HEADS IN, HEARTS IN

18 USC 707

Science Activities

The Heads In, Hearts In family enrichment program encourages families to use their minds (putting their "heads in") as a tool to expand their knowledge around a variety of topic areas. By creating a shared educational experience, the family unit will work, grow and learn together, putting their "hearts in" to the process.

This unit contains the following:

- A Drop of Blood
- Baking Soda Fizz
- Chromatography: What's That?
- Coin Drop
- Color-Changing Milk
- Colorful Rain
- Corn Plastic
- Creating Landforms
- Dancing Raisins
- Dissecting a Seed
- Drops on a Penny
- Fingerprint Fun
- Food Chain Stacking
- Fun With Sugar Cubes
- Garden in a Glove
- Germs! Germs! Germs!
- Let's Count Money
- Let's Race: Force and Friction
- Magnetic Bottle
- Measuring Dry Materials
- Measuring Liquids
- Money Match
- Penny Scrubber
- Plant Parts
- Root Beer Float
- Seed Scavenger Hunt
- Soap That Floats
- Soybean Seed Necklace
- States of Matter
- Sugar Surprise
- Touch and Feel Cloud
- Tubs of Butter Fun!
- What's This Made Of?

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HEADS IN, HEARTS IN

A Drop of Blood

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ "Blood in an Artery" handout
- ❑ Clear ½-gallon sealable container
- ❑ Corn syrup
- ❑ Red cinnamon candies
- ❑ Dry lima beans
- ❑ Lentils
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print one copy of "Blood in an Artery" handout in color. Laminate.
- Pour corn syrup, red cinnamon candies, lima beans and lentils into the clear ½-gallon sealable container.
- Set up the display table and arrange needed supplies.

HEADS IN, HEARTS IN

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A Drop of Blood

Guide for Families

Learning Objectives

What you need to know:

There are four parts of blood:

- Plasma
- Red blood cells
- White blood cells
- Platelets

Blood is very important to our bodies. A child weighing 80 pounds has about 3/4 gallon of blood in his or her body. Each component of blood plays an important role. **Plasma** is the clear portion of the blood. **Red blood cells** deliver oxygen from the lungs to the tissues and organs in the body. **White blood cells** help defend the body against disease and infections. **Platelets** help blood to clot when there is a cut.

What you will do and learn:

In this activity, you will look at a model of a drop of blood and a picture that shows the parts of blood labeled. Using the picture, you will identify the four parts of blood in the model.

Instructions

1. Look at the model of a drop of blood in the container and the picture of blood in an artery. What do you notice? What do you think our blood does?
2. Look at the four separate parts: plasma, red blood cells, white blood cells and platelets.
3. Looking in the container, which part do you think is the plasma? Red blood cells? White blood cells? Platelets? (See the answers below.)

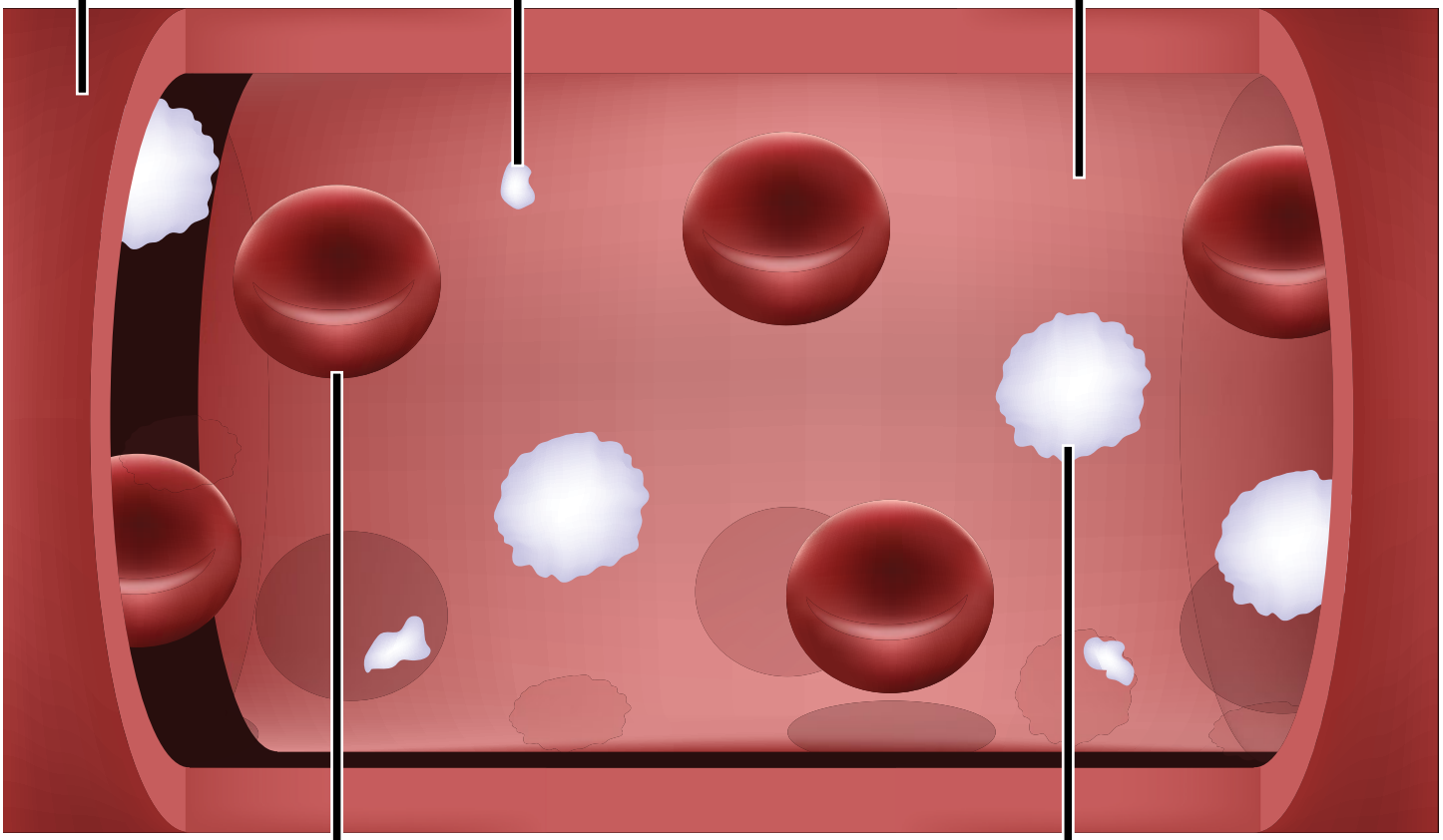
Answers:

1. Plasma (corn syrup)
2. Red blood cells (red cinnamon candies)
3. White blood cells (dry lima beans)
4. Platelets (lentils)

This activity is adapted from Creekside Learning. (2011, February 24). *More kitchen science: What's inside a drop of blood?* Retrieved from *http://creeksidelearning.com/more-kitchen-science-whats-inside-a-drop-of-blood/#_a5y_p=2079624*

A Drop of Blood

Blood in an Artery Handout



HEADS IN, HEARTS IN

Baking Soda Fizz

Instructions for Set-Up:

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ 3 small bowls
- ❑ 3 medium bowls
- ❑ Liquid food coloring of any color
- ❑ Baking soda
- ❑ 3 pipettes or medicine droppers
- ❑ Vinegar (1 quart)
- ❑ Lemon juice (1 quart)
- ❑ Lemon-lime pop (2 liters)
- ❑ 3 labels ("vinegar," "lemon juice," "lemon-lime pop")
- ❑ Large bowl for disposal of waste
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Put 3 to 4 drops of liquid food coloring in each small bowl.
- Pour a layer of baking soda into the bottom of each small bowl, thick enough to cover the bottom of the bowl and the food coloring.
- Fill one medium bowl with vinegar, one with lemon juice and one with lemon-lime pop.
- Label each bowl.
- Place the small bowls and medium bowls on the display table along with 3 pipettes or medicine droppers.

Note: This activity is best done with a facilitator who will clean up after each experiment by dumping the waste into the large bowl.

HEADS IN, HEARTS IN

Baking Soda Fizz

Guide for Families

Learning Objectives

What you need to know:

Sodium bicarbonate – **baking soda** as we commonly know it – is a chemical **base**. This base reacts with the **acid** of the vinegar, lemon juice and pop. This causes a **chemical reaction** called an **acid-base reaction**. This chemical reaction produces **carbon dioxide gas** when the **carbon** in the baking soda reacts with the **oxygen** in the vinegar, lemon juice or pop.

What you will do and learn:

You will gain an understanding of chemical reactions by mixing baking soda with three types of liquids.

Instructions

What do you think will happen when...?

1. Take a pipette or medicine dropper with vinegar (from bowl labeled "vinegar") and drop by drop, add the vinegar to the baking soda (in one of the small bowls). What happens?
   - The **acetic acid** (the part of vinegar that makes it sour) reacts with the sodium bicarbonate (baking soda) to form **carbonic acid**. Carbonic acid is unstable and immediately falls apart into **carbon dioxide** and **water**. The bubbles you see are from the reaction that come from the carbon dioxide escaping the solution that's left.
2. Next, take a pipette or medicine dropper with lemon juice (from bowl labeled "lemon juice") and drop by drop, add the lemon juice to the baking soda (in one of the small bowls). What happens?
   - The same thing as when you mix baking soda and vinegar! An easier way to think about it: It's an acid-base reaction because it involves an acid (**citric acid** in the lemon juice) reacting with a base (sodium bicarbonate, also called baking soda). This is a chemical reaction.
3. Last, take a pipette or medicine dropper with lemon-lime pop (from bowl labeled "lemon-lime pop") and drop by drop, add the pop to the final bowl with baking soda. What happens?
   - Again, the **citric acid** in lemon-lime soda reacts with the base (baking soda).
4. Discuss what you observed.

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Chromatography: What's That?
Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Paper towels (one 2-inch by 4-inch strip per participant)
- ❑ Scissors
- ❑ 3-ounce paper cups (one per participant)
- ❑ 3 or 4 permanent markers
- ❑ Rubbing alcohol (about a tablespoon per participant)
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Cut the paper towels into strips approximately 2 inches wide by 4 inches long.
- Set up the display table with the supplies.

HEADS IN, HEARTS IN

Chromatography: What's That?

Guide for Families

Learning Objectives

What you need to know:

Chromatography is a way to separate the parts of a mixture based on how much of each part is present. The parts might be separated based on size or weight.

What you will do and learn:

In this activity, you will discover that there may be many different colors combined to create the final marker color that we see.

Instructions:

What do you think will happen when...?

