

Applied Science Our Technological World



# THIRD GRADE PHYSICS



3 WEEKS LESSON PLANS AND ACTIVITIES

#### APPLIED SCIENCE 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.



#### 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.* 



# PRE LAB

**OBJECTIVE:** 

- 1. Exploring magnetism.
- 2. Comparing how a magnet repels and attracts.

#### **VOCABULARY:**

attract magnet magnetism negative positive repel

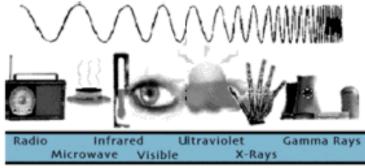
#### MATERIALS:

magnets Periodic Table Placemats

#### **BACKGROUND:**

Physics is the study of physical events on Earth and in the Universe. It is an attempt to explain why and how certain events occur. Physics occurs whether we understand it or not. For instance, when you pick up a book and drop it, the force of gravity pulls it toward the Earth. (Illustrate this with your students.) How does this happen? In part, this is still a mystery because we know that larger objects attract smaller objects. Exactly how they attract is not known. Whether you know why the book will fall or not, the book will still fall.

There are 4 major ways in which matter interacts on our planet. There are strong interactions and weak interactions, which involve the use ways atoms operate. Gravity is another interaction, which is mysterious, because we don't feel a force, but its impact is widespread. Electromagnetism is also an interaction, whose mysteries have been realized



in the early part of the 1900's.

Electricity and magnetism are related and are the components of electromagnetism. Light is a subset of the electromagnetic wave spectrum. The electromagnetic wave spectrum also includes radio waves, microwaves, ultra violet rays, x-rays, and gamma rays. Magnets exhibit

Students discover the three naturally magnetic elements.

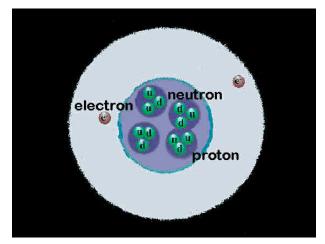
both attractive and repulsive forces. North attracts south, north repels north, and south repels south.

You can compare magnetism with electricity by explaining that electricity has opposites also. Negative repels negative, positive repels positive. Only when positive and negative are put together does electricity flow.

# PROCEDURE:

1. Discuss with students that the study of "physics" includes topics such as gravity, electricity, magnetism, light and friction. The next several units will concentrate on explaining electricity and magnetism. In previous labs, students have experienced both phenomena. The third grade is when students will begin understanding why these phenomena occur.

2. Go over the structure of an atom with students. Remember all matter is made up of elements, which are made up of atoms. Go over electrons, protons, and neutrons. On the picture below point out that the nucleus is the center of the atom with the neutrons (neutral) and protons (positive charge) are located. The electrons (negative charge) are revolving around the nucleus. Electrons are important in understanding electricity and magnetism.



3. Show students the periodic table of the elements. Remember all elements are made up of atoms. Quiz them on their knowledge. For instance, "The gas we need to live is called \_\_\_\_\_(students answer oxygen. What is the symbol?"

What is salt made up of? Sodium (Na) and Chlorine (Cl) What are several metals? Iron (Fe), Nickel (Ni) What metal is a character from the Wizard of Oz made of? Tin (Sn) What are rings made of? Gold (Au), Silver (Ag) 4. Ask students how many elements are naturally magnetic. The only three naturally magnetic elements are nickel, cobalt, and iron.

Notice that the three of them are very close on the Periodic Table. The periodic table is designed so that elements with similar properties are

near each other. Iron is the weakest of all the elements; nickel and cobalt are the strongest and keep their magnetism longer. The magnets we use in this program are called ALNICO, which stands for aluminum, nickel and cobalt.

5. Use the magnets to illustrate the basic principles of magnetism, like repel and attract. If students are unfamiliar with magnets, they may need to play with the magnets before the lab.



LAB

**OBJECTIVE:** 

Students create magnetic forces with different types of magnets.

- 1. Identifying north and south on different magnets.
- 2. Discovering "magnetic force."

# VOCABULARY:

attracts magnetic force magnetism repel



#### MATERIALS:

Applied Science-Physics (3A) or bar magnets ring magnets logo magnets iron filings 2 wand magnets with iron filings on them

# **BACKGROUND:**

Magnetism is a force generated by the motion of spinning electrons all going in the same direction. Students will go over this in more detail in the post lab. However, this lab will have them experience the direction of magnetic force and the power of magnets. The magnets you are using are ALNICO, which are permanent magnets. These magnets never demagnetize due to the combination of nickel, cobalt and aluminum.

