: *Investigating how you pay your energy bill.*
LAB: *Exploring small appliances.*
POST: *Evaluating electrical safety.*

BUILT ENVIRONMENT

WEEK 8.
PRE: *Comparing different modes of transportation.*
LAB: *Designing a train route to service a community.*
POST: *Investigating different types of trains.*

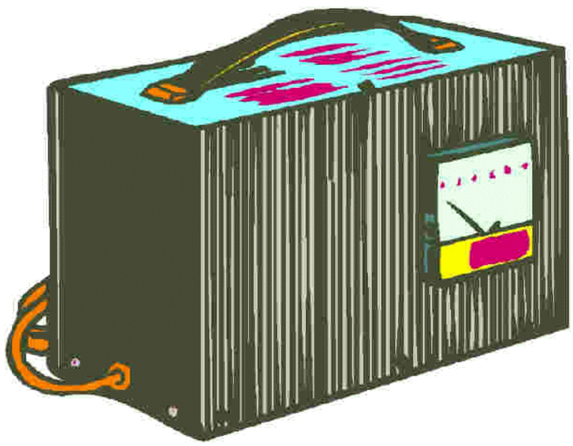
APPLIED SCIENCE - TECHNOLOGY (3A)

PRE LAB

Students discover how a battery works.

OBJECTIVE:

1. Exploring DC and AC electric current.
2. Investigating a battery.



VOCABULARY:

battery
circuit
current

MATERIAL:

worksheet

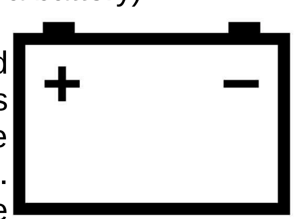
BACKGROUND:

An electric current is the flow of electric charge which transports energy from one place to another. It is measured in amperes, where 1 ampere is the flow of 6 1/4 billion-billion electrons (or protons) per second. However, no current exists unless there is a complete pathway or circuit through which electrons may flow. The flow of electricity through a circuit can be stopped by breaking or opening the circuit with a switch. By closing the circuit the flow of electricity can be restored.

Electric currents travel easily through some materials like metal and poorly through others like plastic. The substances that electricity can easily flow through are called conductors, those that do not allow electricity to flow are called non-conductors. Some substances restrict the flow of electricity and these are called semiconductors. Silicon is the most famous semiconductor used in the computer industry.

PROCEDURE:

1. When a circuit is complete, as shown on the student's worksheet, the current flows from a region with excess or high number of electrons (the negative pole of a battery) to a region with relatively few or low electrons (the positive pole of a battery).



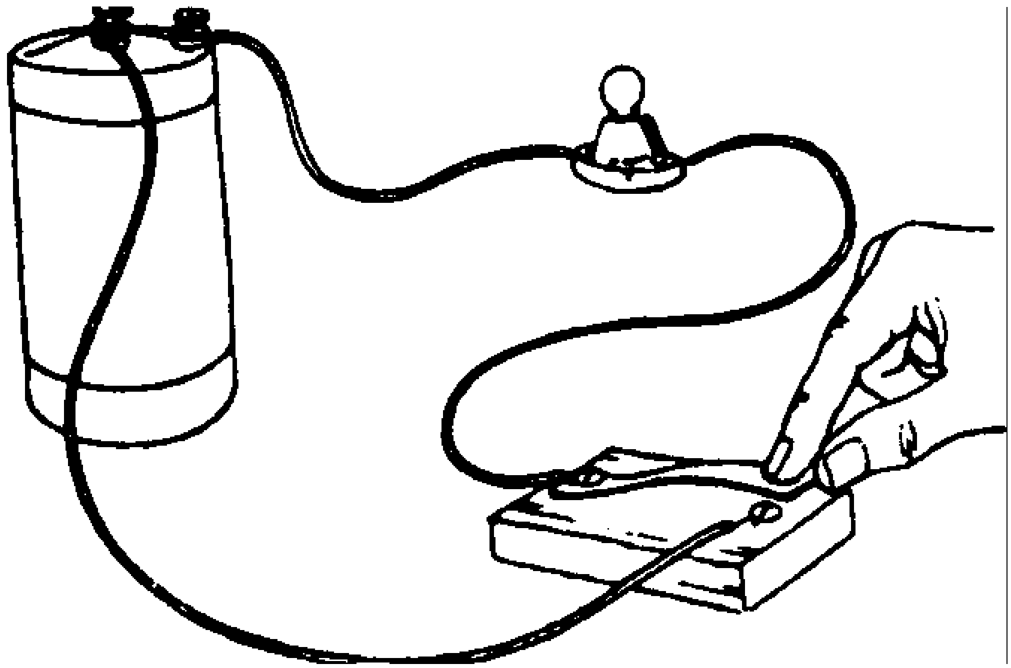
2. There are two possible types of electric flow, direct and alternating current. Direct current means that the flow of charges is in one direction. A battery produces direct current (DC) because there is no way to change the + and - you see on the battery. Alternating current (AC) has electrons in the circuit that quickly move

