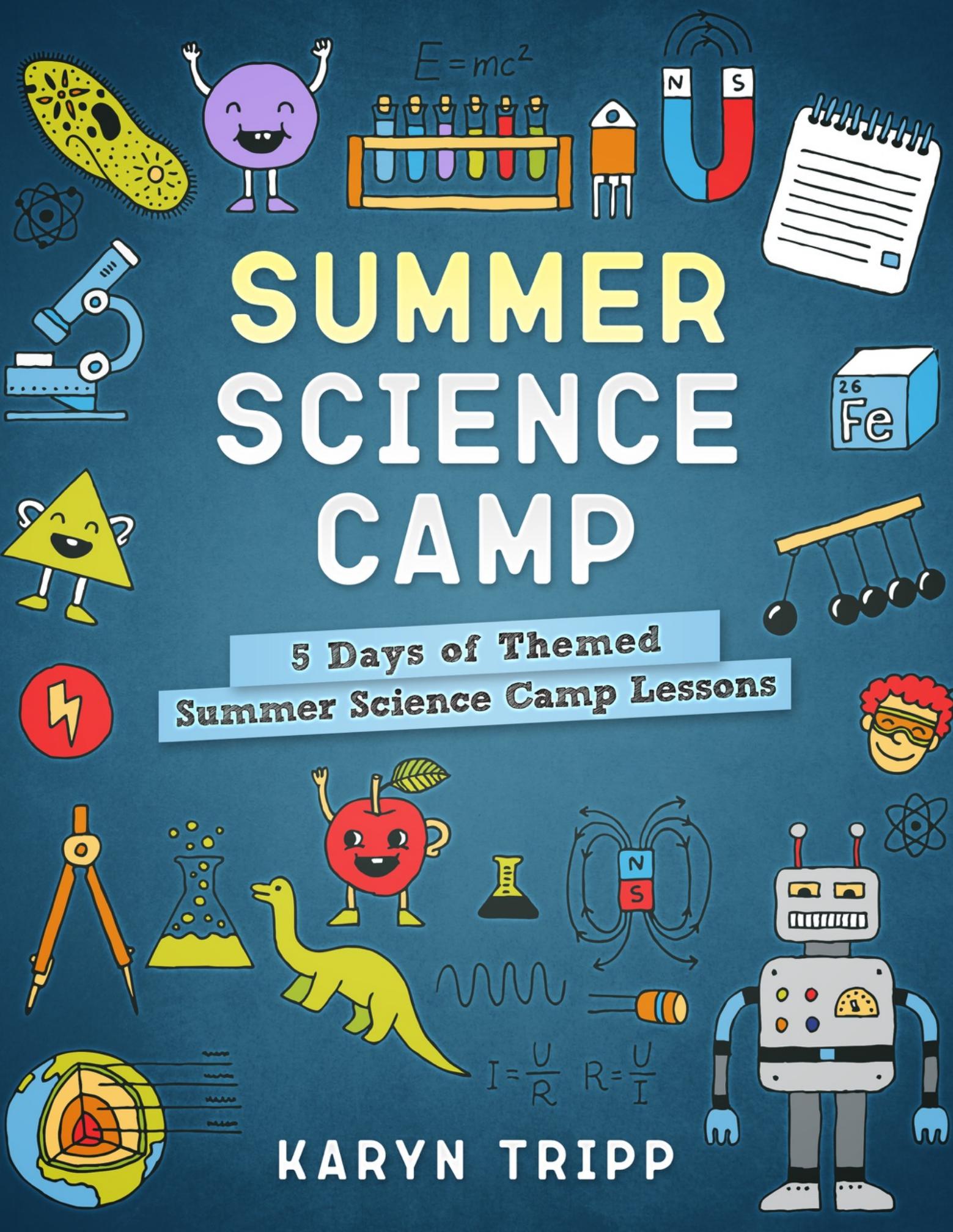


SUMMER SCIENCE CAMP

5 Days of Themed Summer Science Camp Lessons

KARYN TRIPP





Summer Science Camp

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by Karyn Tripp

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Summer Science Camp Lessons

This lesson guide includes 5 days of summer-themed science activities to do with elementary level kids. You can use this for summer camps or for other learning opportunities in homes or schools. Each day includes a theme and 4-5 different options for experiments to do with the kids. There are also recommended snacks, books and active play activities for each day.

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Day One- Water Science

Experiments For This Day Include:

- Water Filtration Experiment
- Mini Water Sprinkler Pump
- Straw Water Pump
- Blooming Paper Flowers
- Water Clock

Recommended Books: (click titles for links)

[The Magic School Bus at the Waterworks](#) by Joanna Cole

[One Well: The Story of Water on Earth](#) by Rochelle Strauss

[A Drop Around the World](#) by Barbara McKinney

Snack Ideas:

Oranges: give each child an orange and a cup of water. Test to see if it will float. Then peel the oranges and test them again. Why did it change?

Watermelon slices

H₂O (Give them water bottles to drink and save them for a later experiment)

Extra Activity Ideas:

- Break the Ice: Divide kids into teams. Give them big blocks of ice with small objects frozen inside. Give them water guns and salt and see who can break the ice first.
- Water Balloon Spoon Races: Fill small water balloons and give kids a large wooden spoon. Carry the balloons across to the bucket on the other side without breaking them. Team with the most in the bucket wins.
- Fill the Bucket: Give the kids sponges and 2 buckets. Try to fill the empty bucket with water by carrying water across with the sponges.

Supplies for All Water Experiments:

- 2 Glass Jars
- Sand
- Gravel
- Coffee Filters
- Dirty Water
- A Plastic Cup with a Hole Cut in the Bottom
- Wooden Skewers, 1 Per Child
- Plastic Straws, 1 Per Child
- Masking tape
- Cups of Water, 1 Per Child
- Scissors
- Markers
- Water Bottles
- Coffee Stir Sticks
- Hot Glue Gun
- Drill
- Sharpie Markers
- Clay
- Flower Template

Water Experiment #1: Water Filtration

Supplies:

- 2 Glass Jars
- Sand
- Gravel
- 3-4 Coffee Filters
- Dirty Water
- A Plastic Cup with a Hole Cut in the Bottom



Instructions:

Begin by getting a jar full of dirty water. You could collect it in a pond, reservoir, puddle, or other location. If that option is not available, just create it yourself!

In the plastic cup, start by lining the bottom with the coffee filters. Then place a layer of clean sand followed by a layer of gravel.

Place the cup into an empty jar. Pour the dirty water into the cup so it can filter down through the gravel, sand and coffee filters. It takes time to filter through (30 minutes - 1 hour)

Look at the difference in the water before and after! The filter collects all of the dirt and particles in it making the water much cleaner.

Discussions or extension ideas:

- Talk about water pollution and the importance of keeping water clean. Discuss water conservation as well. This is usually a critical topic during hot summers.
- Clean the filter and send the water through again. Try dirtying the water with different things like oil, soda, food coloring, etc.
- Get water testing kits to see if you can get it ready for drinking!
- If it is a rainy day, collect rain water in two jars, one with a filter over the top and one without. compare the differences.
- Try this geyser experiment.

See more photos on my website.

Water Experiment #2: Mini Water Pump Sprinkler

Supplies:

- 1 Wooden Skewer Per Child
- 1 Plastic Straw Per Child (the non-bendy ones work best)
- Masking tape
- 1 Cup of Water Per Child
- Lots of extra water for re-fills



Instructions:

Push the pointy end of the wooden skewer through the center of the straw. Position the straw on the bottom third of the skewer.

An inch and a half from the center on each side, cut through one side of the straw leaving the other side attached.

Ben both sides downward to make a triangle shape.

Tape around the straw and the skewer to told it together, but not covering any of the holes in the straw.

Place in a cup of water and spin it around. It will spray around like a sprinkler, so be prepared to get little wet!

Discussions or extension ideas:

When you spin the straw it forces the water inside to spin. When an object is spinning anything on that object will feel a force pushing it outward. This is called centrifugal force. The water in your straw is pushed outward and the only way it can move outward is to move up the the straw. It is pumped upwards. If you spin the straw fast enough the water will fly out like a sprinkler. Many pumps use the same principle. It is a very simple pump to build, so it is used in machines such as washing machines and vacuums.

Water Experiment #3: Straw Water Fountain

Supplies:

- Water Bottle
- Clay or ricky-tack
- Straw
- Balloon
- Food Coloring (optional)



Instructions:

Cut a small hole in a water bottle and put a straw through it. Use a bendy straw and make sure the straw is pointing upwards.

Cover the openings with clay to seal it and make it air tight. Fill it with water. Color the water to make it more visible.

Blow up a balloon and put it over the opening of the water bottle quickly before the air all goes out. You will want to put the water bottle on a tray to catch the water. The air from the balloon pushes the air out of the straw.

Discussions or extension ideas:

Discuss air pressure and how it can push the water out of the straw. Pressure is created when air is trapped inside of the balloon. The air which is forced into a confined space wants to escape. By releasing the air from the balloon into the bottle, water is forced out through the straw, creating a fountain. When all of the water is displaced from the bottle, the remaining air from the balloon still needs to escape and continues to come out of the straw, since it is the only way out.