It is very important for students to experience magnetism and spend time on feeling the "force."

# PROCEDURE:

This lab is done in four stations. Have students spend about 5-8 minutes per station.

1. Make sure the students put a sheet of paper over the magnet. If the iron filings are put directly on the magnet, the magnet will get "dirty." Have students gently sprinkle the iron filings over the entire magnet. (Do not pour them out.) If a student gets any of the iron filings in their eye, wash it out immediately with water and don't rub their eyes.

Demonstrate the procedure before students go to their stations.

2. The students are asked to make the magnets "float." Let them experiment with the rings to see if they can find the right combination. Assure them that they can float but don't give any clues how. Let them discover for themselves. When the magnetic rings float, they are positioned north/north or south/south.

3. These 2 magnets have iron filings on them. Have students try and find north and south. Remember, with these magnetic wands, north is on one of the large faces, south is on the opposite side. It will be difficult to decide which is north and which is south. They look very similar. Ask students to flip the direction of one of the magnets. The magnets will be in a north/north or south/south position and the iron filings will repel.

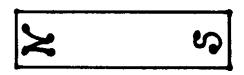
4. How many paper clips can the students pick up. Who can hold the most? See if all the students come up with a similar number. If the strength of the magnet is the same, they should be able to pick up the same number.

In conclusion, go over the four different stations and discuss students' answers.

**PROBLEM:** How can you find the north and south pole of a magnet? **PREDICTION:** 

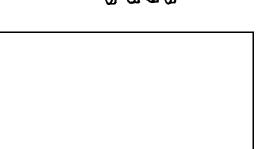
**PROCEDURE:** Go to 4 different stations and complete the assignment. Listen to your teacher give instructions.

Station #1. Put a sheet of paper over the bar magnet. Sprinkle iron filings. Draw what happens. Be careful not to put the iron filings on the magnet.

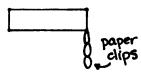


Station #2. There are 4 ring magnets. Experiment with them and arrange them so they "float." See diagram. Explain why this occurs.

Station #3. There are 2 magnets with iron files all over them. Draw what happens when you slowly pull them apart. What causes this? Next try to take 1 magnet and slowly turn it to the opposite face. What happens?



\_\_\_\_\_



Station #4. How many paper clips can you pick up?

How many paper clips can you line up (see diagram above)?

**CONCLUSIONS:** How were you able to distinguish north and south?

# POST LAB

Students spin to understand magnetism.

#### **OBJECTIVE:**

- 1. Comparing objects that are magnetic and non-magnetic.
- 2. Discovering how magnetism works.

#### **VOCABULARY:**

atom electron proton

#### **MATERIALS:**

magnets for demonstration

#### **BACKGROUND:**

The atom and how the electrons spin around the nucleus is important to understand

magnetism. The center is the nucleus where all the neutrons, protons and other particles are located. The other "orbits" are the electrons. There are set orbits for so many electrons. For instance the first orbit would only have two electrons. The second orbit would have 8 electrons. Draw

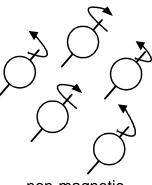
the diagram on the right to help illustrate this point. Point out that matter is made up of all the components of the atom.

Protons are positive, electrons are negative, and neutrons are neutral.

Electrons spin around the nucleus, and protons, neutrons and other particles are also moving within the

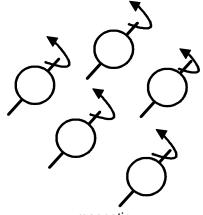
nucleus. In most substances, half of the electrons spin in one direction (clockwise) and the other half spin in the other direction (counterclockwise). However in some substances like iron, nickel, and cobalt, the

electrons naturally spin more in one direction than another. In other substances, you can temporarily change the direction by physically making them align themselves in the same direction. The spinning causes magnets to generate a force. The spin of









magnetic

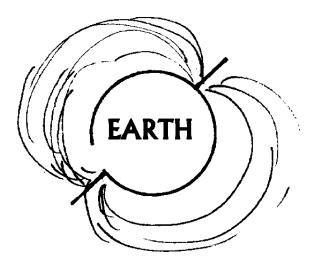
the electrons becomes very important in understanding magnetism. If they are all aligned in the same direction, the magnet will be stronger.