1. Take a strip of paper towel.
2. Using the permanent marker, place a medium-sized dot approximately ½ inch from one end of the strip of paper towel.
3. Pour just enough rubbing alcohol into the bottom of the cup to cover the entire bottom.
4. Place the dotted end of the paper towel into the cup so the end touches the bottom of the cup.
5. The end of the paper towel should be submerged in rubbing alcohol.
6. Observe the paper towel soaking up the rubbing alcohol. Observe what happens to the dot. Talk about what you see. (Chromatography occurred when the chemical mixture [the spot made by the marker] was seperated by a liquid [rubbing alcohol] into parts. You saw those parts when the alcohol was absorbed and moved up the paper towel.)
7. Why do you think some colors moved farther than others from the dot?

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4-H Heads, In Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

HEADS IN, HEARTS IN

Coin Drop

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ 10–15 different types of coins (pennies, nickels, dimes and quarters)
- ❑ 10–15 index cards, 3 inches by 5 inches
- ❑ Up to fifteen 9-ounce clear plastic cups
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up display table with supplies.

HEADS IN, HEARTS IN

Coin Drop

Guide for Families

Learning Objectives

What you need to know:

Sir Isaac Newton defined the three laws of motion. The **first law of motion** states that an object at rest will stay at rest unless an external force is applied to it, and an object in motion tends to stay in motion with the same direction and speed unless an external force is applied to it.

Gravity is a force that pulls all objects towards the center of the earth.

Friction is a force that holds back the movement of a sliding object.

What you will do and learn:

You will experiment with friction, gravity and the law of motion by using coins, an index card and a cup.

Instructions

1. Select a variety of 3 to 4 coins.
2. Place an index card on top of the cup.
3. Place the coins on top of the index card. Center the coins in the middle of the card but do not place them on top of each other.
4. Do you think you can remove the card so the coin falls in the cup?
5. Using your fingers, flick or pull the index card away from the cup. What happens to the coins?

Variations: Stack coins on top of each other. Use more or less fingers to flick the card.

The first law of motion helps us to understand why the coins drop directly into the cup. In this experiment, the coins are at rest while they sit on top of the card and cup. When you flick or pull the card out from under the coins, you enable **gravity** to act upon the coins and pull them into the cup. When the coins drop, the bottom of the cup stops the coins.

Why don't the coins stay with the card when the card goes flying? It's because of the lack of **friction**. There isn't enough friction between the coin and the card for the coin to stay with the card.

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4-H Heads, In Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

HEADS IN, HEARTS IN Color-Changing Milk

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Whole milk (enough to fill each small dish 1/3 full)
- ❑ 2 small dishes
- ❑ Food coloring (3 colors minimum)
- ❑ 1 dropper per food coloring
- ❑ Cotton swabs such as Q-tips (one per participant)
- ❑ Dish soap (enough to cover each cotton swab tip)
- ❑ Large bin for disposal of milk solution
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up the display table and arrange needed supplies.

HEADS IN, HEARTS IN

Color-Changing Milk

Guide for Families

Learning Objectives

What you need to know:

Milk is mostly water but it also contains vitamins, minerals, proteins and tiny droplets of fat suspended in solution. Fats and proteins are sensitive to changes in the surrounding solution (the milk).

What you will do and learn:

You will learn how fats and proteins change after the addition of a second substance. You will also learn about molecules of fat in the milk we drink.

Instructions

1. Pour a small amount of whole milk into the dish.
2. Choose 3 colors of food coloring and put one drop of each in the center of the milk. Keep the drops close together.
3. Grab one clean cotton swab. Predict: what do you think will happen if you touch the tip of the cotton swab to the center of the milk?
4. Place one end of the cotton swab in the center of the milk. What happens?
5. Using the other end of the cotton swab, dip it in dish soap. Predict: what do you think will happen when you touch the tip of the cotton to the center of the milk?
6. Place the soapy end of the cotton swab into the center of the milk. Hold it there for 10 to 15 seconds. What happens?

The secret of the bursting colors is the chemistry of that tiny drop of soap. Dish soap, because of its bipolar characteristics (**nonpolar** on one end and **polar** on the other), weakens the chemical bonds that hold the proteins and fats in a solution. The soap's polar, or **hydrophilic** (water-loving), end dissolves in water, and its **hydrophobic** (water-fearing) end attaches to a fat globule in the milk. This is when the fun begins.

The molecules of fat bend, roll, twist, and contort in all directions as the soap molecules race around to join up with the fat molecules. During all of this fat molecule gymnastics, the food coloring molecules are bumped and shoved everywhere.

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4-H Heads, In Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

HEADS IN, HEARTS IN

Colorful Rain

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Water
- ❑ Clear cups or jars
- ❑ Shaving cream
- ❑ Liquid food coloring
- ❑ Display table

Activity Preparation

- Find or purchase items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up the display table with needed supplies.

HEADS IN, HEARTS IN

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Colorful Rain

Guide for Families

Learning Objectives

What you need to know:

Clouds are made of lots of tiny particles. Water or ice collect on the particles. When enough water or ice collect and become heavy enough, the particles fall to the earth as precipitation. Precipitation can be snow, rain, sleet, freezing rain or hail.

What you will do and learn:

You will discover how water collects in clouds and falls to the ground.

Instructions

1. Fill a clear cup half full with water.
2. Squirt a small amount of shaving cream on top of the water, enough to cover the top of the water completely. This creates a cloud.
3. Add food coloring, drop by drop, on top of the shaving cream. How many drops do you think it will take to fall through the cloud of shaving cream?
4. Wait and see what the weight of the food coloring will do to the cloud.

The water represents the air and the shaving cream represents a cloud. When the food coloring is added to the shaving cream, one drop at a time, it becomes heavy enough to fall through the saving cream. This is similar to when water droplets fall from a cloud.

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4-H Heads, In Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

HEADS IN, HEARTS IN

Corn Plastic

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Resealable plastic sandwich bags (1 per participant)
- ❑ Cornstarch (1 tablespoon per participant)
- ❑ Medium-sized bowl
- ❑ 2 small bowls
- ❑ Water (1½ tablespoons per participant)
- ❑ Corn oil (2 drops per participant)
- ❑ 2 tablespoon-sized measuring utensils
- ❑ One ½-tablespoon-sized measuring utensil
- ❑ Pipette or medicine dropper
- ❑ Liquid food coloring (2 drops per participant)
- ❑ Microwave
- ❑ Extension cord
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up the display table with supplies as described in the following bullets:
  - Place resealable plastic bags on the table.
  - Place cornstarch in a medium-sized bowl for ease of participants scooping and measuring.
  - Place one tablespoon-sized measuring utensil next to the bowl of cornstarch.
  - Put water in one small bowl and corn oil in the other.
  - Place one pipette or medicine dropper next to the bowl of corn oil.
  - Place one tablespoon-sized measuring utensil and one ½-tablespoon-sized measuring utensil next to the bowl of water.
  - Place bottle of food coloring on the table.
  - Set up the microwave and plug in to a power supply using the extension cord. Make sure it works.

HEADS IN, HEARTS IN

Corn Plastic

Guide for Families

Learning Objectives

What you need to know:

Corn is **biodegradable**. That means that over time, it will break down without harming the earth. Corn is a **renewable** resource – it can be reproduced or grown again and again. Cornstarch and corn oil are both **by-products** of corn, which means that they were made from corn. Other products made from corn are packing peanuts, trash bags, carpet, stuffing in pillows and filling in bed comforters.

Most plastics are made from **petroleum**, which cannot be reproduced at the same rate it is consumed. Petroleum is considered a **nonrenewable** resource. Today you will make plastic from corn, a renewable resource.

What you will do and learn:

You will learn what **biodegradable** means and identify biodegradable materials when you make your own plastic from corn.

Instructions

1. Put 1 tablespoon of cornstarch in a plastic bag.
2. Add 2 drops of corn oil.
3. Add 1½ tablespoons of water.
4. Seal the plastic bag and mix the ingredients together, gently.
5. Open the bag and add 2 drops of food coloring. Seal the bag, and mix gently.
6. Give the bag to the volunteer or teacher.
7. He or she will unseal the plastic bag, and place it in the microwave for 20 to 25 seconds.
8. He or she will return the bag to you. Caution it may be hot!
9. Squish the ingredients together through the plastic bag and observe what happens.
10. Observe and discuss:
    - What do you notice about your biodegradable plastic?
    - Does it look and feel the same as other plastics you're familiar with such as plastic bottles, bouncy balls, plastic cups and other plastic things?
    - What could you make with it if you let it harden?
    - What does it smell like?

Most plastics are made from **petroleum**, which is a nonrenewable resource or a resource that cannot be reproduced in a useful amount of time. Using renewable substitutes such as corn that can act like petroleum, we can recreate products that are not dependent on nonrenewable resources such as oil reserves. The corn acts as a **polylactic acid plastic (PLA**) and has similar properties to traditional petroleum-based products.

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4-H Heads, In Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

HEADS IN, HEARTS IN

Creating Landforms

Instructions for Set-Up

Supplies

- ❑ Guide for Families" handout
- ❑ 15 clear plastic standup displays (optional)
- ❑ "Landforms" handouts
- ❑ 13 disposable cookie sheets, 9-inch by 13-inch or larger
- ❑ 10-pound bag of sand
- ❑ Water to moisten sand
- ❑ Pieces of craft foam cut into various lengths, colors and sizes
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print one copy of each "Landforms" handout. Laminate or place each in a clear plastic standup tray.
- Cut pieces of craft foam to assist learners in creating their landforms.
- Set all materials on the table for easy access by participants.

HEADS IN, HEARTS IN

Creating Landforms

Guide for Families

Learning Objectives

What you need to know:

A landform is a feature of the earth's surface. Landforms include hills, lakes, mountains, oceans, plains, plateaus, ponds, rivers, streams, valleys, islands, canyons and volcanos.

What you will do and learn:

You will recognize and name various landforms and correctly identify characteristics of landforms. You will recreate landforms using the materials given.

Instructions

1. Select a tray. Explore each landform by looking at the photograph and reading the description.
2. Identify what characteristics your landform has.
3. Using the sand and craft foam, create your own version of the landform.
4. What characteristics are similar between landforms? What characteristics are different?

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Creating Landforms

Landforms Handout

What is a landform?

A landform is a feature of the earth's surface.

Creating Landforms

Landforms Handout

Hill

A hill is an area of high ground lower than a mountain.

Creating Landforms

Landforms Handout

Lake

A lake is a body of water surrounded by land. Michigan has five large lakes called the Great Lakes: Lake Huron, Lake Ontario, Lake Michigan, Lake Erie and Lake Superior.

Creating Landforms

Landforms Handout

Mountain

A mountain is a high, steep surface feature of the earth that rises above the land around it. A mountain stands by itself or is a part of a group of mountains.