You could also demonstrate the experiment with a cup full of water and a notecard. Fill a cup one-third with water. Cover the entire mouth with an index card. Holding the card in place, take the cup to the sink and turn it upside down. Remove your hand from underneath and the card will stay put keeping the water in. Because the water inside the cup is lighter than the air outside, the card is held in place by about 15 pounds of force from the air pushing up, while the force of the water pushing down is only about one pound of force.

Water Experiment #4: Blooming Paper Flowers

Supplies:

- Paper Flowers (or coffee filters)
- Scissors
- Markers
- Tub of Water



Instructions:

Start by cutting out some paper flowers. You can use my printable Flower Template on the next page, or just cut your own.

After they were cut, we colored them with markers. We used markers because we wanted to see the colors swirl in the water. This works better with the coffee filters.

Fold the flower petals into the center. You do not want to fold them tightly, just a loose fold or they will not open as well. Don't press the creases too tight. You can also add in a little surprise extra paper shape inside the folded flower. See what I mean in the video below.

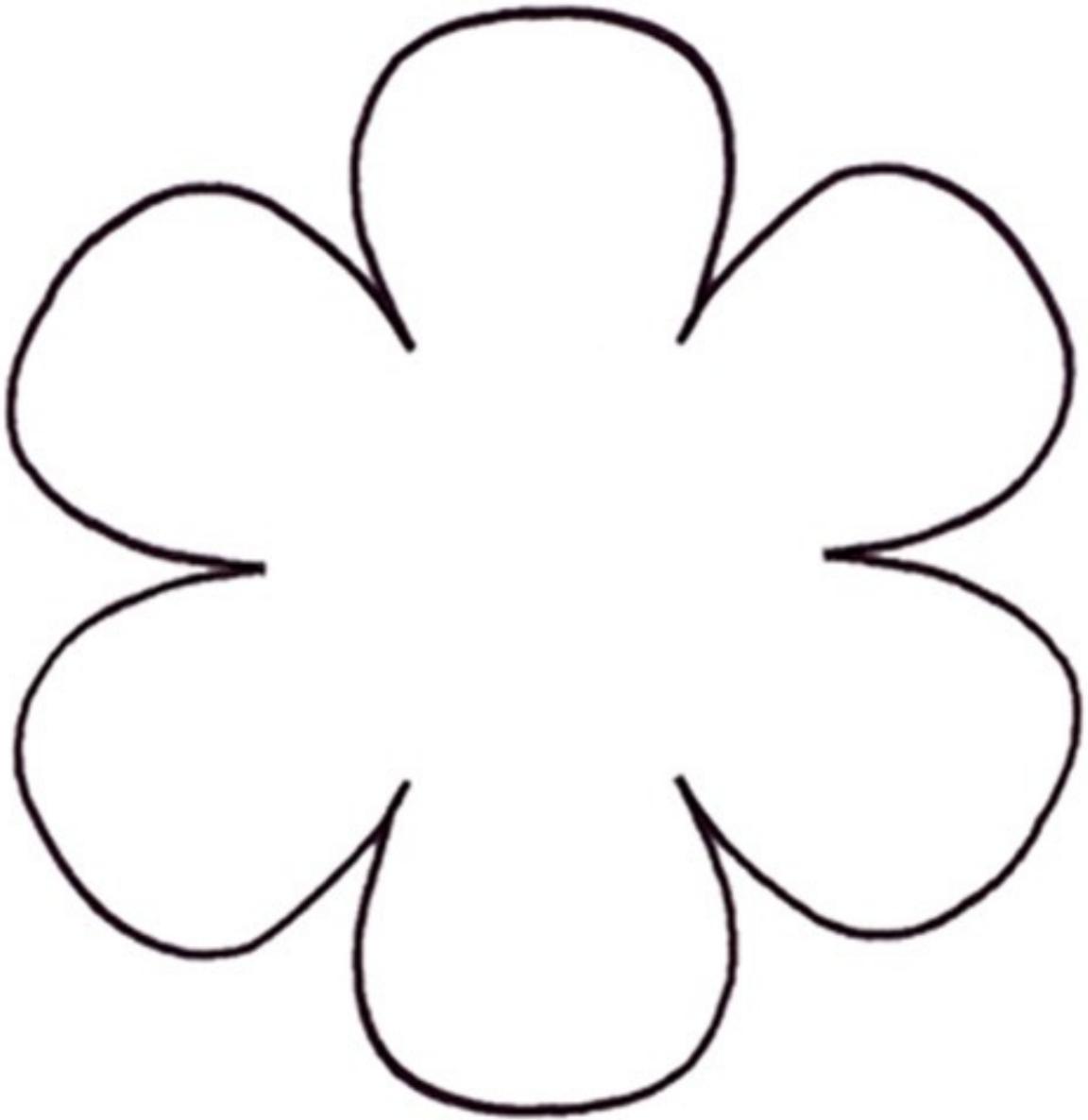
Fill a bowl or other large container with a few inches of water. We used a plastic bin so we could do lots at once.

Place the folded flower into the water and the paper will absorb the water causing it to open the petals. It is pretty amazing to watch. They begin opening one at a time until it is all the way open.

Discussions Ideas:

Why does this happen? The paper is made up of small fibers. When the fibers absorb water, they swell up and the paper expands. This makes the creases flatten out, which opens the flower. Different papers will open at different rates. Try a few different types of paper to test it out!

See the Youtube video example: <https://youtu.be/nFW8r6lv8ls>
Also see more photos on my website.



Water Experiment #5: Water Clock

Supplies:

- 2 Water Bottles for each child
- Coffee stir straws
- Drill
- Hot Glue Gun
- Sharpie Markers



Instructions:

Empty the water bottles and keep the lids. Using a hot glue gun, glue the tops of the two lids together.

Find a drill bit to match the width of your straw and drill two holes through the two caps.

Cut the straw in half and place them through the holes with one long and one short facing each side. Trim off the extra. And hot glue around the edges of the straw to secure them in place.

Fill one bottle with water and screw the lids back on to both bottles.

Flip the bottle and time the water. Mark with a line at each minute. Flip and do the same on the other bottle so both sides have the minutes marked.

It works like an hourglass with the water passing back and forth between the two bottles. It is fun to create something that measures time without technology.

Discussions Ideas:

How does it work? A water clock was an ancient way to tell time with natural elements, similar to an hourglass or a sundial. Time is measured by the flow of water from one container to the other.

This is one of the oldest ways to measure the passing of time! They used to make water clocks with bowls that had a hole at the bottom and was placed on a ledge above another bowl. The water poured into the second bowl. As time went on they became more advanced with gears and water wheels. They calibrated the water clocks with a sundial for accuracy. You can still use them to measure time today!

[See more photos on my website.](#)

Day Two- Plants & Insects

Experiments For This Day Include:

- Worm Tower
- Leaf Transpiration
- Pitfall Insect Trap
- Leaf Chromatography
- Flower Dissection

Recommended Books: (click titles for links)

Wiggling Worms at Work by Wendy Pfeffer

On Beyond Bugs by Tish Rabe

Small Wonders: Jean-Henri Fabre and His World of Insects by Matthew Clark Smith

Tell Me, Tree by Gail Gibbons

Snack Ideas:

Grapes on a skewer (caterpillars)

Ants on a Log (Celery, Peanut Butter and Raisins)

Popcorn- discuss the different seeds we eat!

Butterfly snack bags- ziplock baggies with a clothespin through the center to look like a butterfly

Extra Activity Ideas:

- Nature Scavenger Hunt
- Spider Web Game: Get a different colored yarn for each team. Then, tie the end of each ball of yarn to a different object and wind the yarn through obstacles, like trees or furniture. Make it look like a spider web & overlap the different colors of yarn. All of the yarn should meet at the end; this is the starting point. Each player takes the loose end of their yarn and makes their way through the web, rewinding their yarn. The first ones to untangle theirs wins.
- Leaf and tree rubbings
- Make leaf or dandelion crowns

Supplies for All Insect and Plant Experiments:

- Empty 2 liter soda bottles
- Dirt
- Gravel
- Dark colored paper
- Tape
- Trees with Leaves
- Plastic Ziplock Bags
- Rubber Bands
- Scissors
- Shovel
- Various leaves
- Rubbing Alcohol
- Coffee Filters
- Cups/Jars
- Flowers
- Flower ID Chart

Insect & Plant Science Experiment #1: Build a Worm Tower

Supplies:

- Empty 2 liter soda bottle
- Dirt
- Gravel
- Dark colored paper
- Tape



Instructions:

Cut the top off of the soda bottle and keep the top. Fill the bottle 1/3 of the way with gravel then the rest with dirt. Let the kids dig outside and find worms to add to the bottle. Add worms into the bottle after filling it about half way. then add more dirt to it.

After it is filled all the way, put the top of the bottle on, but flip it upside down so it is like a funnel. This keeps it closed, but allows you to add water into the bottle to keep the soil moist. Add a little water to the soil.

Cover the outside of the bottle with dark paper so that the worms have a dark place to tunnel through.

Let them dig around for a day or so, then you can remove the paper to see what they are doing in the bottle. There will be worms around the outside of the bottle that you can observe.