first in one direction and then in the opposite direction, alternating back and forth between relatively fixed positions. When you use a transformer, you are using AC. Many calculators, cellular phones and other common items use an AC adapter or transformer which helps extend the longevity of the item. The worksheet shows direct current.

3. Batteries are the simplest source of power for DC. Batteries are chemical apparatuses that allow "electrons" to be generated for use later on. Each battery has either 1 cell or multiples of cells. Each cell is 1.5 volts. Many of the common batteries are composed only of 1 cell. Whether the battery is an A, AA, B, C, or D, size determines how long the battery will last. It does not refer to the voltage. A six-volt battery has 4 unit cells stacked in a series. You may want to show students different batteries and a transformers.

4. ANSWERS: 1. Current flows from the negative to the positive. 2. A switch is closed when it completes the circuit and allows electrons to flow continuous. 3. An electric circuit is when the circuit is closed and the electrons are flowing. Display a battery or other source that can generate electrons.

APPLIED SCIENCE - TECHNOLOGY (3A)



LABEL THE DIRECTION OF THE CURRENT WHEN A COMPLETE CIRCUIT IS MADE. USE ARROWS, LABEL ONE OF THE ELECTRODES + AND ONE -. LABEL BATTERY, SWITCH, LIGHT

1. WHICH WAY DOES THE CURRENT FLOW?

____

____

2. WHAT DOES IT MEAN TO HAVE THE SWITCH "CLOSED?"

____

____

3. WHAT IS AN ELECTRIC CIRCUIT? DO YOU NEED A BATTERY OR CAN YOU USE SOMETHING ELSE?

____

____

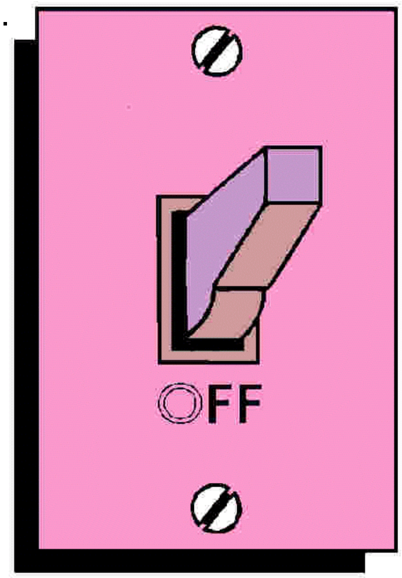
APPLIED SCIENCE - TECHNOLOGY (3A)

LAB

Students create their own electrical circuits.

OBJECTIVE:

1. Comparing series and parallel circuits.
2. Exploring the uses of series and parallel circuits.



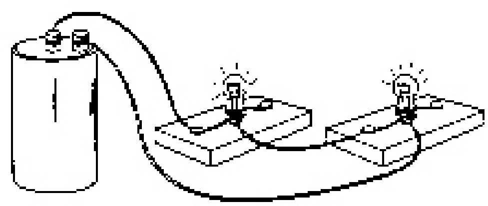
VOCABULARY:

parallel circuit
series circuit

MATERIALS:

light bulb
alligator clips
bulb holder
battery holders with 2 D batteries
Christmas lights-optional
energy or alien ball

BACKGROUND:



A simple series circuit is shown in the figure on the right. When connected in a series, a single pathway is formed through which current flows. A parallel circuit (figure in the procedure), form branches, each of which is a separate path for the flow of electrons. Both series and parallel connection have their own distinctive characteristics.