Creating Landforms

Landforms Handout

Ocean

An ocean is a large body of salt water. Oceans cover most of the earth.

Creating Landforms

Landforms Handout

Plain

A plain is a large, mostly flat land.
Many different types of grasses grow there with few trees.

Photograph © iStock.com/GeorgeBurba

Creating Landforms

Landforms Handout

Plateau

A plateau is a rise or hill with steep sides and a flat top.

Photograph © iStock.com/mcdustelroy

Creating Landforms

Landforms Handout

Pond

A pond is a small, shallow body of water surrounded on all sides by land. A pond is smaller and more shallow than a lake and usually has a lot of plants growing in it and around it.

Photograph © iStock.com/Givaga

Creating Landforms

Landforms Handout

River

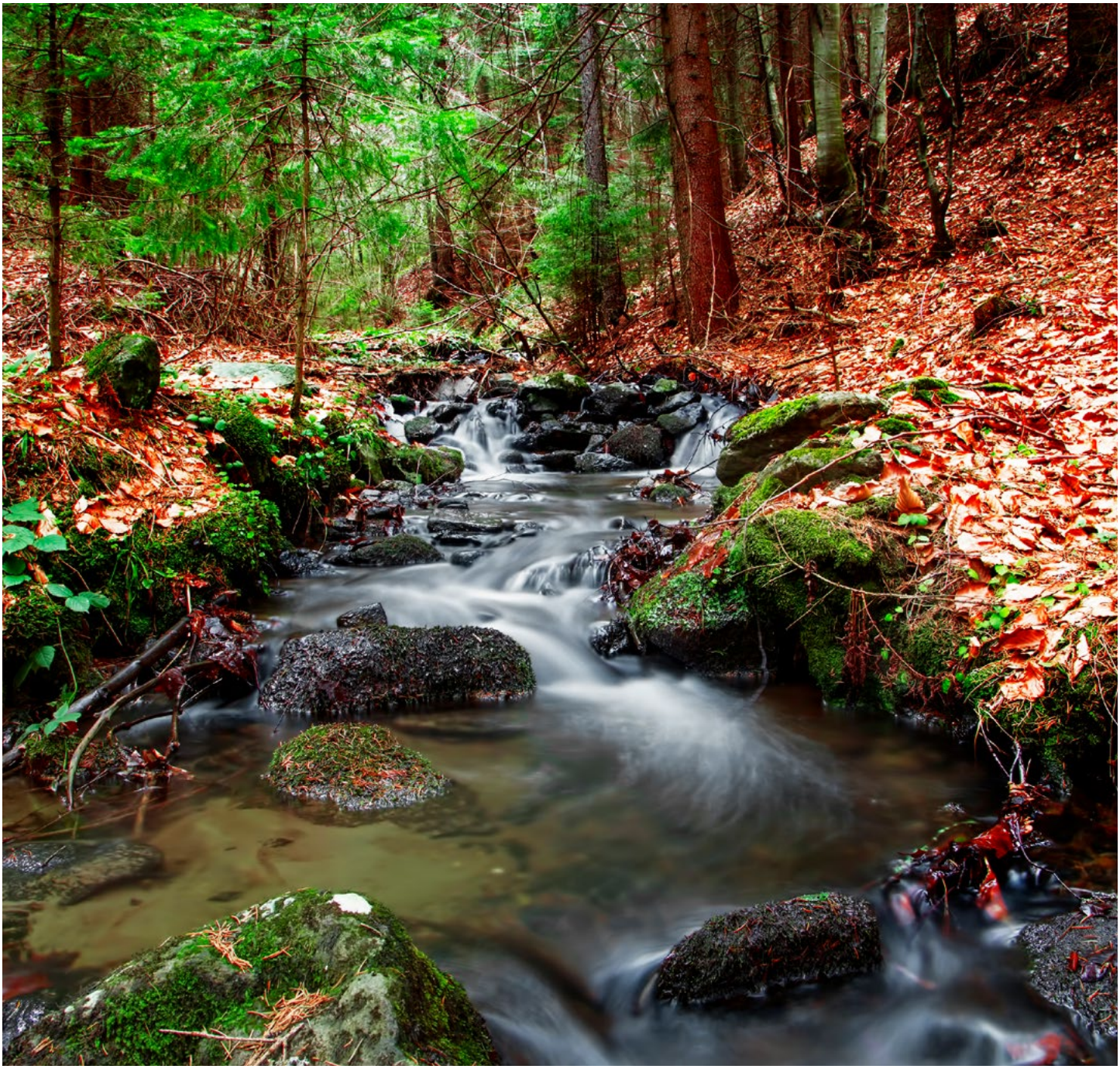
A river is a large stream of water that flows downhill. It causes slow changes in the earth's surface by moving earth materials and forming valleys. A river is a surface feature.

Creating Landforms

Landforms Handout

Stream

A stream is a small body of flowing water.



Photograph © iStock.com/Catalina-Gabriela Molnar

Creating Landforms

Landforms Handout

Valley

A valley is a low landform found between hills and mountains.

Creating Landforms

Landforms Handout

Island

An island is a piece of land surrounded by water on all sides.

Photograph © iStock.com/yykkaa

Creating Landforms

Landforms Handout

Canyon

A canyon is a narrow valley with very steep sides created from erosion over time.

Photograph © iStock.com/SumikoPhoto

Creating Landforms

Landforms Handout

Volcano

A volcano is a mountain with magma chambers, pipes and vents that release magma gases and steam from deep in the earth's surface.

HEADS IN, HEARTS IN

Dancing Raisins

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Two to three 2-liter bottles of lemon-lime pop
- ❑ Approximately ten 10-ounce or 12-ounce clear cups
- ❑ 1–2 boxes of fresh raisins
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up the display table and arrange needed supplies.

HEADS IN, HEARTS IN

Dancing Raisins

Guide for Families

Learning Objective

What you need to know:

Making carbonated beverages involves dissolving **carbon dioxide** gas into a liquid under pressure. This process is called **carbonation**. When you open the beverage, you remove the pressure and the carbon dioxide begins to escape.

What you will do and learn:

You will watch raisins "dance" in lemon-lime soda and talk about why they do that.

Instructions:

What do you think will happen when...?

1. Fill the clear cup approximately half full with lemon-lime pop.
2. Notice the bubbles in the pop. The bubbles are carbon dioxide gas released from the liquid.
3. Add a few raisins to the cup. What happens?
4. Be patient!
5. Discuss what happened to the raisins.

When the raisin is dropped into the carbonated beverage it sinks to the bottom, where carbon bubbles attach to it and lift it to the top of the beverage. The raisin floats on the top until the bubbles break, releasing the gas and allowing the raisin to fall to the bottom again. The process continues until the carbonated beverage goes flat – the carbon dioxide escapes. The carbonation bubbles attach to the surfaces of various items. The rougher the surface, the more locations there are for the bubbles to attach.

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4-H Heads, In Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

HEADS IN, HEARTS IN

Dissecting a Seed

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ "Parts of the Seed" handout
- ❑ 2 clear plastic standup displays (optional)
- ❑ 2–3 bags of lima beans
- ❑ Large bowl
- ❑ Water
- ❑ Several small magnifying glasses
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print out "Parts of the Seed" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Soak lima beans in a large bowl of water for 24 hours to soften.
- Set up the display table and arrange needed supplies.

HEADS IN, HEARTS IN

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Dissecting a Seed

Guide for Families

Learning Objectives

What you need to know:

Every seed has three parts:

- The **seed coat** helps protect what is inside. Seed coats can be thin or thick.
- The **endosperm** is the **food** for the seed so it can begin to grow.
- The **embryo**, or **baby root**, (roots, stem, leaves) is the part of the seed that will sprout into a new plant.

What you will do and learn:

You will investigate the lima bean seed and identify the three parts.

Instructions

1. Pick out a lima bean.
2. Gently peel away the **seed coat**.
3. Gently split your lima bean into two halves.
4. See if you can find the parts of the seed.
5. Use the magnifying glass to get a closer look.
6. Try to identify the roots, stem and leaves.

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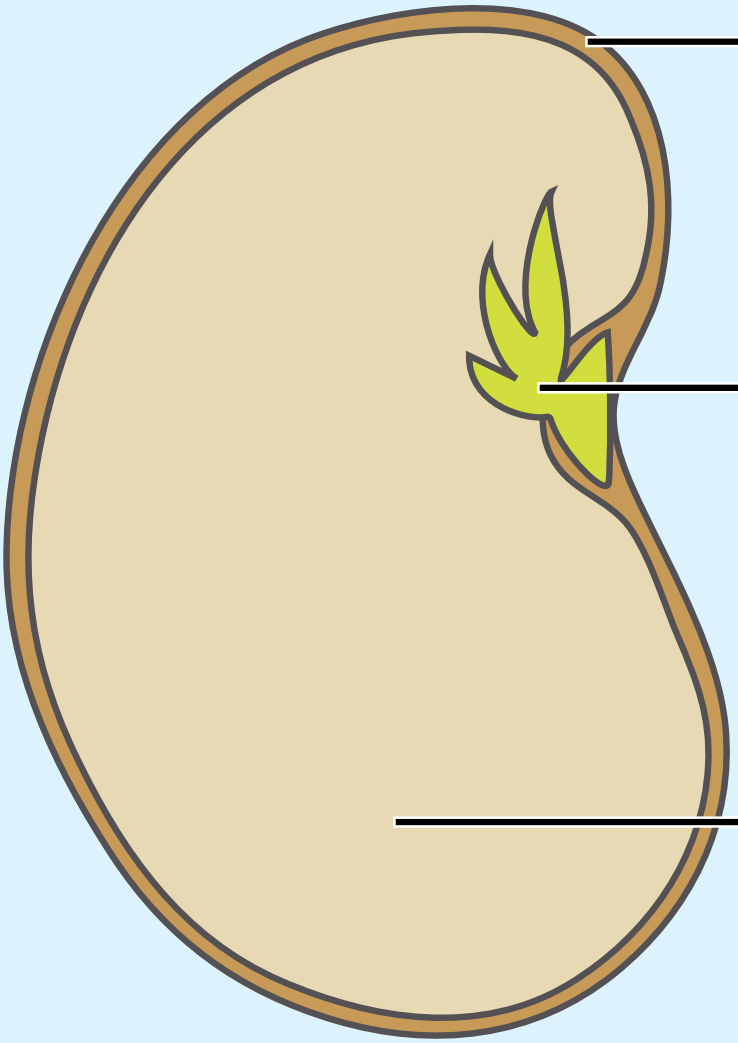
Dissecting a Seed

Parts of the Seed Handout



Seed coat

Helps protect what is inside.