Discussions Ideas:

Earthworms aerate and enrich the soil as they burrow through it. They feed on plants and animals, or their rotting remains. Most worms are blind. Their most important sense is touch. Their skin picks up vibrations caused by sounds or movements. Worms live where there is food, moisture, oxygen and a favorable temperature. If they don't have these things, they go somewhere else. In an acre of land, there can be more than a million worms!

[See more photos on my website.](#)

Insect & Plant Science Experiment #2: Leaf Transpiration

Supplies:

- Trees with Leaves
- Plastic Ziplock Bags
- Rubber Bands



Instructions:

For our leaf transpiration project, we went out into our yard on a sunny day and found a big leaf on a tree. We covered it with a plastic bag and sealed it tight around the branch with a rubber band. After a minute I could see the bag beginning to fog up a bit. We left it and I said we would come back in a hour or two to see what had happened.

Being a busy absent-minded mom, I forgot about it until the next day. I reminded my son and we went running out to the yard to see what might have happened. We were both quite surprised to see quite a lot of water had collected in the plastic bag!

Discussions Ideas:

Transpiration is the process of water moving through plants and its evaporation from leaves, stems and flowers. We all know that plants need water. However, it only uses a small amount. The rest is lost by transpiration (about 99%!!) Leaves have pores all over them that you can see if you look closely on the bottom side with a magnifying glass. These pores are called stomata. The plants open their stomata to let in carbon dioxide and water comes out of the pores in the process. It cools the plants, but it is also a critical part of the water cycle. Transpiration adds a huge quantity of the water back into the air.

[See more photos on my website.](#)

Insect & Plant Science Experiment #3: Pitfall Insect Trap

Supplies:

- Empty 2-liter bottle
- Scissors
- Shovel



Instructions:

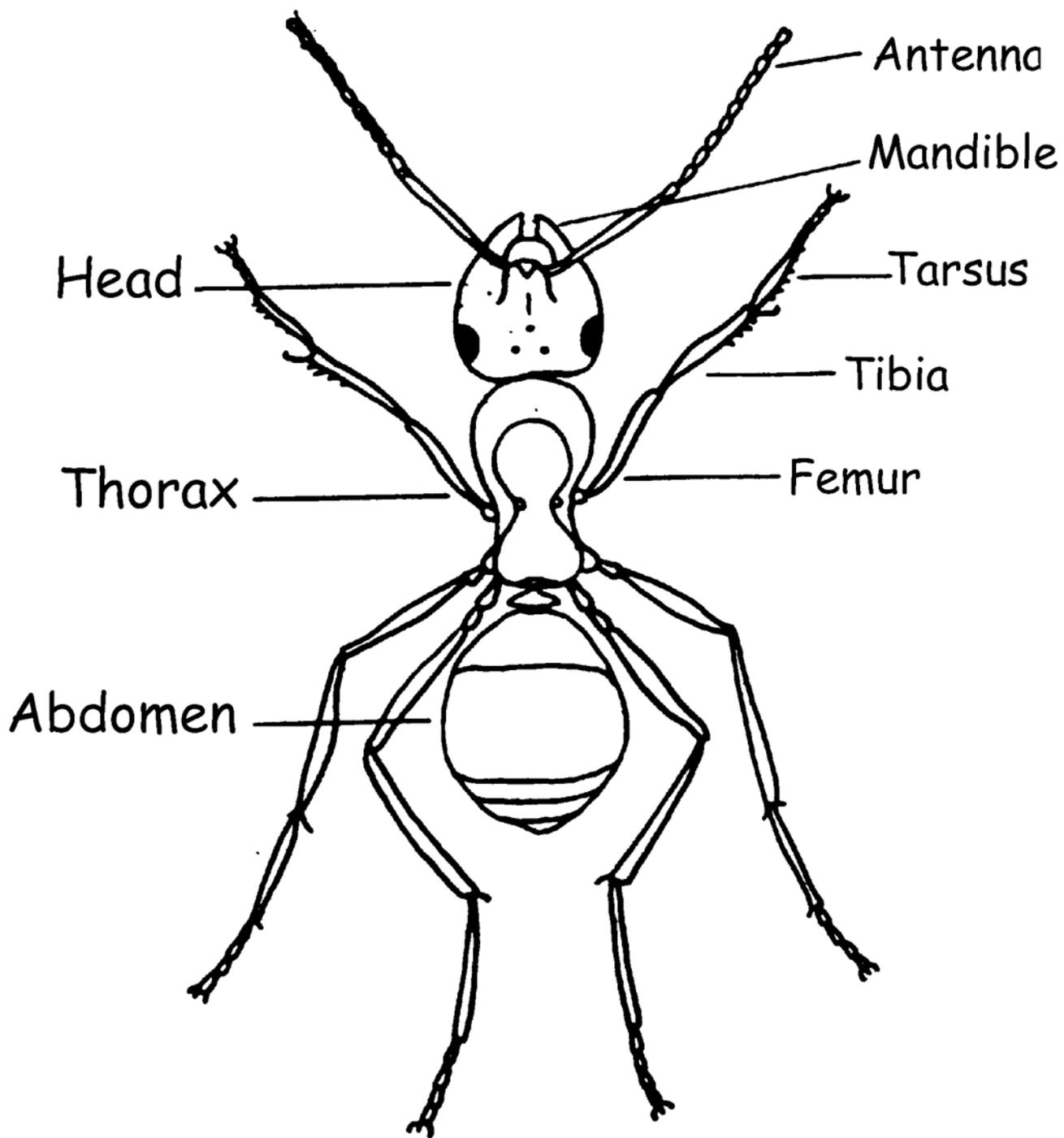
To make the insect trap, you just need an empty 2-liter soda bottle. Cut off the top about 1/3 of the way down. Invert the lid into the bottle so the top is down inside.

Next you need to choose a spot outside that will not be disturbed. Dig a hole that will fit the bottle.

Then fit the bottle into the hole. Fill in any dirt around the edges and cover the top with leaves to disguise it a bit. Now the bugs, when they walk over it, will slide down inside. The sides of the bottle are too slippery for most bugs to climb out. They will get trapped down inside of the bottle. This may be something you will want to do and then check on the following day.

Discussions Ideas:

Discuss the different types of insects that live in your area. You can identify the ones found in your trap, too! Talk about insects and their body parts. Compare different insects. See the diagram on the next page.



Insect & Plant Science Experiment #4: Leaf Chromatography

Supplies:

- Various leaves
- Rubbing Alcohol
- Coffee Filters
- Cups/Jars



Instructions:

Get several different types and colors of leaves to test. Rip them into little pieces and put them into small jars. Then cover the leaves with a small amount of rubbing alcohol.

Place the jars into a pan of HOT water. Shake them around every few minutes to help release the pigment. I kept refreshing the hot water to keep it hot. We left it for about an hour- until you can see the alcohol changing color.

Then, use strips of coffee filter paper and place them into the liquid with the end in the alcohol and the other end taped to the edge of the jar to keep it in place. Let it sit for an hour or two for the color to be absorbed up into the paper strips. The colors will separate and it will show the varying shades of color in the leaves. It's pretty cool to see what happens!

Discussions Ideas:

You can see the different pigments by breaking them down and separating them with chromatography. Chromatography is the separation of mixtures into individual components using energy (heat) and alcohol.

Insect & Plant Science Experiment #5: Flower Dissection

Supplies:

- Flowers- (carnations or other inexpensive flowers) 1-2 per child
- Flower Diagrams

Instructions:

