BALLOON SKEWERS

Introduction:

Some things in this world just don't go together very well - cats and dogs, oil and water, sharp objects and balloons! Whenever you are carrying an inflated balloon, you always know to keep it away from anything that has the potential to pop it. The worst nightmare for any balloon would be sharp objects. Yet, with a little background knowledge about polymers, you'll be able to pull off the unthinkable...inserting a wooden skewer through a balloon and out the other side without popping it!

Materials:

- Balloon
- Bamboo skewer or very large needle
- Cooking oil or petroleum jelly
- Safety glasses

Procedure:

1. Put on your safety glasses.
2. Blow up a balloon and tie if off. If you let a little air out of the balloon, it will be easier to skewer.
3. Dip the wooden skewer or needle into the cooking oil or petroleum jelly. (Be sure that the entire skewer has lubrication on it, not just the tip.)
4. Using a gentle twisting motion, insert the skewer (or needle) into the thick nipple end of the balloon, opposite the knot. Continue pushing on the skewer until it emerges from the other side, right near the knot. The balloon should not burst, but it may. You can actually insert it from either direction.
5. Pull the skewer out slowly through to the end. Place your hand over the holes to feel any air leaking out.
6. To show that this is a real balloon, jab the skewer through the side and it will pop.

How does it work?

Balloons are made out of thin sheets of rubber or latex, which in turn are made from many long intertwined strands of polymer molecules. The rubber is stretchy because of the elasticity of the polymer chain. When the balloon is blown up, the polymer strands are stretched. The middle area of the balloon stretches more than the tie end or the nipple end (opposite the tie). A sharp, lubricated point can be pushed through the strands at the tie and nipple ends because the polymer strands will stretch around it. A sharp, lubricated point pushed through the strands at the side of the balloon will pop the balloon because the strands are already stretched and will break. Once a tear begins, it enlarges quickly as the air rushes out of the balloon.

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EATING IRON?

Introduction:

Science can help us find one of the most common elements on Earth in your breakfast cereal: iron. Even though it only makes up less than five percent of the Earth's mass, it is found in a lot of places, like rocks and even in your blood. Iron plays an important role in our bodies. It helps to carry oxygen molecules from our lungs to the rest of our body. While we can't produce iron ourselves, it's naturally present in many foods, including meats (beef, pork, and turkey), produce (raisins, spinach, prunes) and nuts (walnuts, cashews, peanuts). Some food makers put a dash of it in other food products – such as fortified breakfast cereal. (Of course it wouldn't be healthy to eat iron on its own, so stick to getting your daily dose via food and vitamins.) Like many metals, iron is magnetic. Using a strong magnet, let's find out if we can remove, or "extract," the iron from the cereal.

Materials:

- Total® and other flake cereals
- A blender
- Measuring cup
- Clear plastic cups
- Water
- Strong magnet
- White plastic spoons
- Safety glasses

Procedure

1. Put on your safety glasses.
2. Mix 2 cups of Total® cereal with 2 cups water in a blender bowl. Let it sit for a few minutes until the cereal is soft.
3. Blend the water-cereal mix to make a smooth slurry.
4. Pour some cereal slurry into a plastic cup.
5. Hold the magnet against the side of the cup while stirring gently with a spoon.
6. When the magnet is taken away, a black spot of iron filings can be seen on the side of the cup.

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How does it work?

As it turns out, at least some of the iron with which our breakfast cereals are fortified with "raw" elemental iron. In this form, it is strongly attracted by a magnetic field (iron compounds do not show this same degree of attraction). The small pieces of elemental iron are attracted to the magnet and gather to form the dark spot. The longer the slurry is stirred, the darker the spot. When the magnetic field is removed, the spot gradually falls and disperses back into the slurry.

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SIDEWALK CHALK

Introduction:

One of childhood's favorite outdoor activities at home is drawing with chalk on the driveway. You can play hopscotch and draw and create silly stories. This sidewalk chalk is pretty easy to make, and by doing it at home, you can save money, create your own designs, and have fun with the whole family.