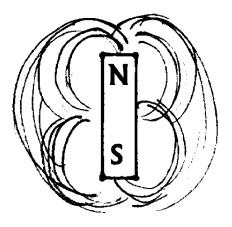
# **PROCEDURE:**

1. Students will learn that electricity is when electrons move in one direction. To compare electricity and magnetism, use the following example: Have several students spin in place, half spin one direction, half spin in the other direction. This is how most matter's electrons move. While students continue to spin, have them all move in the same direction by taking 2 or 3 steps. This is electricity; electrons move in the same direction. Have the students stand still and spin in one direction, this is a simple example of magnetism. (Students might get dizzy if you have them spin too much!)

2. Magnetism has a force that attracts certain substances. Many metals are influenced by magnets. Review with students what is considered "magnetic" and "non-magnetic." Have students use the magnets from the previous lab to make a list of items in the class that are magnetic as opposed to those items that are not affected. Note: A computer or television can be ruined by putting a magnet near them. Caution students not to put a magnet on them because they will be damaged.

3. You may want to draw the diagram below that illustrates that the Earth has a magnetic force similar to that of a bar magnet. That is why we have a North and South Pole.





# PRE LAB

#### **OBJECTIVE:**

- 1. Investigating electricity.
- 2. Comparing static and current electricity.

# VOCABULARY:

current electricity electrons static

#### MATERIALS:

fluorescent tube plasma ball

#### BACKGROUND:

There are 2 basic kinds of electricity: static electricity and current electricity. Static electricity is uncontrolled electrons passing from one body to another in sudden, momentary movements. Examples include clothes from the dryer that stick together; or getting a shock after walking on a carpet and then touching something. Static electricity is usually a nuisance and a hazard that can cause fires.

Current electricity is when the electrons are controlled by moving along a path together. The path is usually a conductor of electricity. A copper wire can move electricity from a power plant to a house.

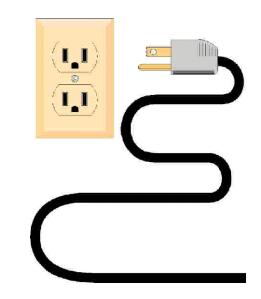
# PROCEDURE:

1. Static electricity can be illustrated by showing students the plasma ball. Plasma is stripped electrons, which is basically what static electricity is. In many plasma balls, the plasma gives off a light different than most static electricity we are used to. Demonstrate the different ways you can control some of the electrons by putting your hand to the ball. This demonstration looks better in a dark room. Put a small fluorescent tube to the Plasma Ball. Notice that the electrons will light the tube. The electrons go through the tube and excite the gas to give a glow.

The electricity is always looking for the "ground." So it uses



Students see a demonstration of static electricity.



your body to conduct the electricity. However, it is not enough electricity to cause any harm.

2. Current electricity is controlled; the electrons all move in one direction. Wire can transmit electricity so it becomes a very useful energy source. When its movement along a wire is controlled, it is current electricity. Remember, electricity is a flow of electrons in one direction.

3. On the board, have students make a list of their experience with electricity. Put it in 2 columns - CONTROLLED (CURRENT) and UNCONTROLLED (STATIC), as illustrated below. Students are sure to bring up lightning which is a visible discharge of electricity. This will be explained in the post lab.

CONTROLLED	UNCONTROLLED
electric circuit	when clothes get stuck
electric oven	when socks stick to clothes
electric can opener	when confetti gets stuck on items

# LAB

**OBJECTIVE:** 

- 1. Exploring the origin of static electricity.
- 2. Comparing static and current electricity.

# **VOCABULARY:**

electricity electrons negative positive protons

#### MATERIALS:

Applied Science - Physics (3B) or plastic comb confetti fluorscence tube (6-8 inch) plastic rod balloons

Students creating static electricity with

balloons, combs, and cloth.

#### **BACKGROUND:**

Electricity is produced when an electron moves after being taken away from an atom. Review that atoms make up all matter. Atoms are usually electrically balanced, there are as many positive charges (protons) as there are negative charges (electrons). Particles with the same charge repel or push each other apart. Electrons repel electrons;



protons repel protons. Particles with the opposite charges attract each other. However, when the electrons leave and move together it produces electricity. When this electricity is controlled, it is called current electricity, when it can't be controlled it is called static electricity.