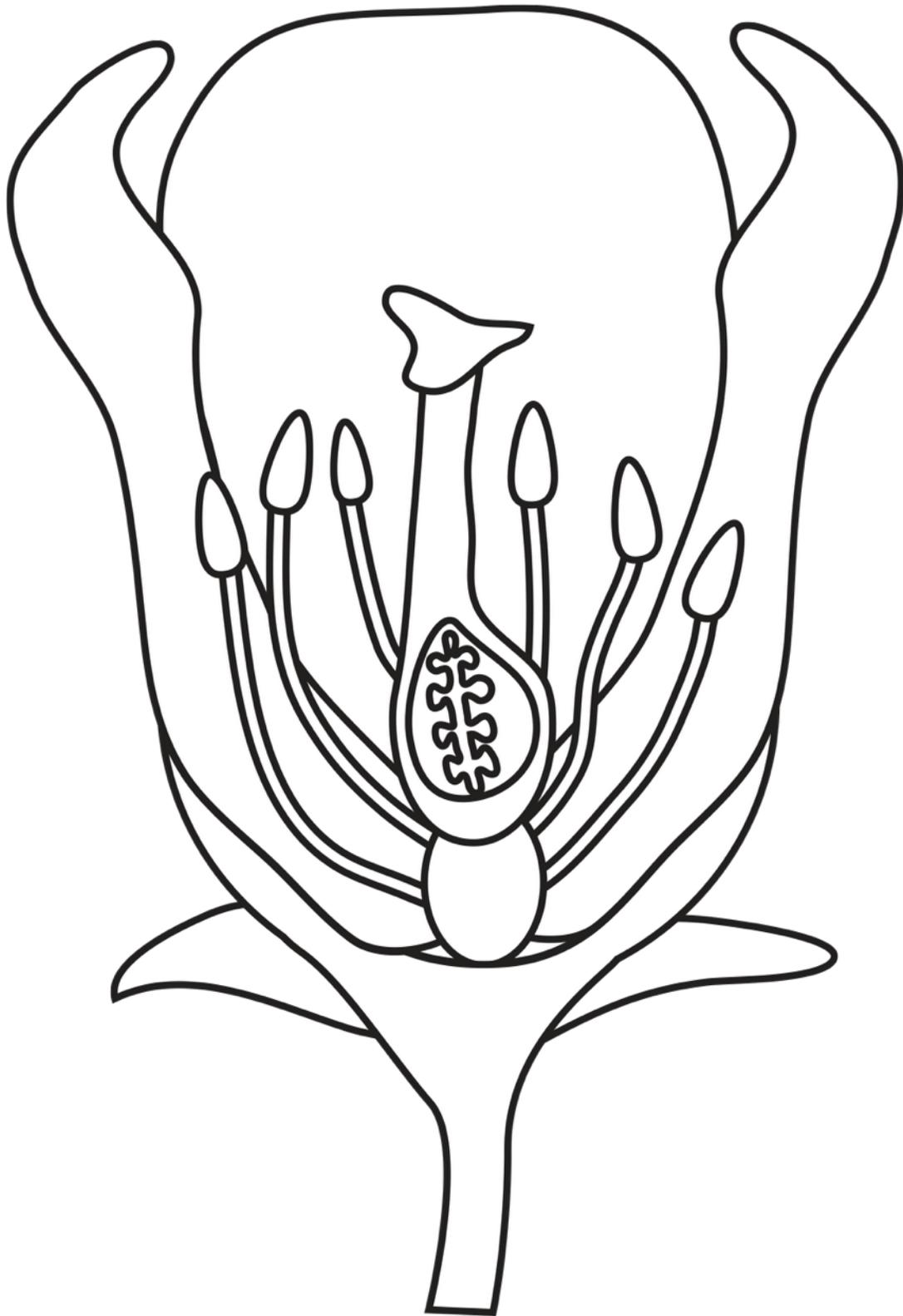
Use the diagrams on the following pages to teach kids about the parts of flowers. Give each child a flower and let them open it up and discover each part and learn the names. Carnations are an inexpensive choice for a larger group, but most flowers will work great!



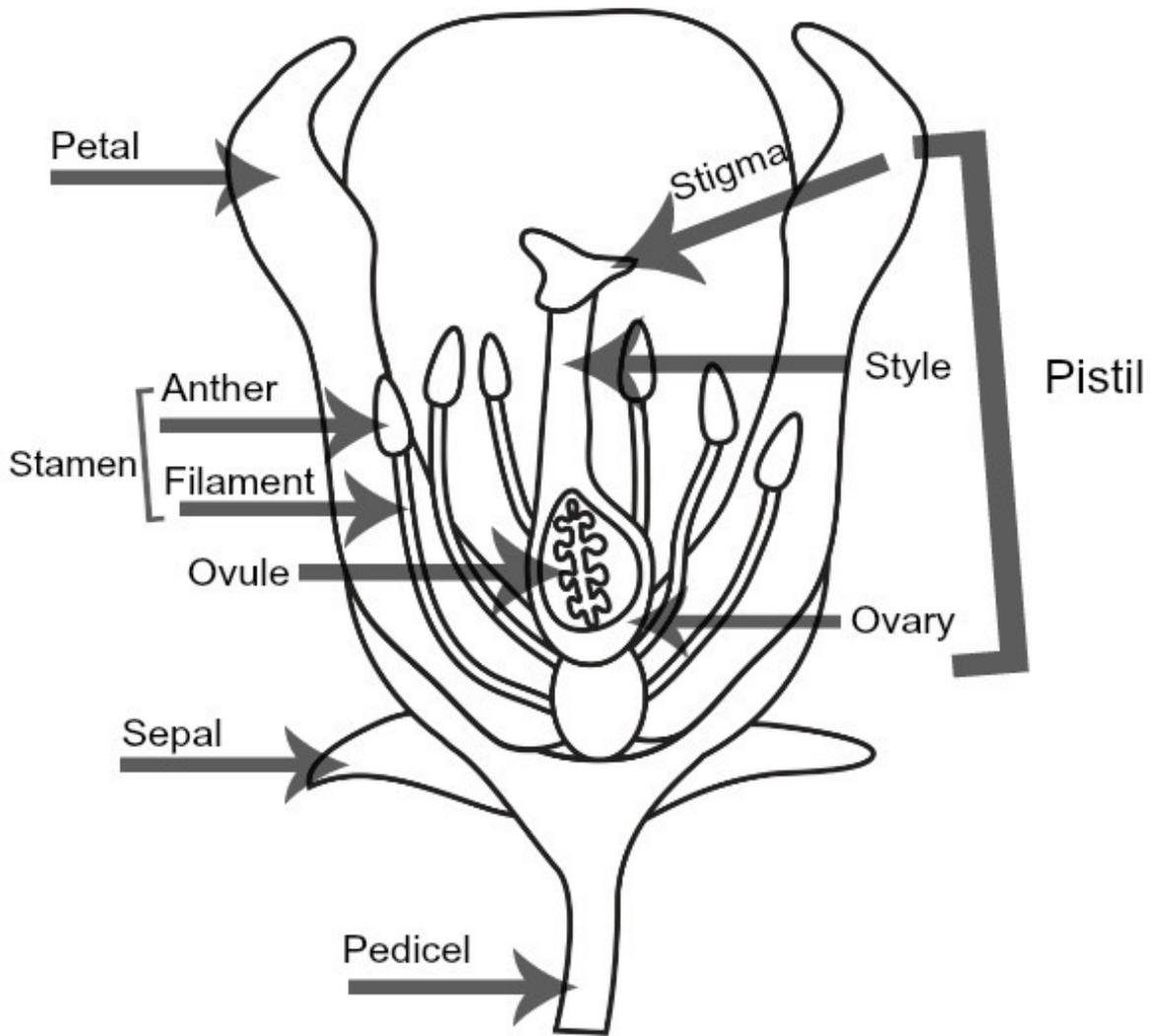
Discussion Ideas:

You could use a variety of flowers and compare the differences. Also, discuss the importance of each part of the flower and what the purpose is.

- The main flower parts are the male part called the stamen and the female part called the pistil.
- The stamen has two parts, the anthers and the filaments. The anthers hold the pollen and are usually yellow. Anthers are held up by a stem-like part called a filament.
- The pistil is the larger center section and has three parts, the stigma, the style, and the ovary. The stigma is the sticky surface at the top of the pistil; it traps and holds the pollen. The style is a tube-like structure that holds up the stigma. The style leads down to the ovary that contains the ovules.
- Petals attract pollinators and are usually the reason why we buy and enjoy flowers because of their beauty.
- Sepals are the green petal-like parts at the base of the flower. Sepals help protect the developing bud.
- Flowers can have either all male parts, all female parts, or a combination. Flowers with all male or all female parts are called imperfect (cucumbers, pumpkin and melons). Flowers that have both male and female parts are called perfect (roses, lilies, dandelion).



Flower Parts



Day Three- Weather Science

Experiments For This Day Include:

- Solar Cooking
- Sun Prints
- Solar Still
- Weather Vane
- Homemade Thermometer

Recommended Books: (click titles for links)

[The Boy Who Harnessed the Wind](#) by William Kamawamba

[The Reasons for Seasons](#) by Gail Gibbons

[Oh Say Can You Say What's The Weather Today?](#) by Tish Rabe

Snack Ideas:

Extra Activity Ideas:

- Cloud tracking- see attached diagram
- Shadow clock- trace their shadow standing in the same spot every hour
- Tornadoes in a bottle- 2 2-liter bottles attached together and full of water. Spin to make tornadoes.

Supplies for All Weather Experiments:

- Muffin pan
- Foil Cupcake Liners
- Empty Oatmeal Can or Empty Pringles Cans
- Wooden Skewers
- Roll of Tin Foil
- Empty Pizza Box
- Glass Bowl
- Small Jelly Jar
- Plastic Wrap
- Rock
- Clay
- Straw
- Card Stock Paper
- Wooden Skewer
- Tape
- Sun Print Paper or Construction Paper
- Arrow templates

Weather Science Experiment #1: Solar Cooking

Supplies:

- Muffin pan
- Foil Cupcake Liners
- Empty Oatmeal Can or Empty Pringles Cans
- Wooden Skewers
- Roll of Tin Foil
- Empty Pizza Box



Instructions:

For this experiment, there are a few ways you can do it. You can test out three different solar cooking experiments to see which one works best and most quickly. Or, you can choose just one of them for all of the kids to do together.

Option #1: In a Muffin Pan- This is a simple method of solar cooking. You make s'mores inside of a muffin pan using foil cupcake liners. Build them in the muffin pan and let the sun cook them. The time will vary depending on the weather where you live.

Option #2: In An Oatmeal or Pringles Can: Pringles cans are already foil lined, Oatmeal cans will need to be lined with foil. Either one works! Cut out a rectangle window in the center of the can and stick a wooden skewer tall the way through the can from top to bottom. You can cook marshmallows (or hot dogs!) on the stick. Cover the window with plastic wrap to seal in the heat.