Embryo

The part of the seed that will sprout into a new plant.

Endosperm

The food for the seed so it can begin to grow.

HEADS IN, HEARTS IN

Drops on a Penny

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ 1–2 shallow pans
- ❑ Several pennies
- ❑ 5–10 eye droppers
- ❑ Small bowl with water
- ❑ Small bowl with soapy water
- ❑ Paper towels
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up the display table with the supplies. Include paper towels for cleaning up spills.

HEADS IN, HEARTS IN

Drops on a Penny

Guide for Families

Learning Objectives

What you need to know:

Surface tension is created by the **force of attraction** between water molecules. A **molecule** is formed when two or more atoms join together. Water is made up of atoms of hydrogen and oxygen. In water, each molecule is attracted to another molecule and they "stick" together. This only happens when the water molecule is next to them or below them (because there is no water above them). As they stick together, they create an invisible shield. (Think about an insect that can rest on top of a puddle.)

What you will do and learn:

You will explore surface tension by placing drops of water on a penny.

Instructions

1. Choose a penny from the table and place it in a shallow pan.
2. Choose an eye dropper and one by one, add drops of water to the surface of the penny.
3. How many drops do you think a penny can hold?
4. Count how many drops of water you add before the water spills over the edge of the penny.
5. Use the same penny. Add drops of soapy water one by one to the surface of the penny.
6. Count how many drops of soapy water you add before the water spills over the edge.
7. Discuss:
   - Was the penny able to hold more drops of plain water or more drops of soapy water?
   - Why do you think that was the outcome?

If we add too many drops of water on the surface of the penny, **gravity** breaks the **force of attraction** making the water spill off the coin. When you add soap to the water, you reduce the **surface tension**.

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HEADS IN, HEARTS IN

Fingerprint Fun

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ "Fingerprint Examples" handout (Letters)
- ❑ "Fingerprint Examples" handout (Numbers)
- ❑ 6 sheets of colored paper (3 of one color and 3 of another color)
- ❑ Scissors
- ❑ Scrap paper
- ❑ Ink pad
- ❑ Wet wipes
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print the letter fingerprints on one color of paper and the number fingerprints on another color of paper. Laminate them if possible. Cut them apart. (Note that A and 1 are the same image, just as B and 7 are, C and 9, and so on.) See the following table for correct fingerprint matches:

Letter	Number
A	1
B	7
C	9
D	11
E	3
F	10
G	6
H	2
I	4
J	12
K	5
L	8

- On the back side of each letter fingerprint and number fingerprint, write the corresponding letter or number as an answer key.
- Set up the display table and arrange needed supplies.

Note that the fingerprints in this activity were used with permission of Frank Virzi.

HEADS IN, HEARTS IN

18 USC 707

Fingerprint Fun

Guide for Families

Learning Objectives

What you need to know:

The ridges on our fingers that create **fingerprints** are important because they help us grasp objects. We leave fingerprints when we touch solid surfaces because of the natural oils found in our skin.

Fingerprints are unique to each person, even identical twins. No one else has the same fingerprints you do. The ridges on your fingers don't change as you grow or get older. Even when you burn, cut or scrape your finger, the original pattern of the fingerprint remains the same as the new skin grows.

What you will do and learn:

You will demonstrate an understanding of the purpose of fingerprints and you will be able to identify similarities between different fingertips while playing a matching game. You will also make your own fingerprint using ink.

Instructions

1. Look at the fingerprints labeled with letters. Now look at the fingerprints labeled with numbers.
2. Try to match the fingerprints labeled with letters with the fingerprints labeled with numbers. Look on the back of the fingerprints to find the answers that match a letter fingerprint to a number fingerprint. Look for the similarities.
3. Look at your own fingerprint. Observe a friend's fingerprint.
4. Press your finger into the pad of ink. Press your finger firmly on to a piece of scrap paper. Observe your fingerprint.
5. Use the wet wipes to clean your hands.
6. What characteristics are similar between the fingerprints? What characteristics are different?
7. What did you find interesting about the fingerprints?

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Fingerprint Fun

Fingerprint Examples Handout (Letters)

A

B

C

D

Fingerprint Fun

Fingerprint Examples Handout (Letters), continued

E

F

G

H

Fingerprint Fun

Fingerprint Examples Handout (Letters), continued

I

J

K

L

Fingerprint Fun

Fingerprint Examples Handout (Numbers), continued

1

2

3

4

Fingerprint Fun

Fingerprint Examples Handout (Numbers), continued

5

6

7

8

Fingerprint Fun

Fingerprint Examples Handout (Numbers), continued

9

10

11

12

HEADS IN, HEARTS IN

Food Chain Stacking

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ "Plants and Animals" handout
- ❑ 6 boxes that stack inside of each other
- ❑ Scissors
- ❑ Wrapping paper or other decorative paper
- ❑ Clear, heavy-duty packaging tape.
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Cover boxes with decorative paper.
- Print "Plants and Animals" handout.
- Cut out each plant and animal.
- Using clear, heavy-duty packaging tape, attach plant and animal pictures to each box in the order they would be found in the food chain. (The higher up the plant or animal is in the food chain, the bigger the box.)
- Set up the display table and arrange needed supplies.

HEADS IN, HEARTS IN

18 USC 707

Food Chain Stacking

Guide for Families

Learning Objectives

What you need to know:

Some animals eat plants. Some animals eat other animals. A **food chain** begins when a plant is eaten by an animal. Then that animal is eaten by another animal and so on.

Every living thing needs energy in order to live. Energy is obtained through food. Plants use sunlight and carbon dioxide to make food. Animals get energy from the food they eat, which can be plants or animals. In the **food chain**, energy is transferred from plants to various species of animals as each animal eats another.

Each plant or animal holds a special role: **producer** (plant) or **consumer** (animal).

What you will do and learn:

You will investigate the food chain. You will decide if each of the animals or plants pictured are producers or consumers. You will organize the food chain in its proper order.

Instructions

1. Look at the pictures on the boxes.
2. Think about a food chain. Some animals eat plants, while some animals eat other animals. Start with the grass and think about which animals eat grass.
3. Stack the boxes in the order you think the food chain would go.
4. Continue to stack the boxes building the food chain. Which animal will be last?

Think about it: Which of the animals or plants is a producer or a consumer? Can a producer also be a consumer? Can a consumer also be a producer?

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Food Chain Stacking

Plants and Animals Handout

Grass

Food Chain Stacking

Plants and Animals Handout, continued

Photograph © iStock.com/hurtled

Grasshopper

Food Chain Stacking

Plants and Animals Handout, continued

Snake

Food Chain Stacking

Plants and Animals Handout, continued

Owl

Food Chain Stacking

Plants and Animals Handout, continued

Mouse

Food Chain Stacking

Plants and Animals Handout, continued

Coyote

HEADS IN, HEARTS IN

Fun With Sugar Cubes

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ 2 small bowls
- ❑ Two 1-gallon containers of water
- ❑ 2 different colors of liquid food coloring
- ❑ 10–15 boxes of sugar cubes
- ❑ Aluminum foil, ripped in pieces approximately 2 inches by 2 inches (1 per participant)
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Color the water in each of the gallon containers a different color using the liquid food coloring.
- Set up the display table and arrange needed supplies.

HEADS IN, HEARTS IN

18 USC 707

Fun With Sugar Cubes

Guide for Families

Learning Objectives

What you need to know:

Did you ever wonder why sugar dissolves in water? Sugar dissolves because water molecules are polar. A molecule happens when two or more atoms join together. Water is made up of atoms of hydrogen and oxygen. A water molecule can break the bonds that hold together sugar molecules.

What you will do and learn:

You will explore some unique characteristics of water.

Instructions

1. To one small bowl, add some colored water and to the other small bowl, add some water of a different color. Add just enough to fill the bottom of the bowl.
2. Get 6 sugar cubes. Three for each bowl.
3. Don't do it yet, but in one bowl, you will stack three sugar cubes on top of each other. In the other bowl, you will also stack three sugar cubes on top of each other, but in this second bowl, you will put a small piece of foil in between the bottom cube and the two stacked on top of it.
4. Discuss and predict:
   - When each stack is placed in the colored water, what you do think will happen?
   - Will one dissolve faster than the other? Which one? Why?
5. Now do the experiment by following the instructions in point number 3.
6. Think about why the cubes dissolved differently.

Water is absorbed by the sugar cubes and you can see the colored water rising through the sugar. When there is no barrier to prevent the water from being absorbed, the water weakens the sugar cube and the cubes fall. By placing the piece of foil in between the layers of sugar cubes, the water cannot go through and just weakens the bottom sugar cube. However, because the bottom sugar cube is weak, the entire stack of cubes will still fall.

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4-H Heads In, Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

HEADS IN, HEARTS IN

Garden in a Glove

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Clear, disposable, poly, food service glove (1 per learner)
- ❑ Yarn cut in approximately 4-inch sections
- ❑ Water
- ❑ Cotton balls (5 per learner)
- ❑ 5 different varieties of seeds such as basil, green beans, yellow beans, carrots, lettuce, oregano, parsley or spinach
- ❑ 6 small bowls
- ❑ 5 labels
- ❑ Permanent markers
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Label five of the small bowls with the variety of seed that's in the bowl. Use the sixth bowl for water.
- Set up the display table and arrange needed supplies.

HEADS IN, HEARTS IN

18 USC 707

Garden in a Glove

Guide for Families

Learning Objectives

What you need to know:

You can grow plants in a glove! When conditions are right, seeds will grow into plants. Those conditions include:

- Air (inside the glove)
- Water (in the cotton ball)
- Warmth (present when the glove is placed in the sun)
- Sun (daylight)
- Soil (cotton ball)

What you will do and learn:

You will grow a garden in a glove and be introduced to the plant growing cycle. You will become familiar with the components plants need to grow: air, water, warmth, sun and soil.

Instructions

1. Before you begin, think about these questions: Do you think you can grow a plant in a glove? What do plants need to grow?
2. Take one plastic glove
3. Using a permanent marker, label each finger of the glove with the variety of seed that you will put in that finger. For example, label one finger “basil,” another “carrots,” and so on.
4. Blow air into the glove gently to expand it slightly.
5. Dip 5 cotton balls into the water to moisten slightly.
6. Dip each moist cotton ball into a different seed bowl, picking up a few seeds with the cotton ball.
7. Place the cotton ball with seeds in the correct finger. For example, place the cotton ball with carrot seeds in the finger labeled “carrots.”
8. Blow more air into the glove, and tie it shut with a piece of yarn.
9. Bring it home and place in a sunny window.
10. Once the seeds grow into seedlings, transfer into a small pot, cup or container for continued growth.