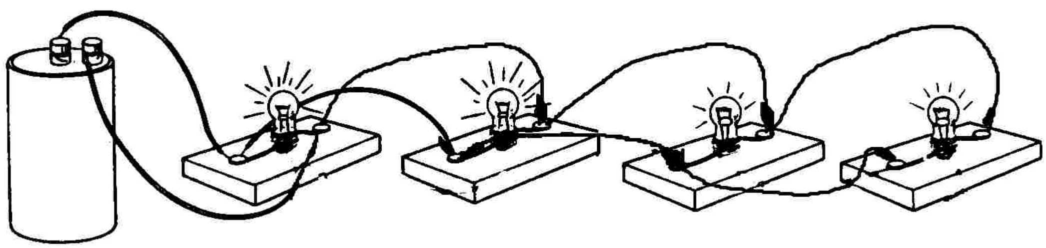
In a series circuit, when one of the bulbs or one of the wires is left open or is broken, the entire circuit ceases. The break opens the circuit. Less expensive Christmas lights are usually of this type, and you have to search for the defective bulb. A parallel circuit is designed so that if one branch is defective, the flow of electricity will not be broken to the other branches.

PROCEDURE:

1.Give each group an Energy or Alien Ball. (Do not take the Energy Ball apart unless you are replacing the batteries inside.) Show students that by putting two fingers on the electrodes, (pieces of metal) the "alien ball" speaks. The circuit has been completed. Students should be arranged similar to the two above figures. This takes a little thinking so don't give them too much guidance. Let them figure it out themselves. See how many people can hold hands and still let the alien speak. You will be surprised! The alien ball has two watch batteries inside, a computer chip, a small light, and a sound system. These will last for up to 3 or 4 years, depending on the batteries. The ball can be opened along its equators to replace the batteries. illustrate the series and parallel circuits over and over.

2. The lab is designed for students to work in groups of 4 or 5 and to make their own parallel and series circuit. If you have enough equipment, have two students work with 1 bulb, 1 lamp holder, 1 batter holder, 2 D batteries, 1 bulb, and 2 alligator clips. Have them make a series circuit. Then have four students put together a series circuit and continue until the entire class has made a series circuit.

3. After the series circuit, have about 4 sets (about 8 children) work to put the parallel circuit together. Students will only have to use one battery holder with 2 batteries. They should also realize that they can hook up two alligator clips at each electrode on the lamp holder like below.



4. During the conclusion, ask students which circuit would be better for use in the home. Hopefully they will see that a parallel circuit has many more advantages. In a series circuit, the greater the number of lamps, the more the lamps will dim. Energy is divided among more lamps so the voltage drops across each lamp. In the parallel circuit, all lamps get the same voltage, so all are the same brightness. Students might ask questions about why lights suddenly go out at home. This is usually caused when lines carry more than a safe amount and "overload". To prevent overloading in circuits, fuses are connected in series along the supply line. In this way the entire line current flows through the fuse. A fuse is constructed with a ribbon of wires with a low melting point. If the current in the line becomes dangerously large, both lines in a fuse become hot and the fuse "blows out." Circuits may also be protected by circuit breakers which use magnets or bimetallic strips to open the switch when overloaded.

5. Note that in a series circuit, the brightness of the light decreases. Warn students not to put too much voltage. If you only have a 1.5 volt battery, you can only light a 1.5 volt light bulb. If you have a light bulb that requires 120 volts, your battery will not allow it. If you have a 6 volt battery and a 1.5 volt light bulb, you will "blow" the bulb.

APPLIED SCIENCE - TECHNOLOGY (3A)

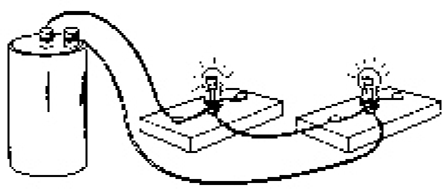
PROBLEM: What is the difference between a parallel and series circuit?

PREDICTION:____

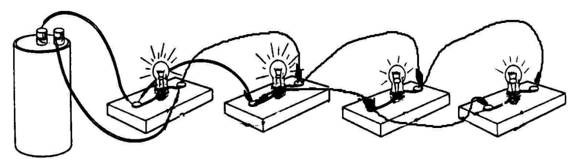
PROCEDURE:

Follow the diagrams below and compare a series circuit with a parallel circuit. Then use your classmates and an alien ball to make your human series and parallel circuit. The electrons flow through the surface of your body, so in fact you act as a wire.

SERIES



PARALLEL



1. How many paths of current does the series circuit have? ________________________

2. How many paths of current does the parallel circuit have? _______________________

Draw how you made your series and parallel circuit with your classmate. Use stick figures to represent students.

CONCLUSIONS: Explain the difference between series and parallel? Which one do you think is used in our society? Explain.