Option #3: In a Pizza Box: Wrap the insides of a Pizza box with tin foil. Prop it open with a stick and place the items you are cooking inside. If you want to keep the box closed to keep out insects, cut a square out of the center of the lid and cover with plastic wrap.

Discussions Ideas:

Discuss the heat of the sun and how/why this works. The cookers you make are absorbing the sun's heat and heating up the food which cooks it. If you try multiple types of this experiment, talk about which one worked best and let them discuss why they think that is the case.

Weather Science Experiment #2: Solar Still

Supplies:

- Glass Bowl
- Small Jelly Jar
- Plastic Wrap
- Rock



Instructions:

We made a very simpler version of a solar still with a glass bowl, a small glass jar and plastic wrap.

Fill a bowl with water and mix in a few tablespoons of salt until it dissolves in the water. Put a glass jar in the center of the bowl, and push it down. You do not want to get any of the salt water into the jar, so make sure the water is not too full in the bowl.

Cover it all with plastic wrap and seal it tight. Put a rock in the center to weight it down and allow the water to fall into the jar. Place it outside in the warm sun for a few hours. What happens is the water evaporates and collects on the plastic wrap. Then with the rock in the center it causes the water to run down towards the jar and pool in the jar.

If you let it work for several hours, there will be a small amount of water in the jar. Taste it, and the water will not taste salty, but fresh. My kids thought this was SO cool! But they were a little afraid of tasting it.

Discussions Ideas:

A solar still is an easy way to distill water, using the heat of the sun to create evaporation from salt water or any impure water and turning it into fresh water, leaving the salt behind. This would be useful to know how to do in nature if you had no fresh water to drink or in an emergency situation. You can also discuss the process of evaporation.

Weather Science Experiment #3: Weather Vane

Supplies:

- Clay
- Straw
- Card Stock Paper
- Wooden Skewer
- Tape



Instructions:

Print the arrow templates located on the next page.

Stick the dowel into a small ball of clay.

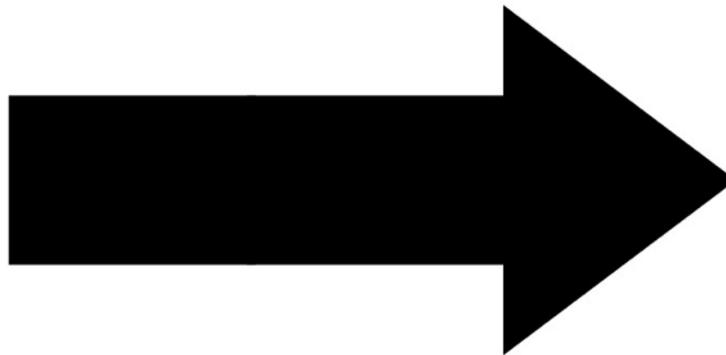
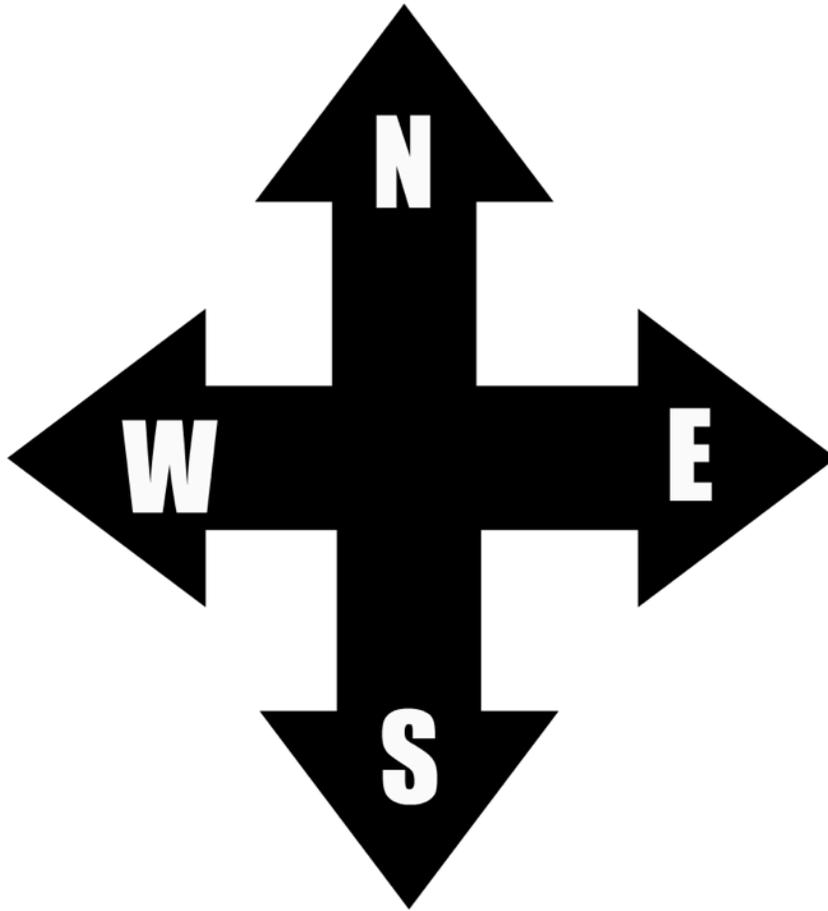
Punch holes in the middle of the four sided arrow and slide it onto the skewer. Slide the straw onto the top. The straw should be loose and able to spin around. Tape the other single arrow to the top of the straw.

Take your wind vane outside and adjust the bottom arrows to point in the correct direction. (N-S-E-W) The wind will blow the top arrow and point in the wind is blowing!

You could do this to track the wind direction for a few days & record your results.

Discussions Ideas:

Talk about weather and the directions of wind. Wind direction changes usually accompany changes in the weather. The air flows around low pressure systems. A wind shifting from the south often means warmer air is approaching and a wind from the north often means cooler air is approaching.



Weather Science Experiment #4: Sun Prints

Supplies:

- Sun Print Paper or Construction Paper
- Other objects to use to create the prints (toys, nature objects, etc).
- Sunscreen (optional)



Instructions:

This works best with sun print paper, however construction paper will suffice to save costs. Set the papers out in a sunny location. Let the kids place different objects on the paper and leave them for a period of time. You will need to weigh the papers down so they do not blow away. This can be done with a large sheet of plexi-glass, plastic wrap, or anything else.

It can take a few hours for the images to show up, so do this activity at the beginning of the day! Let the kids make a few with varying objects and patterns.

Expand it by testing UV sunscreens on the paper!

Discussions Ideas:

The nature print paper is coated with light-sensitive chemicals. They react to light waves and particles when exposed to light. When you place objects on the paper, they block the light and turn white while the paper around them remains blue. Water stops the process and fixes your images on the paper.

Weather Science Experiment #5: Homemade Thermometer

Supplies:

- Modeling clay
- Red food coloring
- Water
- Clear straw
- Rubbing alcohol
- Small clear bottle with a narrow neck
- Thermometer (optional)



Instructions:

Pour equal amounts of water and rubbing alcohol into the bottle until it is 1/4 of the way full. Add in a few drops of red food coloring to make it more visible and to look like a thermometer. Put the straw into the bottle and wrap the clay tightly around it and the opening of the bottle. You do not want the straw touching the bottom of the bottle, so move it up and have the clay hold it in place. Leave the top opening of the straw uncovered.

Now you can test the thermometer! Put your hands around it to see if that warms it up. Or place it into a bowl of really hot water to get a fast reaction. Put it into the freezer to see what change happens.

Discussions Ideas:

When the alcohol and water mixture gets hot, it expands and moves up the straw. How hot would it have to be for the water to come out of the straw?

Try to make a scale for the thermometer. Use a store bought thermometer to identify the temperature that the area where the homemade thermometer mixture is. Put a line on the straw where the liquid is, and mark the temperature that the thermometer says. Do this in various cold and hot places.

Day Four- Rocket Science

Experiments For This Day Include:

- Film Canister Rockets
- Ribbon Rockets
- Mento Soda rockets
- Bottle Rockets
- Straw Rockets

Recommended Books: (click titles for links)

[If You Decide to Go to the Moon by Faith McNulty](#)

[Mousetronaut by Mark Kelly](#)

[This is the Way to the Moon by Miroslav Sasek](#)

[Me and My Place in Space by Joan Sweeney](#)

[Space Shuttle Blasts Off by Peter Bently](#)

[Mission to Mars by Franklyn M. Branley](#)

Snack Ideas:

- Make rocket fruit kabobs with strawberries on top, and assorted fruit.
- Make edible constellations with pretzels and marshmallows.
- Pop rocks
- Star shaped cookies or crackers

Extra Activity Ideas:

- Make the moon phases out of Oreo cookies.
- Balloon Rockets: Tie a string across the back of two chairs and thread a straw through it. Blow up a balloon and do not tie it. Tape it to the straw and let go of the balloon. It will race across!
- Tea Bag Rockets: Open a tea bag and dump out the tea leaves. Unfold the bag and it will be a tube shape. Place on a plate and light the bottom of the tea bag. As it burns, it will float up in the air. It goes quickly, so be prepared to do it multiple times!