In the cartoon to the left, the "scientist" is chasing an escaped electron from an atom. That electron creates energy that we refer to as electricity. Electrons are easy to remove from an atom, unlike protons and neutrons.

# **PROCEDURE:**

1. In lab, students will experience static electricity. On damp days, static electricity sometimes doesn't do what it is suppose to. The best days are when it is warm and dry. Make sure to follow the instructions on the sheet. The best type of cloth to use is wool or nylon. To explore more with your students, find out which cloth has the most "static" by rubbing different types of cloths on the comb and see which one is the quickest to pick up the confetti.

2. Have students blow up the balloon. Direct them to put the balloon on the wall. The more the students rub the balloon, the longer it will stay on the wall. This activity can be extended by having students use different types of cloth.

3. Students should also rub the balloon and put a fluorescent tube end on the balloon. Rub the balloon rapidly and then barely touch the side of the tube to the balloon. Do this rapidly. If enough static electricity is built up, the electrons will go through the tube and allow it to glow. Darken the room so students can see this better. They will become very excited about the bulb glowing. It sometimes takes many attempts for this to work.

PROBLEM: Where does static electricity occur?

#### PREDICTION:

#### EXPERIMENT 1.

1. Hold a plastic comb over confetti without rubbing the comb. What happens?

2. Rub a plastic comb with a piece of cloth. Hold the comb over a small pile of confetti. Did the comb "attract" or "repel" the confetti?

3. Rub the plastic rods, put it on the confetti? What happens?

#### **EXPERIMENT 2.**

1. Blow up a balloon. Without rubbing it, try and put the balloon on the wall. Does it work?

YES NO

2. Blow up two balloons. Using a piece of cloth, both partners simultaneously rub their own balloon; one for 15 seconds and the other for 30 seconds. Quickly place both balloons on the wall and time how long each one stays up.

#### **EXPERIMENT 3.**

1. Rub a balloon to produce static electricity. Place one end of a fluorescent tube to the balloon. Describe what happens.

CONCLUSION: How can you create static electricity?\_\_\_\_\_

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# POST LAB

#### **OBJECTIVE:**

- 1. Investigating lightning.
- 2. Exploring myths about explaining lightning.

# VOCABULARY:

electricity lightning

#### MATERIALS:

books on Ben Franklin Internet

#### **BACKGROUND:**



Students research Ben Franklin on the

Throughout the world, many myths have evolved around lightning and thunder. Many of these myths include gods who controlled the phenomena. Zeus (Greek), Jupiter (Roman), Iko (New Zealand), Kvum (Pygmies/Africa), Wakan (Dakota Indians/North America), are just a few names that lightning has been associated with. There are many beliefs that also revolve around lightning. Some made sense and others are nonsense. For instance, in the United States, France and Germany, it was thought that only milk could extinguish a fire caused by lightning.

Any discussion of electricity always seems to lead to lightning and Benjamin

Internet.



Franklin. Franklin was always curious about natural phenomena. In the mid 1700's, electricity was the "rage" in Scientists, inventors, and Europe. people curious about electricity, wanted to learn more about it. Franklin researched the subject and conducted several experiments. He published a short book on the subject that literally made him famous. In France, Franklin did several experiments with electricity and lightning, but he conducted his infamous kite flying experiment in a thunderstorm in Pennsylvania. It is

Franklin's description of electricity that is still used today and includes such terms as positive, negative, battery and conductor. You may want to focus on Ben Franklin's life to illustrate his curiosity. Franklin invented the lightning rod which allowed lightning to strike the rod and then the energy goes harmlessly into the ground. Many times lightning would strike a home and burn it. The lightning rod was so successful, that Franklin sold fire insurance to people if they installed a lightning rod.

Lightning occurs when atmospheric conditions create centers of negative and positive charge. There is a point where a lightning flash or a large electrical spark in the atmosphere is created. There are many forms of lightning from streaks to even small beads in the sky. Lightning is an example of static electricity which seeks to go through a ground. This is usually metal or the highest object in an area. The mechanisms responsible for lightning are complicated but children are fascinated by the power of lightning.

# **PROCEDURE:**

1. Have the students do some research on Ben Franklin, by either using the Internet or books you may have available. You may want students to write a paragraph about Ben Franklin's accomplishments as a scientist.

2. As an added activity you may want students to develop their own myths about lightning. Suggest they ask people at home what they think lightning is. From that information have them create a story.