____

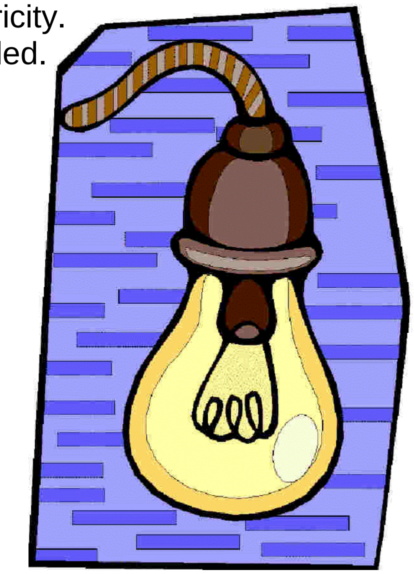
APPLIED SCIENCE - TECHNOLOGY (3A)

POST LAB

Students discover how electricity flows through a city.

OBJECTIVE:

1. Discovering how machines operate using electricity.
2. Investigating how the lights of a city are controlled.



VOCABULARY:

alternating current
direct current
electricity
energy

MATERIALS:

worksheet

BACKGROUND:

If a bulb "lights up," electricity is flowing through the wires in a closed circuit. If the bulb doesn't light up, electricity isn't flowing and it is an open circuit. Electricity can be generated by water (hydroelectric), batteries (chemical) or nuclear. Remember, electricity is a flow of electrons - it doesn't matter which "electrons" or what causes the energy that moves the electrons.

Electricity is all around us, but we rarely think about it. Students don't question where electricity comes from when a switch is turned on and off and many may not know where electricity originates. Many large cities get their power from hydroelectric sources. In the early 1900's, there was a "master" plan to develop and trap energy by damming water. The water would then move large turbines that could be converted to electricity. This electricity would then move to the cities by a network of wires.

The history of electricity is fascinating, especially because many of the early pioneers became famous. Prior to 1880's there was no public supply of power, even in advanced countries of the world. Sources had to be close and voltage had to be low because all that was first available was direct current. As the demands and distances of customers increased, alternating current was used because of its greater transmission through the use of transformers. It was slowly realized that electrical power was a common commodity and many public power stations started to develop a network to help generate a continuous source of power.

The first public DC power was in London in early 1882. The second was in New York in late 1882 and was started by Thomas Edison. In 1886, Westinghouse and Stanley created the first alternating current in Massachusetts. Students may be familiar with the

Edison and Westinghouse companies that bear these early inventors names.

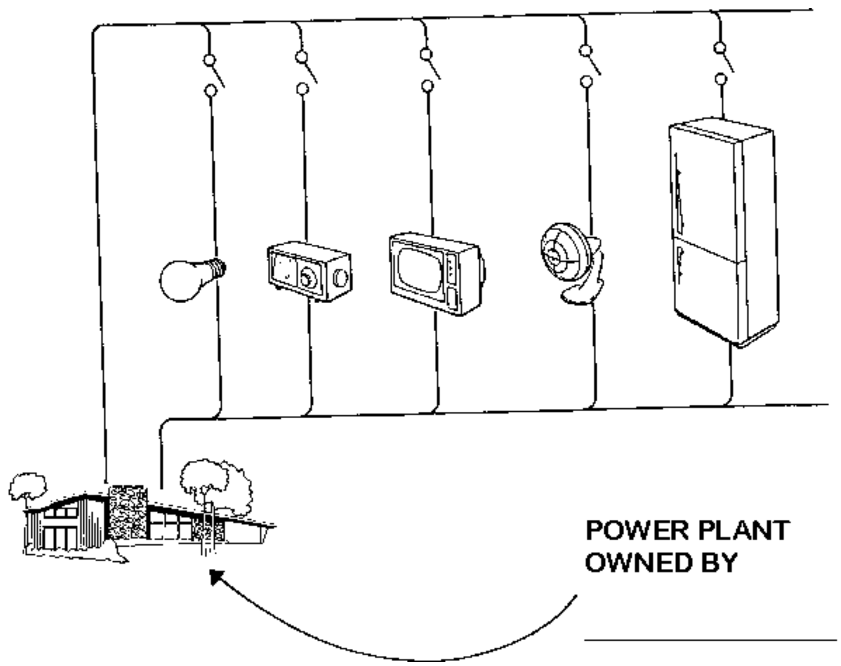
PROCEDURE:

1. Use the worksheet and see if students can visualize how these power plants carry electricity for all people to use. You may want to use this as an overhead and trace how electricity travels to an urban area.