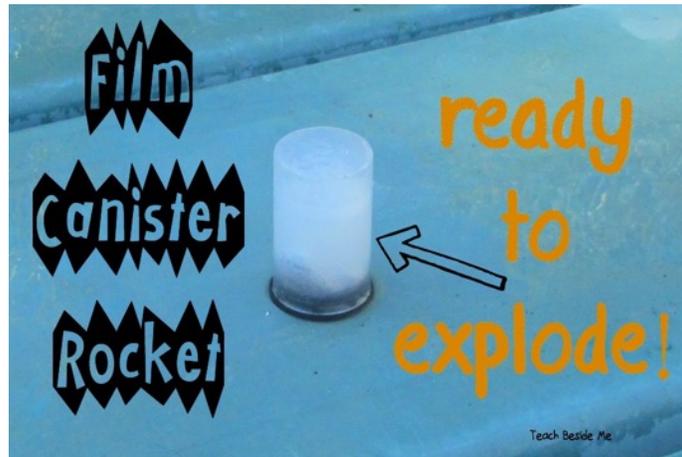
Supplies for All Rocket Experiments:

- Empty Film Canisters (you can [buy them](#) in bulk)
- Effervescent Tablets (like alka-seltzer)
- Water
- Paper to decorate rockets (optional)
- Plastic Water Bottles
- Baking Soda
- Vinegar
- Cork
- Tissue Paper or Toilet Paper
- Balloons
- Funnel

Rocket Science Experiment #1: Film Canister Rockets

Supplies:

- Empty Film Canisters (you can buy them in bulk)
- Effervescent Tablets (like alka-seltzer)
- Water
- Paper to decorate rockets (optional)



Instructions:

If you want to decorate them to look like rockets, you just wrap a piece of paper around the canister with the lid of the canister sticking out the end so you can open and close it. Tape it together, We made little cone tops out of circles with a slit cut into it so you can wrap it around to make a cone.

To set off the rockets, you need to fill the canisters about 1/3 of the way full of water and drop in a tablet. Quickly close the lid and set it down (lid side down) on the table or ground outside.

This is definitely an outside activity~ it is messy! The tablets will fizz and release carbon dioxide that will cause the canister to pop open and shoot up. **Make sure to stand back do you don't get hit by any flying parts!**

Discussions Ideas:

What's happening? When you add the water it starts to dissolve the tablet. This creates a gas called carbon dioxide. As the carbon dioxide is being released, it creates pressure inside the film canister. The more gas created, the more the pressure builds up until the cap is blasted down and the rocket is blasted up into the air.

Rocket Science Experiment #2: Easy Bottle Rockets

Supplies:

- Plastic Water Bottles
- Baking Soda
- Vinegar
- Cork
- Tissue Paper or Toilet Paper
- Balloons
- Funnel



Instructions:

There are two options for this experiment.

Pour about an inch worth of vinegar into the bottom of the bottle. Put about a teaspoon of baking soda onto the tissue square and fold it up (this will create a time-release packet).

Go outside and when you are ready to watch it explode, drop the baking soda packet in, put on the cork- tight, but not too tight- and let it explode. Place it cork side down to watch it fly!

The second option is to keep the bottle right side up. Using a funnel, put a teaspoon of baking soda into the balloon and the vinegar in the bottle. Attach the balloon to the top of the bottle without letting the baking soda fall in as you do so. Dump it in all at once and watch the balloon inflate.

Discussions Ideas:

What's happening? Mixing vinegar and baking soda is an acid/base reaction that creates a lot of foam and bubbles. These bubbles are filled with carbon dioxide gas that's being released. When you close the bottle with the cork, you prevent the carbon dioxide from escaping. This increases the pressure inside the bottle. Eventually the bottle can't hold all of the pressure and it explodes into the air.

The contents of the bottle shoot down, and the bottle shoots up. This is an example of Newton's Third Law of Motion: for every action, there is an equal but opposite reaction. Rocket Science

Rocket Science Experiment #3: Easy Bottle Rockets Ribbon Rockets

Supplies:

- Toilet Paper Rolls
- Curling Ribbon
- Decorating supplies (optional)



Instructions:

You can decorate the toilet paper rolls to look like rockets if desired, but it is not necessary.

Cut two long strings of curling ribbon. I did them quite long (several feet), but made sure they were even. Thread them through the rocket and have someone on each end holding the two ribbons.

To make the rocket go, pull the rocket all the way up to one person. Then pull the two ribbons apart and the rocket will shoot across to the other side. Then keep it going back and forth the same way. It takes a minute to figure out the rhythm of it.

Here is a video of how to make the ribbon rocket work. Sometimes it is just easier to see it in action. It took us a minute to get it going.

Discussions Ideas:

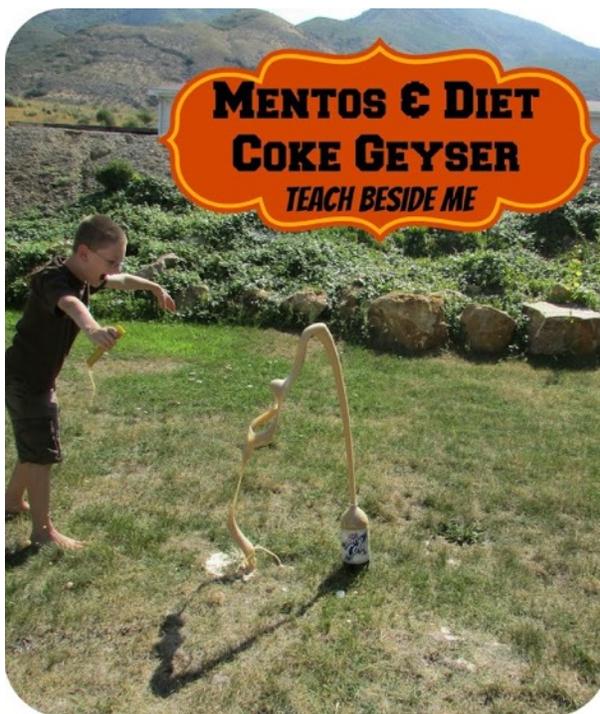
How does this work? The motion of the ribbons and the friction make the rocket move across the tube.

Have races between teams to see how many times they can get their rocket across in a minute!

Rocket Science Experiment #4: Coke Geysers

Supplies:

- 2-liter bottles of DIET cola
- Mint Mentos (candy)
- Rolled paper
- lots of space!



Instructions:

To do this you just need a 2 liter bottle of Diet Coke (buy generic!) and roll of mint Mentos. You'll also want a piece of paper to roll the mints in before dropping them in the bottle.

This little experiment is fun, messy, & over before you know it. Make sure to do this outside!!

Roll the Mentos up inside a half sheet of paper- roll them really tight so it will fit through the hole in the bottle. Drop them in all at once & RUN!

Discussions Ideas:

What's Happening?

The Coke & Mentos geyser is a physical reaction, not a chemical reaction. It is a process called nucleation. All the carbon dioxide in the soda is looking for a way out. It is attracted to any tiny bumps that it can grab onto. Those tiny bumps are called nucleation sites and are places the gas can grab onto and start forming bubbles. Nucleation sites can be anywhere that there is a high surface area in a very small volume.

The surface of a Mentos is covered with over 40 microscopic layers of liquid sugar. That makes it not only sweet but also covered with lots and lots of nucleation sites.

There are so many microscopic bumps on the surface of a Mentos that tons of bubbles will form around the Mentos when you drop it into a bottle of soda.

Since the Mentos are also heavy enough to sink, they react with the soda all the way to the bottom. The escaping bubbles quickly turn into a raging foam, and the pressure builds dramatically. All the pressure has got to go somewhere, creates a massive geyser!

Rocket Science Experiment #5: Straw Rockets

Supplies:

- Straws
- Paper Rockets (see attached template)
- Scotch Tape
- Square of paper
- Crayons or markers to color the rockets



Instructions:

Cut out the rocket template. You will also need another square of paper about four or five inches long.

Decorate the rocket if you want.