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4-H Heads In, Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

HEADS IN, HEARTS IN

Germs! Germs! Germs!

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Germ lotion that glows under black light (available at *Amazon.com* or *http://glogerm.com*)
- ❑ Portable black light
- ❑ Extra batteries (if portable black light takes batteries)
- ❑ Wet wipes
- ❑ Handwashing poster (*http://msue.anr.msu.edu/uploads/236/66667/JIFFJump1-HandwashingPoster.pdf*)
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print handwashing poster. Options: Print poster and laminate to display, or print copies of posters for families to display at home.
- Set up the display table and arrange needed supplies.

HEADS IN, HEARTS IN

Germs! Germs! Germs!

Guide for Families

Learning Objectives

What you need to know:

Whether we like to believe it or not, we live in a world filled with germs, bacteria and viruses. It is hard to find out about germs when you can't see them, but what if you could see simulated germs on your hands and anything you touch? The germ lotion is an amazing way for you to understand the importance of proper hand-washing techniques and also to learn how easily germs can spread.

What you will do and learn:

You will identify how germs are spread. Using the germ lotion, you will discover places on your hands that are easily cleaned as well as places on your hands where germs may be hiding, such as in between fingers or around fingernails.

Instructions

1. How do you think germs are spread?
2. Discuss how germs are spread:
   - Coughing and sneezing
   - Blowing our noses or going to the bathroom without washing our hands
   - Touching things such as doorknobs, floors or animals without washing our hands
3. Place a small amount of germ lotion into your hands. The germ lotion represents germs that are on our hands.
4. Rub your hands together, making sure to get the backs, palms and fingernails.
5. Place both hands under the portable black light.
6. Discuss:
   - What do you see? Does it look like a lot of germs or very few?
   - How might you have gotten that many germs if they were real?
   - What is one way that you can get rid of the germs?
7. Wash your hands using a wet wipe. (If a sink with soap and water is available, it's a better option than using wet wipes.) Try to get your hands as clean as you can with the wet wipe.
8. Place both hands under the portable black light.
9. Observe your hands.
   - What is different about your hands now?
   - Were you able to remove all the germ glow lotion?
   - What parts of your hands no longer have germs?
   - What parts of your hands still had germs where you see you'll need to wash better?

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4-H Heads In, Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

HEADS IN, HEARTS IN

Let's Count Money

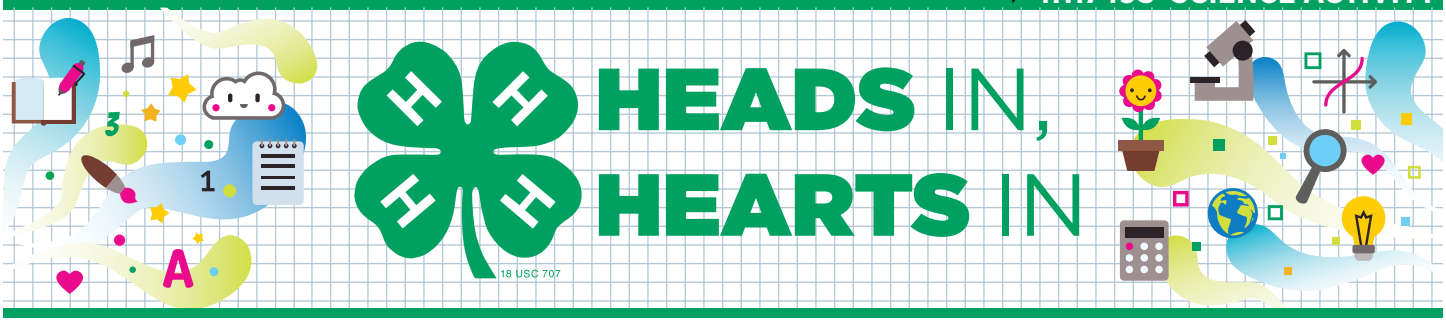
Instructions for Set-Up

Supplies

- ❑"Guide for Families" handout
- ❑2 clear plastic standup displays (optional)
- ❑"Coin Denomination" handout
- ❑"Money Cards" handout
- ❑Scissors
- ❑Coins in various denominations (pennies, nickels, dimes and quarters)
- ❑Bowl
- ❑Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print one copy of the "Coin Denomination" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print one copy of the "Money Cards" handout on durable paper and cut out the cards, or print, cut and laminate the cards.
- Put coins in the bowl.
- Set up the display table and arrange needed supplies.



Let's Count Money

Guide for Families

Learning Objectives

What you need to know:

- A **penny** is equal to 1 cent.
- A **nickel** is equal to 5 cents.
- A **dime** is equal to 10 cents.
- A **quarter** is equal to 25 cents.

What you will do and learn:

You will become familiar with each coin and how much it is worth. You will practice counting coins. You will use addition to add up coins to reach the amount of money on the card.

Instructions

1. Please do not take money with you!
2. Choose a money card.
3. Read the amount of money found on that card. For example, "30 cents."
4. Use the coins provided to make that amount of money in three different ways.

   For example, if the card says "30 cents," you might make that amount of money in these three ways:
   - 1 quarter and 1 nickel
   - 3 dimes
   - 2 dimes, 1 nickel, and 5 pennies

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4-H Heads In, Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

Let's Count Money

Coin Denomination Handout

Penny = 1 cent	Nickel = 5 cents	Dime = 10 cents	Quarter = 25 cents
Front	Front variations	Front	Front
	 		
Back variations	Back	Back	Back variations
 			 

Let's Count Money

Money Cards Handout

36¢	25¢	77¢
52¢	99¢	17¢
30¢	68¢	32¢
27¢	75¢	21¢
16¢	11¢	15¢
84¢	45¢	88¢
50¢	66¢	92¢

HEADS IN, HEARTS IN
Let's Race: Force and Friction
Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ 5-inch binder
- ❑ Foam board or cardboard (cut approximately 18 inches by 25 inches)
- ❑ 3 different types of materials to be used to create roads (examples: aluminum foil, pipe cleaners, sand, plastic wrap or other)
- ❑ Stapler with staples or tape
- ❑ 3 toy cars for racing (all of the same size and weight)
- ❑ Display table.

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Staple or tape each of the three materials to the foam board or cardboard to create three different types of roads. Lean the foam board or cardboard against the 5-inch binder to create a ramp.
- Set up the display table and arrange needed supplies.

HEADS IN, HEARTS IN

Let's Race: Force and Friction

Guide for Families

Learning Objectives

What you need to know:

Force is another word for pushing or pulling. Force is what we use to make things move. Sir Isaac Newton's first law states that an object in motion tends to stay in motion. Why do objects that we see moving every day stop moving? That's because of friction. **Friction** is a force that resists motion.

What you will do and learn:

You will apply the concept of force and friction. You will hypothesize, observe and evaluate the motion of the cars on each of the roads. You will have an opportunity to develop your observation, prediction and evaluation skills.

Instructions

1. Look at the race track. Notice that there are three different types of roads.
2. Observe: What makes each road unique? How are they different? How are they similar?
3. Hypothesize or predict: What do you think will happen when you race the cars down each of the roads? Which car will go faster? Which car will go slowest?
4. Test your hypothesis!
5. Place the cars at the top of the ramp. Let them go at the same time.
6. Evaluate the results and analyze: Which car was fastest? Slowest? Why?

In this experiment, you used **force** to make the cars move down the roads. Each road creates a different amount of **friction**. The car that is in motion is slowed by the friction (roughness) of the surface of the road. A rougher surface results in more friction. Which surface has the most friction? Which has the least?

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4-H Heads In, Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

HEADS IN, HEARTS IN

Magnetic Bottle

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Pipe cleaners or chenille stems
- ❑ 2-liter plastic pop bottle
- ❑ 2 feet of yarn
- ❑ Strong magnet with attached carabiner
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Cut the pipe cleaners or chenille stems into 1½- to 2-inch sections.
- Remove and discard the cap of the 2-liter plastic pop bottle. Clean the bottle and allow to dry.
- Attach one end of the yarn to the carabiner on the strong magnet.
- Attach the other end of the yarn to the neck of the pop bottle, tying tightly.
- Set up the display table and arrange needed supplies.

HEADS IN, HEARTS IN

Magnetic Bottle

Guide for Families

Learning Objectives

What you need to know:

Magnets are objects that produce **magnetic fields** and attract **metals** such as iron, nickel and cobalt. Pipe cleaners or chenille stems are made of several strands of metal twisted around threads of cotton.

What you will do and learn:

You will investigate magnetic properties.

Instructions

1. Put several pieces of pipe cleaner into the plastic bottle.
2. What do you think will happen when you place the magnet to the side of the plastic bottle?
3. The magnet will attract the pipe cleaners. When this happens, move the magnet around the outside edges of the plastic bottle.
4. The pipe cleaners should move with the magnet.
5. Discuss:
   - Why are the pipe cleaners moving with the magnet?
   - What would happen if there were more pipe cleaners in the bottle?
   - What would happen if there were fewer pipe cleaners in the bottle?
   - What happens when you remove the magnet from the side of the pop bottle?

Once the metal from the pipe cleaners get close enough to the magnet, they are attracted and will stick together. No matter where the magnet goes, the pipe cleaners will follow. Only when they are separated will the pipe cleaners fall back into the bottom of the plastic bottle.

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4-H Heads In, Hearts In | Michigan 4-H Youth Development | Michigan State University Extension

HEADS IN, HEARTS IN
Measuring Dry Materials
Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ "Dry Measurement Task Cards" handout
- ❑ Scissors
- ❑ 5-7 butter knifes (plastic is preferred)
- ❑ 3–5 teaspoon dry measuring spoons
- ❑ 3–5 tablespoon dry measuring spoons
- ❑ Three to five ¼-cup dry measuring cups
- ❑ Three to five ½-cup dry measuring cups
- ❑ Three to five 1-cup dry measuring cups
- ❑ 5–7 dry materials such as marshmallows, oatmeal, salt, sugar, flour, cereal, baking soda, dry coffee grounds and others
- ❑ 5–7 large bowls
- ❑ 5–7 medium-sized bowls
- ❑ 1 small bowl
- ❑ Display table

Note: This activity is best done in conjunction with the "Measuring Liquids" activity.

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print "Dry Measurement Task Cards" handout on durable paper and cut out the cards, or print, cut and laminate the cards.
- Set up the display table and arrange needed supplies as follows.
  - Fill each large bowl with a different dry material.
  - Place empty medium-sized bowls out for learners to measure dry goods into.
  - Place dry measurement tasks cards in small bowl.
  - Arrange measuring tools on the table.