2. Have the students use this diagram to try and find out who supplies power in your city. Ask them to discuss this with their parents or guardians to try and find the name. Make sure students realize that they pay for electricity that comes into their house. Have them identify whether they use electricity or gas at their home. Many home use both, some are all electricity.

APPLIED SCIENCE - TECHNOLOGY (3A) POST

HOW ELECTRICITY TRAVELS TO A POWER PLANT TO YOUR HOUSE



ITEM USED IN HOUSE OR OUTSIDE	DOES IT USE ELECTRICITY OR GAS?
OVEN	
REFRIGERATOR	
WATER HEATER	
HEAT IN THE HOUSE	
AIR CONDITIONER	
WASHING MACHINE	
DRYER	

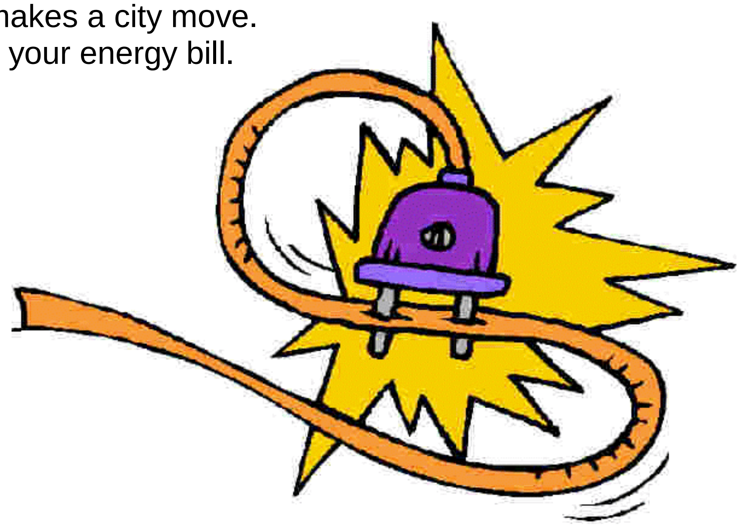
APPLIED SCIENCE - TECHNOLOGY (3B)

PRE LAB

Students learn how to read an electric meter.

OBJECTIVE:

1. Exploring how electricity makes a city move.
2. Investigating how you pay your energy bill.



VOCABULARY:

electricity
kilowatt hour

MATERIALS:

meter cards
worksheet

BACKGROUND:

Students do not really understand how important electricity is to our everyday existence. Public supplies of electricity were not available to countries until the late 1800's. England and the United States were leaders in the development of a public system of power generation. Urban areas were usually serviced before the rural areas. In the period between 1920-1950, the demand for electricity made the "power company" an important part of our everyday lives. Point out that there are different "types" of electric current in different countries. You can't plug a hair dryer bought in the United States into a European plug.

In the generation of electric power from water, fuel, or nuclear, the heat energy is converted into mechanical energy by a prime mover and then into electrical energy by a generator. A generator is based on the "dynamo" principle - a fast-moving substance which can generate electricity. This is much more complicated but it is not necessary to go further than this in the third grade.

PROCEDURE:

1. Many students may ask how electricity is moved. Point out any transmission or power lines. In California for example, much of the electricity is generated by hydroelectric power. If a power plant is close to your school, try to arrange a tour. Invite the janitor, or any member of the maintenance crew from the school district, to give a lecture to explain the power source at your school.

2. People must pay for the luxury of electricity. Private electric utilities are regulated

by state or city governments. The various laws require that power companies be permitted to earn a reasonable profit. But how do we pay for energy?

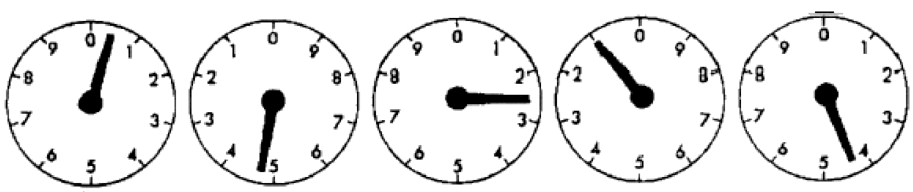
3. A school's electric bills are based on two factors: the amount of electricity used, measured in kilowatt hours, and how much is used at any one time (or kilowatt demand). Schools have two meters; one meter to record the total kilowatt hours used; the other to record the largest number of kilowatts used at any one time.