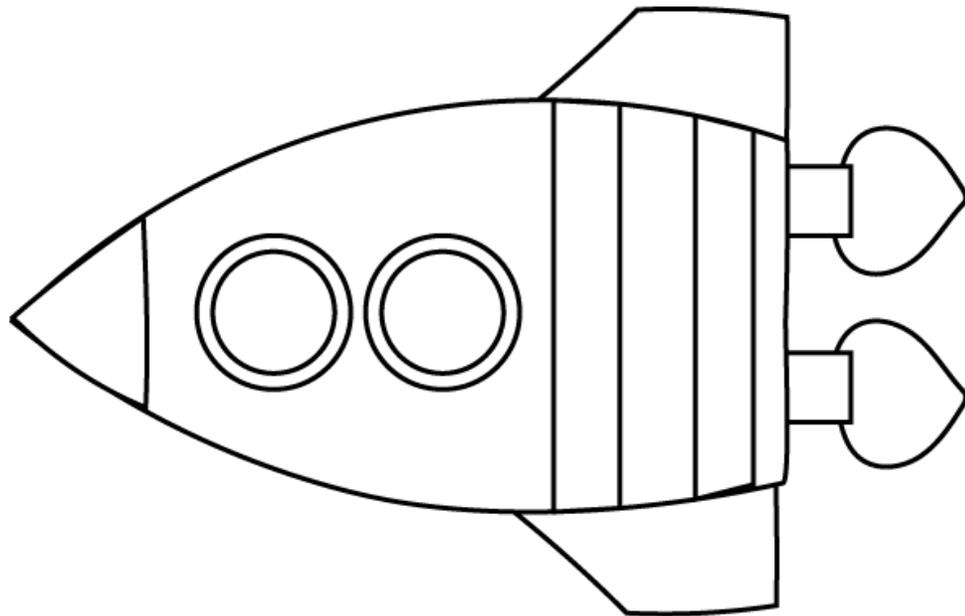
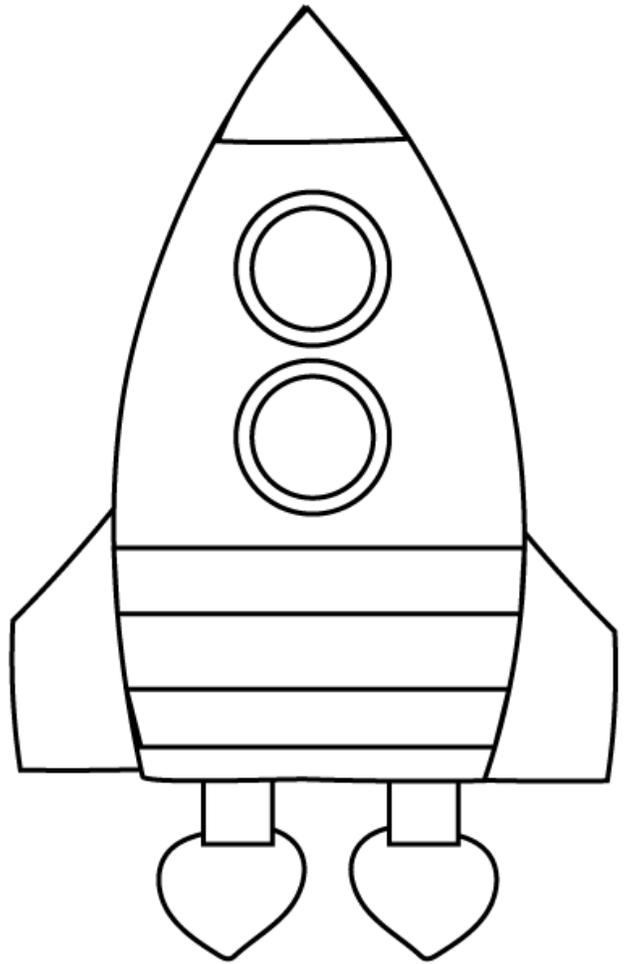
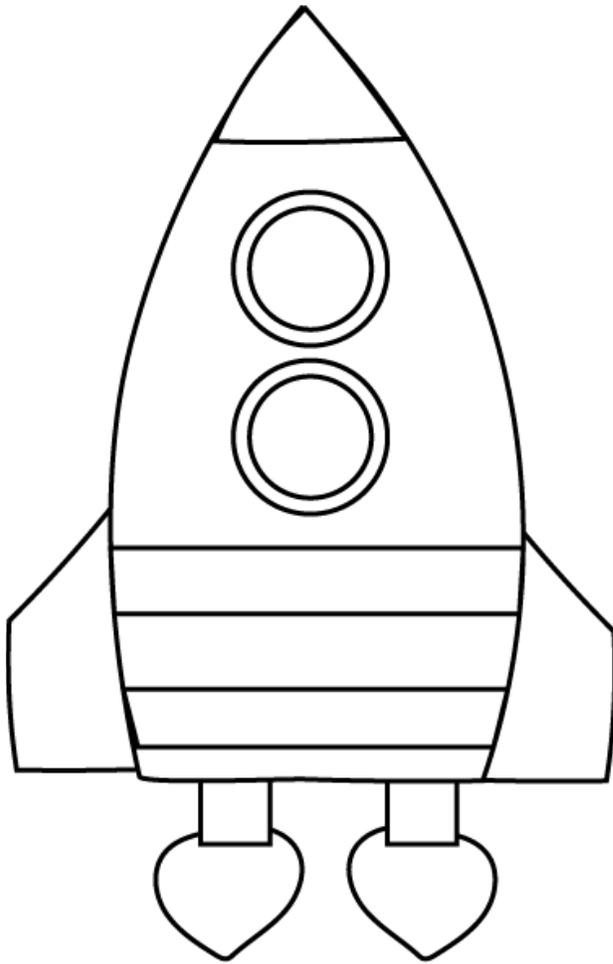
Roll the square of paper tightly around a pencil and tape the paper to keep it rolled. Fold it over at the top about an inch. Secure the fold with tape to keep it down.

Tape the rolled piece to the back of the rocket.

Insert a straw and blow the rocket up into the air~ again and again and again!

Discussions Ideas:

A sharp puff through the straw momentarily fills the rocket tube with "high pressure" air. The tube directs the air back through the opening, producing an action force. The rocket launches because of the equal and opposite reaction force (Newton's third law).



Day Five- Energy Science

Experiments For This Day Include:

- Rubber Band Paddle Boats- Kinetic Energy
- Balloon Powered Cars
- Conductivity experiment
- Play Dough Circuits
- Color Mixing With Lights

Recommended Books: (click titles for links)

[The Magic School Bus and the Electric Field Trip](#) by Joanna Cole
[Electrical Wizard: How Nikola Tesla Lit Up the World](#) by Elizabeth Rusch
[Energy Makes Things Happen](#) by National Geographic
[Oscar and the Bird: A Book About Electricity](#) by Geoff Waring
[Light: Shadows, Mirrors and Rainbows](#) by Natalie M. Rosinsky

Snack Ideas:

Pop Rocks

Peppermint lifesavers (They spark in the dark!)

Make origami paper boats and fill them with goldfish

Make a car snack with apple slices and grape wheels stuck in with toothpicks (let them build them)

Pretzels and some Red, Yellow, & Blue frosting for mixing

Extra Activity Ideas:

- Make origami boats
- If you have Snap Circuits available, this is a great activity!
- Try making a dirt battery. See [Instructions HERE](#).
- Try some sewn circuits. See [Instructions HERE](#).
- Make some light-up roses. See [Instructions HERE](#).

Supplies for All Energy Science Experiments:

- Cardboard
- Rubber Bands
- Duck Tape
- Tub of water
- Lego bricks
- Lego Wheels
- Balloons
- Alligator Clips (at least 3)
- AA Battery Holder & batteries with loose wires
- Random objects some metallic and some non-metallic
- Flour
- Salt
- Cream of Tartar
- Vegetable Oil
- Sugar
- Food Coloring
- LED Pin Lights
- Small Flashlights
- Colored Cellophane
- Rubber Bands

Energy Science Experiment #1: Rubber Band Paddle Boats (Kinetic Energy)

Supplies:

- Cardboard
- Rubber Bands
- Duck Tape
- Tub of water



Instructions:

Draw your boat shape on the cardboard similar to the above image. It looks like a little house and a door. Save the square you cut out to use as the paddle.

You will need to cut the square smaller on all sides so it will easily flip around inside the boat. Keep in mind that you will be covering them with tape, so the width will grow again!

We had to trim a few of our paddles again after we wrapped them with tape. Cover the entire boats and paddle pieces with tape making sure to cover all edges, too. If water gets inside, they get soggy really quickly!

Put a rubber band around the boat and place the paddle piece between the rubber band. Twist it up. You will need to twist going away from the boat or the boat moves backwards.

Discussions Ideas:

Potential & Kinetic energy are fun to discuss with this project. Potential energy is stored energy and kinetic energy is energy in motion.

There is potential energy stored in the rubber band being twisted up tightly. When you let go, that potential energy changes to kinetic energy or the energy of motion.

Energy Science Experiment #2: Balloon Powered Cars

Supplies:

- Lego bricks
- Lego Wheels
- Balloons



Instructions:

You could also make the cars out of cardboard and bottle caps, if you do not have a large supply of Legos. Check out this idea on [Steve Spangler Science](#) for more options.

You just need a car (or platform with wheels attached) and a place to insert the balloon. I blew up the balloon, then twisted it a little to keep the air from escaping. Put it in between two little towers with a block on top to keep it in place. Give it a little nudge and the balloon will propel the car!

Discussions Ideas:

When the air escapes, it propels the car forward. This is another example of Newton's Third Law of Motion that says for every action there is an equal but opposite reaction. The action is the air rushing out of the balloon and the reaction is the car moving forward. IF you put it on a ramp, it will go even more quickly adding gravity into the mix.

Energy Science Experiment #3: Conductivity Experiment

Supplies:

- Alligator Clips (at least 3)
- AA Battery Holder & batteries
- Random objects some metallic and some non-metallic: penny, paper clip, nail, pencil, plastic toys, etc.