HEADS IN, HEARTS IN

Measuring Dry Materials

Guide for Families

Learning Objectives

What you need to know:

The measuring tools that are used for dry materials are different from the tools that are used for measuring liquid materials. When baking and cooking, using the correct tools is important. Using the wrong tools could lead to your using too much or too little of an ingredient. When measuring dry materials, it's best to gently scoop the material, being sure not to pack it down. It's likely when you scoop that the dry material will be heaped on top. Use the flat end of a butter knife to scrape off the access material.

What you will do and learn:

You will be able to identify the correct measuring tool for the task on the card. You will practice measuring various dry goods using a different unit of measurement: teaspoons, tablespoons and cups. Be sure to gently scoop the dry material and use the flat end of the butter knife to scrape off any access material.

Instructions

1. Choose a measurement task card and read the directions.
2. Complete the tasks of each card.
3. Repeat the activity several times by choosing different task cards.
4. Observe how when various dry goods are measured using the same measuring tool, they can look very different. For example, a tablespoon of marshmallows looks very different from a tablespoon of flour. Understanding this will help you understand how to estimate amounts correctly.

Photograph © iStock.com/Phasinphoto

Dry measuring utensil.
When measuring small units of dry materials such as teaspoons and tablespoons, be sure to scrape off excess materials with the flat side of a knife.

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Measuring Dry Materials

Dry Measurement Task Cards Handout

Choose a dry material. Measure 1 cup of that material into the bowl using the 1-cup measuring cup. How many scoops do you need?	Choose a dry material. Measure 1 tablespoon of that material into the bowl using the 1-tablespoon measuring spoon. How many scoops do you need?	Choose a dry material. Measure ½ cup of that material into the bowl using the ½-cup measuring cup. How many scoops do you need?
Choose a dry material. Measure ¼ cup of that material into the bowl using the ¼-cup measuring cup. How many scoops do you need?	Choose a dry material. Measure 1 teaspoon of that material into the bowl using the 1-teaspoon measuring spoon. How many scoops do you need?	Choose a dry material. Measure 2 cups of that material into the bowl using the 1-cup measuring cup. How many scoops do you need?
Choose a dry material. Measure 5 tablespoons of that material into the bowl using the 1-tablespoon measuring spoon. How many scoops do you need?	Choose a dry material. Measure 2½ cups of that material into the bowl using the ½-cup measuring cup. How many scoops do you need?	Choose a dry material. Measure 2¼ cups of that material into the cup using the ¼-cup measuring cup. How many scoops do you need?
Choose a dry material. Measure 4 teaspoons of that material into the bowl using the 1-teaspoon measuring cup. How many scoops do you need?	Choose a dry material. Measure 1 cup of that material into the bowl using the ½-cup measuring cup? How many scoops do you need?	Choose a dry material. Measure 2½ teaspoons of that dry material using the ¼-cup measuring spoon. How many scoops do you need?

HEADS IN, HEARTS IN
Measuring Liquids
Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ "Liquid Measurement Task Cards" handout
- ❑ 3–5 liquid measuring tools
- ❑ Three to five 16-ounce plastic bottles
- ❑ Liquid food coloring
- ❑ Water
- ❑ Permanent marker
- ❑ Scissors
- ❑ Display table

Note: This activity is best done in conjunction with the "Measuring Dry Materials" activity.

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Fill each of the three to five 16-ounce bottles with water of differing amounts (for example, ½ cup, 1 tablespoon and so on).
- Using the liquid food coloring, color water in each bottle a different color.
- Using a permanent marker, write the correct amount of liquid on the bottom of the plastic bottle (for example, ½ cup, 1 tablespoon and so on).
- Print "Liquid Measurement Task Cards" handout on durable paper and cut out the cards, or print, cut and laminate the cards.
- Set up the display table and arrange needed supplies.

Liquid measuring cup
This cup can be used for measuring ½ cup to 2 cup measurements.

Liquid measuring utensil
This can be used to measure teaspoons, tablespoon and ounces.

HEADS IN, HEARTS IN

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Measuring Liquids

Guide for Families

Learning Objectives

What you need to know:

When measuring liquid substances, it is important to use measuring tools that have been created specifically for liquids. For instance, a liquid measuring cup is **transparent** (you can see through it) so the **meniscus** can easily be seen. When you look at liquid in a clear container, it appears to have a curved surface. That's the meniscus. When you're looking for the meniscus, be sure to look at the liquid from the side of the container, not the top. The meniscus occurs because the attractive force between the liquid and the container is greater than between the liquid molecules making the liquid cling to the sides of the container. When measuring liquids, use the bottom of the meniscus for the most accurate measurement.

What you will do and learn:

You will be able to identify that liquid and solid measuring tools are different. When measuring each liquid, look for the meniscus. You will practice using liquid measuring cups to measure the water inside each bottle.

Instructions

1. Choose a measurement task card and read the directions.
2. Complete the tasks of each card.
3. Repeat the activity several times by choosing different task cards.

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Measuring Liquids

Liquid Measurement Task Cards Handout

Find the bottle with yellow liquid. Which measuring tool will you use? Measure that liquid and see how much there is. Look on the bottom of the plastic bottle. Were you correct?	**Find the bottle with red liquid.** Which measuring tool will you use? Measure that liquid and see how much there is. Look on the bottom of the plastic bottle. Were you correct?
Find the bottle with green liquid. Which measuring tool will you use? Measure that liquid and see how much there is. Look on the bottom of the plastic bottle. Were you correct?	**Find the bottle with orange liquid.** Which measuring tool will you use? Measure that liquid and see how much there is. Look on the bottom of the plastic bottle. Were you correct?
Find the bottle with blue liquid. Which measuring tool will you use? Measure that liquid and see how much there is. Look on the bottom of the plastic bottle. Were you correct?	**Find the bottle with purple liquid.** Which measuring tool will you use? Measure that liquid and see how much there is. Look on the bottom of the plastic bottle. Were you correct?

HEADS IN, HEARTS IN

Money Match

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ "Money Match Cards" handout
- ❑ 10 sealable plastic bags
- ❑ Proper amount of coins (quarters, dimes, nickels and pennies) to correspond with the amounts on the Money Match cards
- ❑ Display table
- ❑ "Coin Denomination" handout from the "Let's Count Money" activity (optional)

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print "Money Match Cards" handout on durable paper or print, cut and laminate cards.
- Review the money handout.
- Place the proper amount of money in each plastic bag that corresponds with each Money Match card and set up the display table.
- Refer to or display the "Coin Denomination" handout from the "Let's Count Money" activity (optional).

HEADS IN, HEARTS IN

Money Match

Guide for Families

Learning Objectives

What you need to know:

- A **penny** is equal to 1 cent.
- A **nickel** is equal to 5 cents.
- A **dime** is equal to 10 cents.
- A **quarter** is equal to 25 cents.

What you will do and learn:

You will play a matching game to:

- Become familiar with how much each coin is worth.
- Practice counting coins.
- Use addition to reach the amount of money on the card.
- Use critical thinking skills to match the amount of money in the plastic bag to the amount of money on the cards in written form.

Instructions:

1. Please do not take money with you!
2. Please do not open the plastic bags!
3. To start playing the matching game, choose a plastic bag with money inside.
4. Count the amount of money.
5. See if you can find the card that matches that amount of money.
6. Try to match all plastic bags with money cards.

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Money Match

Money Match Cards Handout

Match! Find $0.19	Match! Find $0.54
Match! Find $0.89	Match! Find $0.98
Match! Find $1.06	Match! Find $0.45
Match! Find $0.75	Match! Find $0.50
Match! Find $0.36	Match! Find $1.55

HEADS IN, HEARTS IN

Penny Scrubber

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ 1 gallon vinegar
- ❑ Small bowl
- ❑ 1 container of salt
- ❑ Plastic spoon
- ❑ Pennies (the dirtier, the better)
- ❑ 1/2 teaspoon measuring spoon
- ❑ 3–4 Styrofoam plates
- ❑ Waste bin (to pour out vinegar and salt solution)
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up display table with appropriate supplies.

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Penny Scrubber

Guide for Families

Learning Objectives

What you need to know:

Pennies are made of **copper**. As a penny gets older the copper reacts with **oxygen** in the air and this causes it to tarnish or dull. The reaction of copper and oxygen mixing creates a substance called **oxide**.

What you will do and learn:

You will observe an acidic reaction and describe what happened.

Instructions

1. Choose a penny.
2. Observe:
   - What does the penny look like?
   - What colors do you see on the penny?
   - Does the front of the penny look exactly like the back of the penny? What are the similarities? What are the differences?
3. Pour a small amount of vinegar into a bowl, just enough to cover the bottom of the bowl.
4. Add ½ teaspoon of salt to the bowl.
5. Mix with plastic spoon.
6. Add the penny to the bowl and use the plastic spoon to carefully stir the mixture, being sure that the penny is completely covered.
7. Remove the penny from the bowl using the plastic spoon, and place it on the Styrofoam plate.
8. Observe what happened.
9. Discuss:
   - What does the penny look like?
   - What colors do you see on the penny?
   - Does the front of the penny look exactly like the back of the penny? What are the similarities? What are the differences?

You have removed the oxide. The vinegar (**acetic acid**) and salt (**sodium chloride**) mixed to create **hydrochloric acid**. The hydrochloric acid "ate" or reacted with the oxide to leave you with a shiny penny that looks new again.

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HEADS IN, HEARTS IN

Plant Parts

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ "Parts of a Plant" handout
- ❑ Plants to match each part of the plant:
  - Root: Carrots or radishes
  - Stem: celery or asparagus
  - Leaf: lettuce or spinach
  - Flower: broccoli or cauliflower
  - Fruit: Apple or tomato
  - Seed : Pea pods or sunflower seeds
- ❑ Common house plant
- ❑ Flower such as a rose
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print "Parts of a Plant" handout. Laminate.
- Set up the display table with plants.

HEADS IN, HEARTS IN

Plant Parts

Guide for Families

Learning Objectives

What you need to know:

Plants have various parts (roots, stems, leaves, flowers and fruit) that serve specific functions.

- Root —The part of the plan that provides support, anchoring the plant. It absorbs water and nutrients, and may store sugar.
- Stem — The part of the plant that transports water and minerals taken in by roots to the leaves. It transports food produced in the leaves to other parts of the plant.
- Leaf — The part of the plant that captures the sun's energy, takes in water and air, and by the process of **photosynthesis**, makes food.
- Flower— The part of the plant that produces seeds.
- Fruit – The reproductive product of the plant; the seed of plants, or the part that contains the seeds.

What you will do and learn:

You will correctly identify the parts of a plant including roots, stem, leaves, flowers or fruits.