4. If students want to lower the school's energy expenses, they will need to do more than use less electricity. They will also need to keep from using a large amount of electricity at any one time. Example: If the cafeteria is preparing lunch from 9 a.m. to 12 p.m., students should ask the shop teacher not to operate the machines LAB this time. This will keep the school's electrical demand lower.

5. Some of the portions of the lab sheet were designed by Pacific Gas and Electric Company. They will help your students see how electricity is recorded. Many places are a little more modern, but many old buildings still use a meter.

6. To make a meter card you will need: brads, stiff paper (about 60 lb paper), pen, circle template

A meter card helps gas companies read meters that may not be assessable to meter readers. Make 5 circles and number the circles as below. Put the brads in the center. Make a "hand" that students can rotate to any of the numbers on the rim. Students will use the hand to help read the meter.

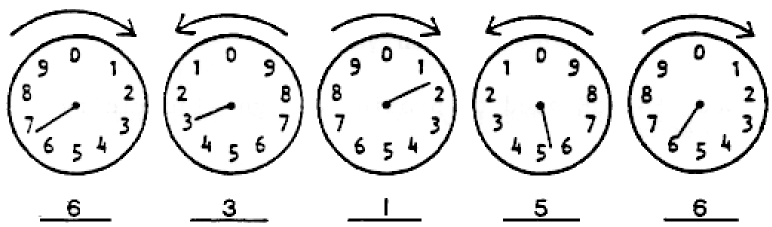


APPLIED SCIENCE - TECHNOLOGY (3B) PRE

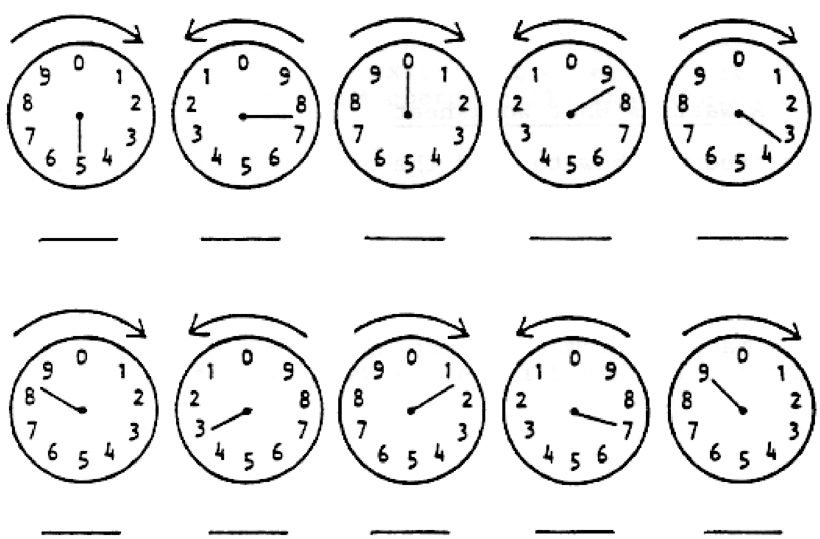
Meter cards

Exercise 1.

Record the position of the arrow below each dial. If the arrow lies between two numbers, record the smaller number. You read the total kilowatts by reading the numbers you have written from left to right. Example:



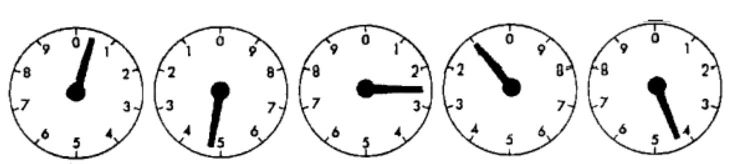
The meter dials above read: 63156



Kilowatt–hours = kwh

The unit of energy you are recording is in ______________________________

Make a meter card. Follow directions from your teacher. It should look like this when you are finished.



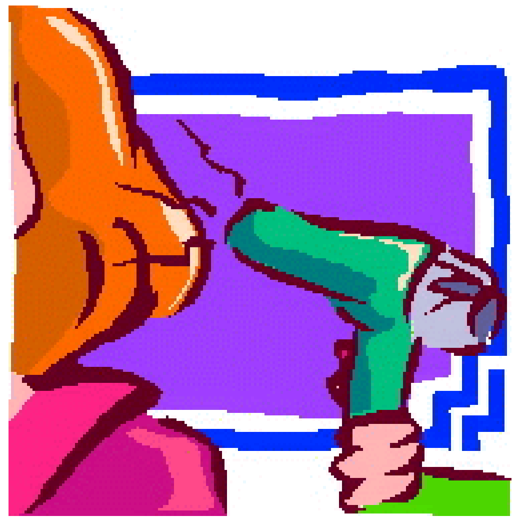
APPLIED SCIENCE - TECHNOLOGY (3B)

LAB

Students determine how much electricity an appliance uses.