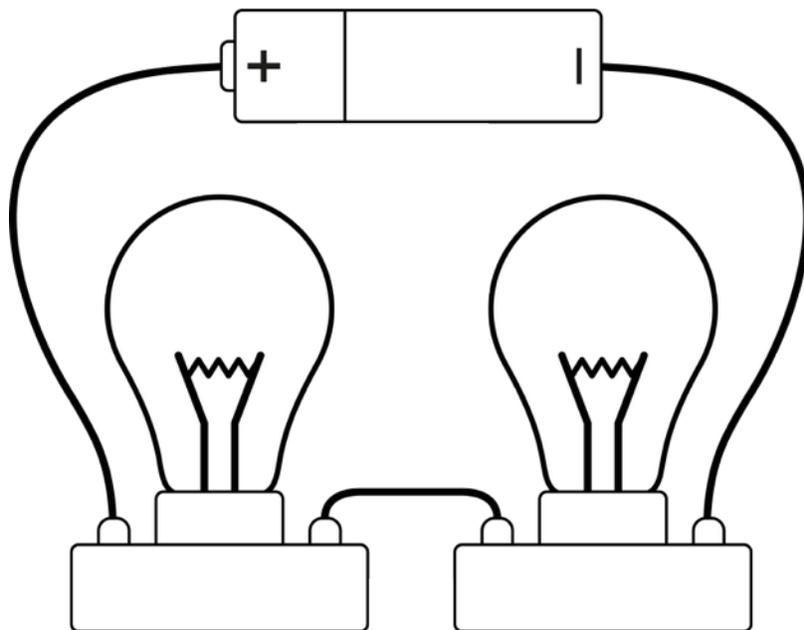
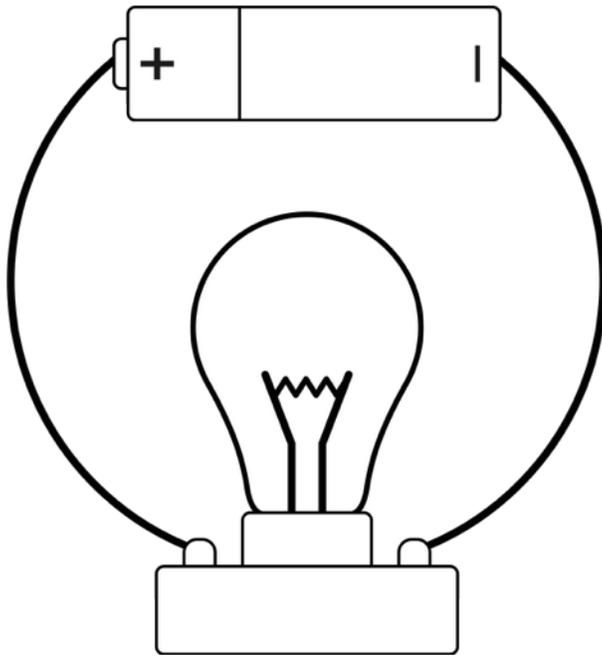
Instructions:

Add batteries to your battery holder. Connect an alligator clip to each side. Red is positive and black is negative. On one side attach a pin light with a third alligator clip to the other side. You will need to match the positive side of the pin light with the positive side of the battery pack. The longer pin is the positive side of the light.

Then between the other two openings you can test the conductivity of the different objects. You can clip them on or even just touch them to the object. The alligator clips tend to be hard for kids to squeeze open.

If it is conductive, the light will light up. If it is not, the light will not light up. It is as easy as that!

Discussions Ideas: Learn how circuits work. Talk about positive and negative charges, what things conduct electricity and what things do not. Use the diagrams on the following page to help illustrate how it works.



Energy Science Experiment #4: Play Dough Circuits

Supplies:

- Flour
- Water
- Salt
- Cream of Tartar
- Vegetable Oil
- Sugar
- Food Coloring
- Battery Pack with loose wires
- LED Pin Lights



Instructions:

CONDUCTIVE PLAY DOUGH RECIPE:

Any old salty play dough recipe will do here! Or you can use your store bought dough.

1 cup Water

1 1/2 cups Flour

1/4 cup Salt

3 Tbsp. Cream of Tartar (or 9 Tbsp Lemon Juice gives the same results)

1 Tbsp. Vegetable Oil

Food Coloring, if desired

Mix in a medium size pot and cook over medium heat stirring consistently. It will thicken into a dough as it cooks. Let it cool, then if it is still too goeey, knead in a bit more flour.

INSULATING PLAY DOUGH RECIPE

1 1/2 to 2 cups Flour

1/2 cup Sugar

3 Tbsp. Vegetable Oil

1/2 cup Water (use distilled for better results)

Food Coloring, if desired

Mix well. Start with less flour, but add more if dough is too sticky. Mine was really sticky so I added quite a bit more flour to get it to the right consistency.

Your battery pack and pin light each have positive and negative sides. The longer pin is positive and the red wire is positive (just like on a number cable!) You need to match those up to create the circuit. Put two pieces of conductive play dough together with the insulating dough between them. Then put the wires into each of the pieces of dough and spread out the pins on the LED light and insert them. They need to be only touching the conductive dough with the matching (+ or - sign or it will not work.)

Discussions Ideas:

Here is how it works: Electricity flows in loops called circuits. It always takes the path of least resistance. The conductive dough will allow electricity to flow while the insulating dough will not.

In the Conductive play dough salt and cream of tartar are included. These ingredients contain ions that allow electrical charges to flow through them. In the insulating dough, the salt and cream of tartar are not included and distilled water is recommended. Sugar does not conduct electricity the way salt does. The water from our tap has minerals (including salt) in it. Using distilled water removes those conductive barriers.

Energy Science Experiment #5: Color Mixing With Lights

Supplies:

- Small flashlights
- Colored cellophane
- Rubber bands



Instructions:

Cover each flashlight with a different color of cellophane sheets cut in half. We used red, yellow, green and blue. Wrap it with tape or rubber bands to secure it on.

Go to a dark room to try it out. We used a white poster board to shine the lights on, but a white wall will work just the same.

Use the Color Mixing with Light worksheet on the next page to help you track the colors you make as you mix the lights. It has a coloring page to fill in the colors you see as well as some questions to fill in about the results.

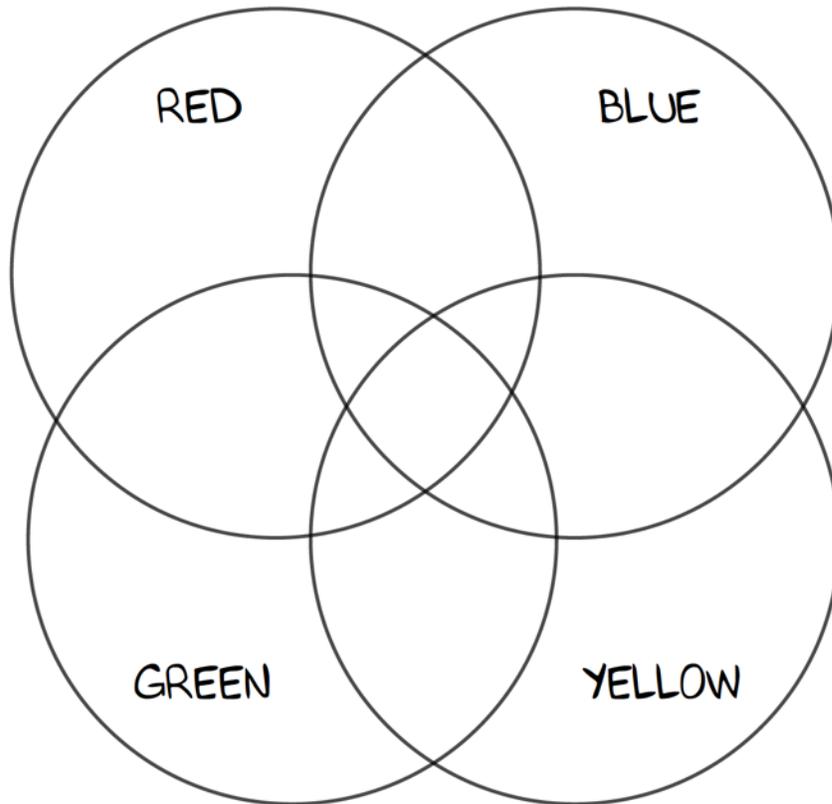
Discussions Ideas:

This is a light energy experiment. Light energy is the only form of energy that we can actually see. It is formed through chemical, radiation, and mechanical means. Light energy can be converted into other forms of energy. Interesting Light travels at a speed of about 300,000 km/s.

Do you know how to make white light from colored light? It is made when you mix red green and blue. These three colors are called the primary colors of light.

Mix paint colors or colored water to see the difference.

Color the circles to reflect what you see when you mix the lights.



Do the lights react the same way paints do when you mix them? _____

What happens when you mix red light with blue light? _____

What happens when you mix red light with yellow light? _____

What happens when you mix red light with green light? _____

What happens when you mix blue light with yellow light? _____

What happens when you mix blue light with green light? _____

What happens when you mix yellow light with green light? _____

What happens when you mix all four colors together? _____

What other colors can you create with the lights? _____

What color combinations were your favorite? _____

Did any colors surprise you when you mixed them? _____