Instructions

1. List the parts of the plant that you already know.
2. Look at the "Parts of a Plant" handout, and then look at each plant.
3. Identify each part of the plant (root, stem, leaf, flower, fruit).
4. Explore the differences between each plant part and answer:
   - What did you observe?
   - Did you see how each part is important to the plant?
   - What senses can you use to learn about this plant?
   - Can you smell it, taste it, feel it?
   - How can using your senses help you to gain knowledge about plant parts?
5. Look at the house plant and the flower. Can you find each part of those plants?

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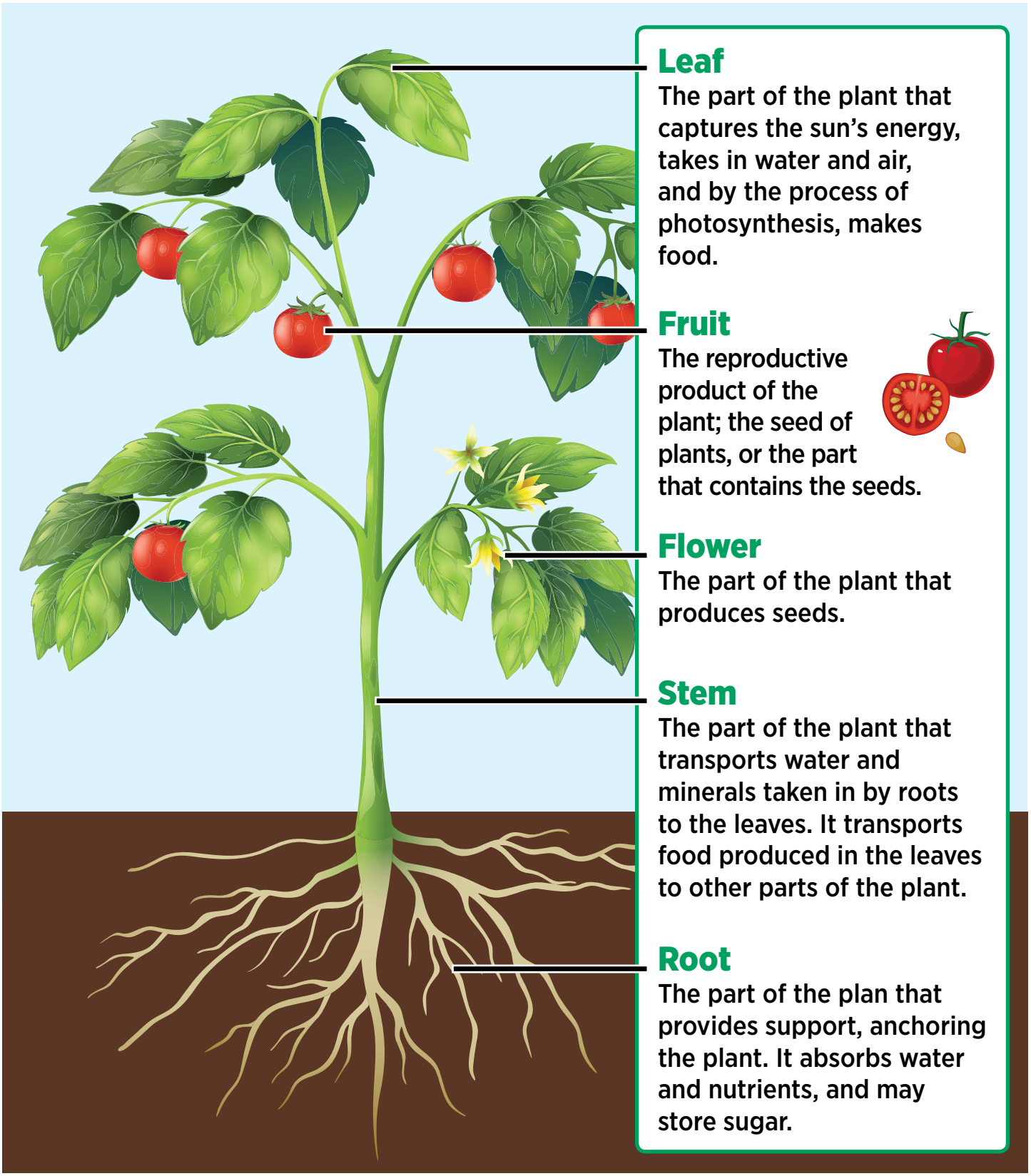
Plant Parts Handout

Parts of a Plant



Leaf
The part of the plant that captures the sun's energy, takes in water and air, and by the process of photosynthesis, makes food.

Fruit
The reproductive product of the plant; the seed of plants, or the part that contains the seeds.

Flower
The part of the plant that produces seeds.

Stem
The part of the plant that transports water and minerals taken in by roots to the leaves. It transports food produced in the leaves to other parts of the plant.

Root
The part of the plan that provides support, anchoring the plant. It absorbs water and nutrients, and may store sugar.

HEADS IN, HEARTS IN

Root Beer Float

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ 5-ounce plastic cups (1 per participant)
- ❑ Root beer
- ❑ Ice cream
- ❑ Ice cream scoop
- ❑ Spoons (1 per participant)
- ❑ Napkins or wet wipes
- ❑ Food handling gloves appropriate for food handling
- ❑ Hand sanitizer
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up the display table with the supplies.

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Root Beer Float

Guide for Families

Learning Objectives

What you need to know:

Matter is everywhere, even in a root beer float! You can find **solids**, **liquids** and **gasses** in a root beer float.

- Solid: ice cream
- Liquid: root beer
- Gas: The ice cream and root beer mix and create bubbles called **carbonation**. Those carbonated bubbles are trapped gas.

Did you know states of matter can change?

- A liquid becomes a solid when it freezes.
- A solid becomes a liquid when it melts.
- A gas becomes a liquid though the process of **condensation**.
- A liquid can become a gas through the process of **evaporation**.

Can any of those changes happen in a root beer float?

What you will do and learn:

You will understand the three types of matter and observe these three states in a root beer float. You will also discover whether the three states of matter in a root beer float can change.

Instructions

1. Begin by using a small amount of hand sanitizer.
2. Using the ice cream scoop, put a small amount of ice cream in the cup.
3. Fill cup ¾ full with root beer.
4. Observe and discuss:
   - Can you identify the solid (ice cream)? Liquid (root beer)? Gas (fizzing and popping of air bubbles on top of the root beer)?
   - What happens to the states of matter when the ice cream melts? Describe using the terms **solid**, **liquid** and **gas**.
   - What happens to the states of matter if we placed the cup in the freezer? Describe using the terms **solid**, **liquid** and **gas**.

Observe that when the ice cream and pop mix, they create bubbles. Those carbonated bubbles are trapped gas.

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HEADS IN, HEARTS IN

Seed Scavenger Hunt

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ 8–10 various packets of seeds (corn, squash, beans, watermelon and others)
- ❑ Clear packaging tape
- ❑ 3-inch by 5-inch index cards (2 per each type of seed)
- ❑ Writing utensil
- ❑ Magnifying glasses
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Choose a packet of seeds and remove the seeds from the envelope.
- Using clear packaging tape, tape the seed envelope to an index card.
- Using clear packaging tape, tape as many seeds as you can to an index card. Be sure the seeds aren't overlapping each other, but can be seen easily.
- On the back of each of the index cards containing seeds, write or label the correct name of the seed.
- Set up the display table with the supplies.

HEADS IN, HEARTS IN

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Seed Scavenger Hunt

Guide for Families

Learning Objectives

What you need to know:

Each type of seed looks and feels different. A seed will grow into a healthy plant if given soil, water and sunlight. Observe how some seeds look like the fruits of the plants (corn or peas), some seeds look like the seeds housed within the plant (watermelon or pumpkin), and others don't look like either the fruit of the plant or the seeds housed within the plant (carrots or broccoli).

What you will do and learn:

Play the matching game. Identify and match seeds to the correct plants.

Instructions

1. Look at the seed envelopes.
2. Now look at the seeds.
3. See if you can identify which seeds belong with each of the seed envelopes.
4. Match as many as you can.
5. Flip over the seed cards to see if you were correct.
6. Use the magnifying glass to look at the seeds more closely.
7. Do you think the size of the seed determines the size of the plant?
8. Do you think the size of the seed determines the size of the fruit?

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HEADS IN, HEARTS IN

Soap That Floats

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Tub large enough to hold 3 to 4 bars of soap
- ❑ Water
- ❑ 3–4 different brands of bar soap. One brand must be Ivory soap.
- ❑ Tongs to remove bar of soap from tub of water
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up the display table with the supplies.

HEADS IN, HEARTS IN

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Soap that Floats

Guide for Families

Learning Objectives

What you need to know:

Density is the measure of how tightly molecules are packed together. Anything that is denser than water will sink. Soap is likely to sink because its ingredients are denser than water. Some soaps have a lot of air trapped inside of them. That causes the soap to float when placed in water. Soap that doesn't have air trapped inside will sink.

Buoyancy is the ability of an object to float in a liquid. Here, the object is a bar of soap and the liquid is water.

What you will do and learn:

You will be able to describe why the soap sinks or floats.

Instructions

1. Observe different bars of soap. Ask questions:
   - What makes something float?
   - Which soaps do you think will float? Which soaps do you think will sink?
   - What differences do the soaps have? What similarities do the soaps have?
2. Place one bar of soap in the pan at a time. Ask:
   - Which ones float and which ones sink to the bottom?
   - Talk about what happened. Which soap is most buoyant?

When Ivory brand soap is made, it is whipped, causing tiny air bubbles to get trapped in the soap as it hardens. This trapped air causes the bar of soap to be more buoyant, allowing it to float when other brands of bar soap sink.

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HEADS IN, HEARTS IN

Soybean Seed Necklace

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Jewelry plastic bags (approximately 2 inches wide by 3 inches long)
- ❑ Soybean seeds (You may use any seeds for this activity. Purchase seeds in the gardening section of your local store.)
- ❑ Cotton balls
- ❑ Bowl for water
- ❑ Water
- ❑ Hole punch
- ❑ Yarn
- ❑ Scissors
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Punch one hole in the top of the bag.
- Cut the yarn into pieces approximately 2½ to 3 feet long.
- Set up the display table with the supplies.

HEADS IN, HEARTS IN

Soybean Seed Necklace

Guide for Families

Learning Objectives

What you need to know:

Soybeans, like most seeds, need **air**, **water**, **sunlight** and **soil** to grow. If you give them **water** and **warmth** they will start to sprout and begin to show roots.

Once your soybean sprouts you'll be able to identify plant parts: roots, stems and leaves.

Farmers grow soybeans in fields. Soybeans are used to make many things, such as crayons, food, make-up, paint and many other items.

What you will do and learn:

You will make a soybean seed necklace to prepare a soybean for sprouting. You will be able to identify the components needed for a plant to grow. You will be able to identify the parts of a plant.