Materials:

- Water (approx. 1/8 cup)
- Plaster of Paris (approx. 1/4 cup)
- Poster paint or food coloring (various colors)
- Mixing container (small paper cups, bathroom dispenser size)
- Stirring utensil (e.g., popsicle sticks)
- Molds (e.g., paper coin wrappers – preformed)
- Old newspaper or paper towels
- Safety glasses

IMPORTANT! *Dry powder from Plaster of Paris may come in contact with eyes. Thus, always wear safety glasses. If Plaster of Paris is in contact with eyes, rinse with plenty of water for several minutes. Do not put Plaster of Paris down any drain as it clogs pipes. Throw used materials in the trash.*

Procedure

1. Put on your safety glasses.
2. In the mixing container, put the Plaster of Paris. Stir in enough water with the Plaster of Paris that the mixture has the consistency of ketchup (you'll need to be able to pour it, but you don't want it to be too runny).
3. Add enough poster paint to make the mixture the desired color.
4. Position the mold. If you are going to use coin wrappers, stand the coin wrapper on one end on a newspaper or paper towel.
5. Pour the mixture into the mold, and leave it alone until it hardens (approximately 1 – 1 ½ hours).
6. If you use a coin wrapper, once the mixture has dried, you can just peel the wrapper away from the chalk (the wrapper will peel away easier if the chalk still has a little moisture in it).

7. Depending on how much water is in your mixture, the paper should be removed after 1-1 ½ hours. Also, the chalk will need to dry out for about one (1) day before using it so that it doesn't crumble.

How does it work?

Plaster of Paris is made from gypsum, a commonly occurring mineral. One of the early major sources of gypsum was the Paris basins in France – hence the name "Plaster of Paris." When heated moderately, gypsum forms Plaster of Paris. When mixed with water to form a paste, the Plaster of Paris hardens quickly. During the reaction, heat is formed (causing the warmth that is noted when casts are made). As the reaction occurs, the crystals expand and become interlocked creating a hard solid that, through expansion, has filled all of the details of the mold it was placed in. As the water evaporates from the Plaster of Paris, what was once a powder and a liquid is now a solid. Furthermore, if you used a paper coin wrapper and placed it on a newspaper or paper towel, you will see that the water absorbed by the newspaper or paper is clear, not the color of the chalk. The Plaster of Paris acts as a filter, where the water molecules are small enough to filter through the mixture, but the molecules containing the color are not.

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POLYMER PUTTY

Introduction:

Polymers are used in many industries to make everything from artificial hip joints to skateboards, including the automotive, aviation, packaging, homes and building construction, medicine, sports and computer industries. A polymer is a giant, chain-like molecule. This large molecule is made from thousands of atoms combining with one another in a long chain. Not all polymers are made by scientists in laboratories. Many polymers are found in nature. Resin from pine trees, latex from rubber trees, tortoise shell, cellulose from plants, protein and carbohydrates are all natural polymers. Let's make some Polymer Putty to see this process in action.

Materials:

- One (1) tablespoon of white glue (Elmer's®)
- One (1) tablespoon of water
- 20 Mule Team® Borax (laundry section of the grocery store)
- Two (2) cups of warm water (for Borax Solution)
- Popsicle sticks for stirring
- Six (6) ounce plastic cup for mixing
- Zipper close plastic bag to store putty
- Food coloring (optional)
- Paper towels
- Safety glasses

IMPORTANT! *Do not dispose of Polymer Putty down the drain; it may clog the pipes. Throw it away in the garbage. Also, do not give it to children younger than 5 years of age. While it is not toxic, it could get stuck in a child's throat. Finally, do not place your putty on natural wood furniture as it will leave a water mark. It may stick to other materials.*

Procedure

1. Put on your safety glasses.
2. Make Borax Solution by dissolving two (2) tablespoons of Borax in two (2) cups of warm water.
3. In the plastic cup, mix water and glue until it is homogeneous.
4. If desired, add a few drops of food coloring to glue and water mixture. Do NOT wait until after the borax is added to mix in food coloring.
5. Continue to mix color until no more white is showing.

6. Mix in Borax Solution by pouring it into the glue mixture slowly while stirring vigorously. If all the water does not get mixed in immediately, keep stirring until it does.
7. Take the Polymer Putty out of the cup and off the stick to begin playing with your own putty!
8. Keep the Polymer Putty stored in the zip-lock bag for safe keeping.

How does it work?

Polymer Putty is a cross-linked polymer which has some properties of a liquid (for example, it flows) and some properties of a solid (for example, it breaks). The glue solution is polyvinyl acetate, which has been dissolved in water. The polyvinyl acetate chains are so long that they interfere with each other, causing the glue to be rather thick and to pour more slowly than water. Polymer Putty is formed when the solution of Borax Solution (sodium borate) is added to the glue solution. The Borax reversibly cross-links the polymer chains, binding them together and producing a gel-like material that is more viscous (thicker) than the glue solution and has a variety of interesting properties.