OBJECTIVE:

1. Investigating the electrical requirements of small appliances.
2. Exploring amperes, watts, and volts.



VOCABULARY:

ampere
electricity
volt
watt

MATERIALS:

small appliances
(recommend can opener, toaster,
coffee maker, electric calculator,
pencil sharpener,
any other electrical apparatus available at the school)

BACKGROUND:

Students have heard the words volt, watt, and amps, but few know what they refer to. These terms all have to do with the flow of electricity. A volt is a force of electricity that goes through a conductor. For instance, a 1.5 volt battery has less force than a 6-volt battery. Houses in the United States have 110 volts coming through the wall socket which is much more force than the batteries. Students are told not to play with the sockets in the wall because of this extra force. Volt is named after Alessandro Volta, an Italian physicist.

An ampere is the measurement of electric current, named after Andre Marie Ampere, a French physicists. Fuses are designed to carry so many amperes. When a system carries too much amperage, it will "blow a fuse." This happens when too many amperes go through the system and this alerts you to decrease power usage.

A watt is the measurement of power. A 100-watt bulb is brighter than a 30-watt bulb. It was named for James Watt, a Scottish engineer and inventor. Many times you will see the term hertz on electrical appliances. This refers to the frequency of the current going through in a cycle. Hertz was named for a German physicist.

PROCEDURE:

1. For the first exercise, find several appliances where the students can find either the watts or volts and amps the appliance uses.

2. Students may bring in small electrical appliances for this exercise. The more the watts or volts or amps, the more electricity is used.

3. Have students determine which appliance uses the most energy. This will depend on the appliances you have. Volts and amps are related to watts: watts = volts x amperes. Have students record the watts, volts and amperes that they determine from the appliance.

APPLIED SCIENCE - TECHNOLOGY (3B)

PROBLEM: How can we measure electricity?

PREDICTION:____
PROCEDURE:
MATERIALS: small appliances
EXERCISE 1.
Appliances are labeled with the amount of watts they use. Look on the back or on the bottom at each of the prepared stations. Not all labels are in watts, some are in volts and amps. Volts and amps are related to watts: watts = volts x amps. Record either the watt or volts/amps in the space below.

appliance	watts	volts	ampere

Which appliance uses the most electricity? ______________________________________

CONCLUSIONS: How do you measure electricity?

____

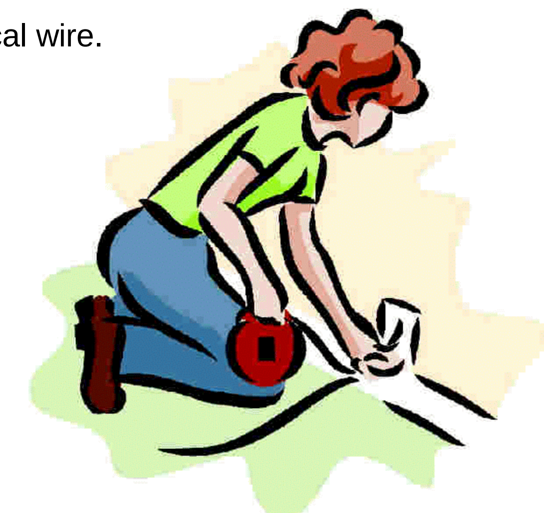
APPLIED SCIENCE - TECHNOLOGY (3B)

POST LAB

Students learn how to be "safe" when handling electricity.

OBJECTIVE:

1. Evaluating electrical safety.
2. Comparing safe and unsafe electrical wire.



VOCABULARY:

electricity
insulation
safety

MATERIALS:

diagrams on electrical safety

BACKGROUND:

Electricity is used in our houses in many ways. We can use it for cooking, cleaning, cooling, freezing, heating, lighting, and entertaining. It helps make living and working around the home, school, or at work easy, safe, and fun. Electricity must be used properly, because it is also very powerful and can cause injury or fire.

Students need to know that wires are not safe without insulation around the wires. Wires are insulated because they become hot and the coating prevents any fires from occurring.

Improper wiring can sometimes show warning signs like light will dim or flicker; motors change speed when an appliances goes on; circuit breakers trip or fuses blow frequently; heat-producing appliances are slow to warm; picture on the TV screen "shrinks": and you don't have enough outlets for all the appliances that need electricity.