Instructions

1. Take one small bag.
2. Place one soybean seed in the bag.
3. Lightly dip a cotton ball in water.
4. Wring out excess water. It should be damp, but not dripping.
5. Place the cotton ball in the bag on top of the soybean seed.
6. Seal the bag.
7. String a piece of yarn through the hole and tie it into a necklace.
8. Place it inside your shirt to give the seed warmth so it will grow.
9. **Do not wear while sleeping!** Place it in a warm, dark place at night. During the day, if you don't want to wear it, put it in a warm, sunny place.
10. Once your soybean begins to sprout, you will need to plant it in soil.

Can you identify the components needed for your plant to grow?

- air (inside the bag)
- water (in the cotton ball)
- warmth (your body)
- sun (daylight when you're not wearing it)
- soil (cotton ball)

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HEADS IN, HEARTS IN

States of Matter

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ "States of Matter" worksheet (1 per participant)
- ❑ Descriptions of each state of matter
- ❑ Hole reinforcement stickers
- ❑ Crayons (if desired)
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print copies of "States of Matter" worksheet. (Print "States of Matter" on one side and the table on the other side.)
- Set up the display table with the supplies.

HEADS IN, HEARTS IN

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States of Matter

Guide for Families

Learning Objectives

What you need to know:

Objects that take up space and have mass are called matter. Everything around you is made of **matter**. Solid, liquid and gas are three states of matter.

Solids, such as a desk, a chair or a phone, are firm and stable. Their molecules are grouped together in organized patterns. The molecules might vibrate slightly but they don't move around.

Liquids, such as water, rain or milk, take the shape of the container they are in, although their volume doesn't change. The particles are packed together, but don't form any type of a pattern. These molecules move around.

Gases, such as air, steam and helium, shift to fit the container they are put in and can even fill it. The molecules of gases are spaced far apart.

What you will do and learn:

You will be able to describe the relationship between particles and how they move as a liquid, solid and gas. You will describe how molecules are different in each state of matter.

Instructions

1. Take one sheet of paper labeled "States of Matter."
2. Read the descriptions of each state of matter in the table on the back: Solid, liquid and gas.
3. In the table, use the stickers to show the relationship between particles for each state of matter:
   - Solid (in a pattern; packed tightly and close together)
   - Liquid (spread apart with no pattern)
   - Gas (very loose and spread out).
4. You can use the front of the "States of Matter" worksheet to draw items that are solids, liquids and gasses.

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States of Matter Handout

States Of Matter

States of Matter

States of Matter Handout

States Of Matter, continued

Solid	Liquid	Gas
Has mass Takes up space Has its own shape	Has mass Takes up space Takes the shape of container	Has mass Takes up space Fills up the entire container

HEADS IN, HEARTS IN

Sugar Surprise

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ 5-pound bag of sugar
- ❑ 3 teaspoon measuring spoons
- ❑ 3 drinks that vary in sugar content (for example, regular non-diet pop, juice and milk)
- ❑ Large bowl
- ❑ 3 small bowls
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up the display table with the supplies.
- Put sugar in the large bowl and leave the 3 small bowls for participants to measure sugar into.

HEADS IN, HEARTS IN

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Sugar Surprise

Guide for Families

Learning Objectives

What you need to know:

Many of our favorite drinks have a lot of sugar in them. Sometimes drinks that we think are healthy actually have much sugar. The daily maximum amount of sugar a child should have is about 6 teaspoons or 25 grams.

What you will do and learn:

You will read nutrition labels to find sugar content. You will compare nutrition labels of drinks.

Instructions

1. Choose a beverage container.
2. How much sugar do you think is in this container? Why?
3. Read the nutrition label on the back or side of the first beverage.
4. Find the word “sugar” and see how many grams of sugar are in that beverage.
5. Measure from the large bowl of sugar the number of ounces of sugar that are contained within that drink. Note that there are 4 grams of sugar in one teaspoon.
6. Discuss: Are you surprised by how much sugar is in that drink?
7. Read the nutrition label on the second beverage.
8. Find the word “sugar” and see how many grams of sugar are in that beverage.
9. Measure from the large bowl of sugar the number of ounces of sugar that are contained within that drink. Note that there are 4 grams of sugar in one teaspoon.
10. Discuss: Is it more or less than the first beverage? Are you surprised by how much sugar is in that drink?
11. Repeat the process for the third beverage.
12. Discuss: Which drink had the most sugar? The least sugar? What surprised you?

What will you do differently in the future? It is best to:

- Read nutrition labels on drinks for sugar content.
- Compare the sugar content in drinks before buying them.
- Choose a drink that has a lower content of sugar.

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HEADS IN, HEARTS IN

Touch and Feel Cloud

Instructions for Set-Up

Warning: Do not touch dry ice. It can cause severe burns. Use tongs.

Supplies

- ❑ "Guide for Families" handout
- ❑ 2 clear plastic standup displays (optional)
- ❑ 3–4 vases with small openings at the top
- ❑ Hammer
- ❑ Dry ice
- ❑ Tongs
- ❑ 3–4 bowls
- ❑ Water
- ❑ Dish soap
- ❑ Pipe cleaners (3 to 4)
- ❑ Towels to dry hands and clean up spills
- ❑ Safety glasses
- ❑ Warning sign
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set out 3 to 4 vases. Using the hammer, break apart a few chunks of dry ice.
- Using the tongs, place a chunk of dry ice in each vase.
- Add warm water to the vase.
- Prepare 3 to 4 small bowls of soapy water.
- Set bowls of soapy water on the display table with one pipe cleaner per bowl.
- Place the rest of supplies on the display table.
- Put up the warning sign about dry ice in a clear plastic standup display, or use another method where it is clearly visible to participants.

HEADS IN, HEARTS IN

18 USC 707

Touch and Feel Cloud

Guide for Families

Learning Objectives

What you need to know:

A **cloud** is made up of tiny droplets of water. When warm air rises, it expands and cools. Cool air can't hold as much water vapor as warm air. Some of the vapor condenses onto tiny pieces of dust that are floating in the air. It forms a tiny droplet around each dust particle. When billions of these droplets come together, they become a visible cloud.

Dry ice is frozen **carbon dioxide**. Instead of melting like regular ice, dry ice turns directly into carbon dioxide gas. Dry ice must be handled with care as it is 110 degrees below zero F (-78 degrees C). It must be handled using gloves or tongs, because it will cause severe burns if it comes in contact with your skin. When you drop a piece of dry ice in a vase of water, you will see a gas. This gas is a combination of carbon dioxide and water vapor – a model of a cloud of tiny water droplets.

What you will do and learn:

You will find out some of the basics of weather and how a cloud is formed. You will learn that chemicals, such as dry ice, should be handled with care.

Instructions

1. Do not touch the dry ice in the vases. It can cause severe burns.
2. Put on the safety glasses.
3. Observe what is happening in the vases that contain dry ice and warm water.
4. Take a piece of pipe cleaner soaked in soapy water.
5. Lightly wring out the pipe cleaner to remove some of the excess water.
6. Gently slide the pipe cleaner over the rim of the vase to form a bubble cap.
7. Observe what happens when you capture the water vapor. You have just trapped a model of a cloud!
8. Touch the bubble and observe what happens.

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Warning: Do not touch the dry ice in the vases. It can cause severe burns.

HEADS IN, HEARTS IN

Tubs of Butter Fun!

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Disposable 3-ounce soufflé cup (1 per participant)
- ❑ Disposable 3-ounce soufflé cup lid (1 per participant)
- ❑ Heavy whipping cream (about 1½ ounces per participant)
- ❑ Cooler with ice to keep heavy whipping cream cold
- ❑ Small bucket or pail for buttermilk disposal
- ❑ Crackers (2–3 per participant)
- ❑ Several plastic knives
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Set up the display table with the supplies.

HEADS IN, HEARTS IN

18 USC 707

Tubs of Butter Fun!

Guide for Families

Learning Objectives

What you need to know:

To make butter, the cream is **agitated** (stirred up) so that the fat molecules (globules) get shaken out of position and clump together. Eventually, after enough **agitation**, the fat molecules clump together so much that butter forms. When this happens, the fat molecules have clearly separated from the liquid in the cream, and this liquid can be removed and made into **buttermilk**. The solid that is left is called butter.

What you will do and learn:

You will discover how to make your own butter using heavy whipping cream. You will gain an understanding of how fat molecules in heavy whipping cream can separate by agitation.

Instructions

What do you think will happen when...?

1. Fill a small cup half full with heavy whipping cream and place a lid on the cup. Double-check to be sure the lid is secure.
2. Gently, but vigorously, shake the cup for approximately 2 minutes.
3. Stop shaking the cream and observe. As you shake the cream, a ball of butter with begin to form slowly.
4. Continue shaking until a fully formed ball of butter is present.
5. After the ball of butter has formed, there should be liquid that is separated from the butter. This liquid is known as **buttermilk**. Gently pour out the buttermilk into the small bucket.
6. What is left is butter.
7. Using a plastic knife, spread on a cracker and enjoy.
8. Does it taste different from the butter that you use at home? How?

NOTE: The colder the heavy whipping cream, the quicker it will turn to butter.

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What's This Made Of?

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ Plastic tray or shallow tub
- ❑ Several items made from plastic and several made from metal (for example, a marker, paper clips, keys, a barrette, a pencil, a hair tie, dice, a binder clip, confetti, a spoon or other items)
- ❑ Strong magnet that has a handle, clasp or carabiner attached to it
- ❑ Piece of colorful yarn or pipe cleaner
- ❑ Display table

Activity Preparation

- Purchase or locate items on the supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Attach a piece of colorful yarn or pipe cleaner to the magnet so it can be easily found and handled.
- Set up the display table with the supplies.

HEADS IN, HEARTS IN

What's This Made Of?

Guide for Families

Learning Objectives

What you need to know:

A **hypothesis** is an educated prediction. Sometimes when you **hypothesize** (make an educated prediction), you predict the correct answer. It's okay to hypothesize and find out you have the incorrect answer.

What you will do and learn:

In this activity, you will use a hypothesis to determine if items are made of plastic or metal. To hypothesize, you will answer the question: "Is this item made from plastic or metal?" You will then make a an educated prediction.

To determine if your hypothesis is correct or incorrect, you will use the magnet. Items that are attracted to the magnet are made from metal and the items not attracted to the magnet are made of plastic.

Instructions

1. Make a hypothesis to decide what you think each item is made out of: plastic or metal. (Use some of your senses to help you decide.)
2. Sort the items on the tray into the categories of plastic or metal. Explain why you chose to put the item on that tray.
3. Use the magnet to be sure the items placed in the metal category are actually made of metal.

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