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HIDDEN RAINBOWS

Introduction:

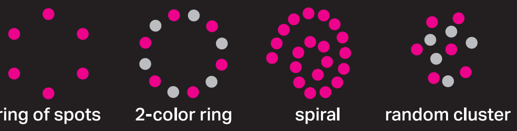
Chromatography is one method that chemists use to separate mixtures. When the mixture is separated, the chemist can tell how many things are in the mixture. Often a mixture contains two or more materials that each has their own color. These colors can be hidden when the mixture is formed. In this experiment, you will use a technique called radial chromatography to study the colors found in black ink pens.

Materials:

- Scissors
- Round filter papers with small hole in middle
- Assortment of <u>water soluble</u> black ink pens
- 6 oz. paper or plastic cups
- Water
- Triangles cut from absorbent paper towels, approximately 3 inches high and 1 ½ inches at the base
- Safety glasses

Procedure

1. Put on your safety glasses.
2. Take one (1) piece of filter paper and one (1) triangle.
3. Use one (1) of the pens to make a pattern of dots spaced around the center hole with no dots being more than an inch from the center. If you do more than 12 or so dots, they will have a hard time distinguishing a pattern from each dot. Here are some possible patterns to use:



4. Insert the tip of the paper towel triangle into the hole through the back of the filter paper. It will act as a wick to draw water into the middle of the paper.
5. Fill each cup ½ to ¾ full with water, and making sure the rim is dry, rest the filter paper circle on top of the cup with the wick in the water. The water will spread from the center of the filter paper out toward the edge.

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How does it work?

This technique of radial chromatography helps scientists distinguish different substances in mixtures. Although they appear as one pure color, most black inks are a mixture of pigments, sometimes as many as eight or nine. The paper towel triangle acts as a wick, drawing the water up to the filter paper. As the water is then absorbed outward and flows past the black spots, each of the pigments gets subjected to two opposing forces: its attraction to the filter paper, which is acting to hold the pigment in place, and its attraction to the water, which is acting to pull the pigment outward along with it. Due to the nature of the molecules that make them up, some of these pigments are more attracted to the filter paper and thus stay more or less where they are spotted, while others are more attracted to the water and thus move out quite far. In a sense, chromatography can be thought of as a race, separating out the fast pigments from the slower ones. The longer the chromatography is allowed to run, the more separated out the pigments become.

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FOSSILS

Introduction:

Scientists constantly test ways to replicate the process of forming fossils. Taphonomists (those who study how to make fossils) have demonstrated the astonishing speed of fossilization, with some being generated in days or even hours. While water and dissolved minerals are usually needed to form fossils, many processes, including coalification, compression, freezing and desiccation (drying out) do not require either. While scientists are still trying to sort out the complex details about fossilization, the exciting news is that you can make them at home!

Materials:

- Paper plate
- Paper cup
- Modeling clay (about size of a lemon)
- Seashell (or whatever you want as a fossil; i.e. toy dinosaurs)
- Petroleum jelly or cooking spray
- Water
- Plaster of Paris
- Plastic spoon
- Safety glasses

IMPORTANT! *Do not wash Plaster of Paris down the drain; it will set and block the pipes. If you have any leftover mixture, let it harden, and then throw it into a garbage can.*

Procedure

1. Put on your safety glasses.
2. Place a piece of clay on the paper plate.
3. Rub the outside of the seashell with petroleum jelly.
4. Press the seashell into clay.
5. Carefully remove the seashell so that a clear imprint of the shell remains in the clay.
6. Mix 4 spoons of Plaster of Paris with 2 spoons of water in the paper cup.
7. Pour the plaster mixture into the imprint in the clay. Throw the paper cup and spoon away.
8. Allow the plaster to harden. It takes about 15 to 20 minutes.

9. Separate the clay from the plaster mold.
10. The result is the clay has an imprint of the outside of the shell, and the plaster looks like the outside of the shell.

How does it work?

The layer of clay and the plaster are both examples of different types of fossils. The clay represents the soft mud of ancient times when organisms made imprints in the mud. If nothing collected in the imprints, the mud dried, forming what is now called a cast fossil. When sediments filled the imprint, a sedimentary rock formed with the print of the organism on the outside. This type of fossil is called a mold fossil.

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