Many times your local utility company may have informational brochures which can help you teach this lesson for your particular area.

PROCEDURE:

1. Look at the diagrams provided and decide whether or not the situation shown is safe or not. Fill in the blanks on the chart

2. ANSWERS:

1. If the child puts a tool into the socket, they will get 110 volts through their body. It is enough to kill someone.
2. This is not immediately dangerous, but if there is a spark or a hot wire, the kit might

burn causing problems. Never climb an electric pole. Call the utility company and they will inform you what to do.

3. If all the wiring is enclosed, nothing should happen. However, a broken wire could cause a shock.
4. A broken wire is very dangerous. It can cause sparks which can cause a fire.

APPLIED SCIENCE - TECHNOLOGY (3B) POST

ELECTRICAL SAFETY

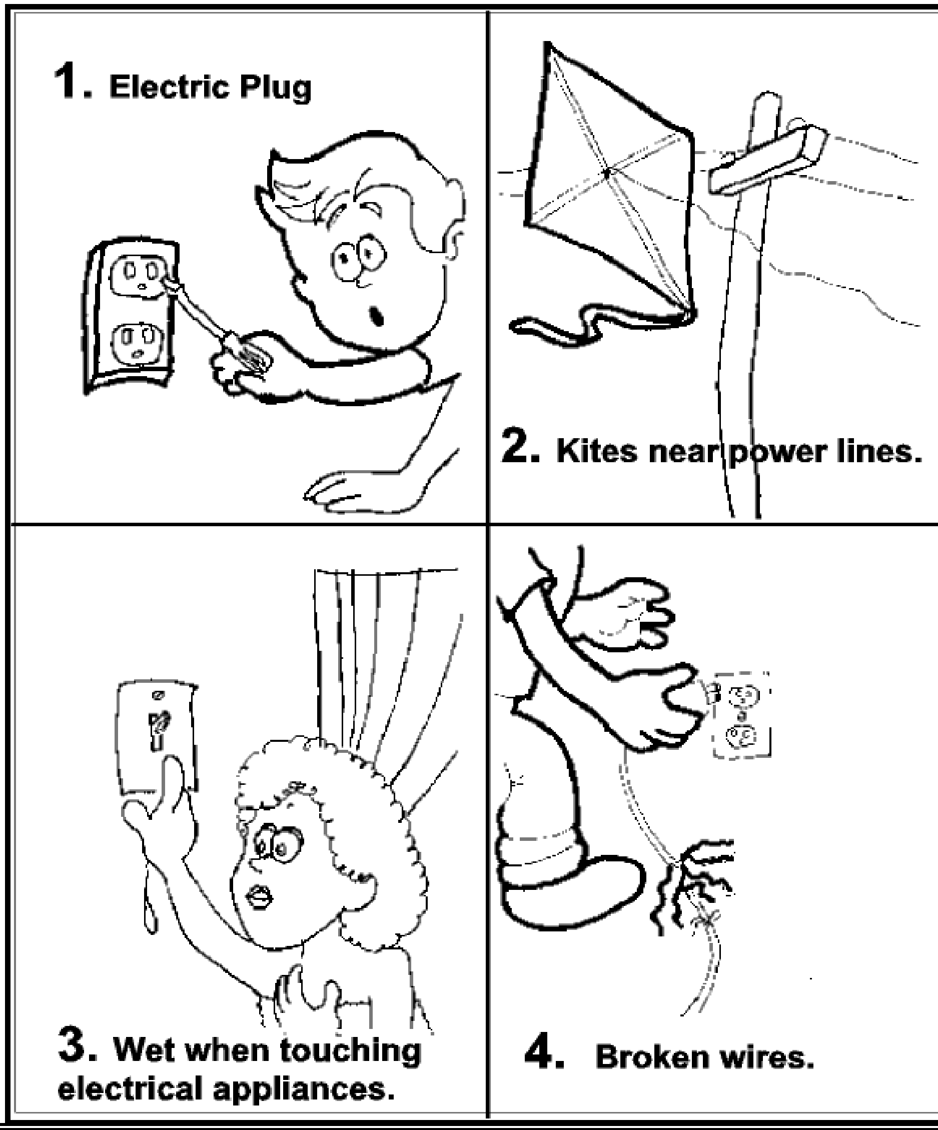


DIAGRAM #	IS IT SAFE	IF IT IS NOT SAFE, WHAT CAN YOU DO?