girl scouts
of california's
central coast

# Brownie Home Scientist

## Badge Workshop

An At-Home Program

# Brownie Home Scientist Badge Workshop (At-Home)

When you think of science, you may start to think of school but there are a number of different science experiments that can be done at home and are actually really fun. In this badge you will be doing some of your own fun science experiments with objects that you already have.

## Program Outline:

### Materials:

- Please see each step for the complete list of supplies

### Step 1: Be a kitchen chemist

Growing rock candy is really fun but it is also scientific. To make rock candy, you will be dissolving sugar in hot water until it is a supersaturated solution. This means that there is more sugar in the water than the water can hold. When this happens, the liquid wants to get rid of all that extra sugar so the sugar crystalizes and turns into rock candy!

What you'll need:

- Cup
- String
- Pencil or other long thin object
- Water
- Sugar
- Food coloring
- An adult

How to make rock candy:

- With an adult's help, boil approximately 2 cups of water.
- Slowly stir in sugar until it won't dissolve anymore.
- Add a few drops of food coloring.
- Pour the liquid into the cup without letting any undissolved sugar in. If there is undissolved sugar, the crystals will stick to those instead of the string.
- Tie one end of the string around pencil and place the other end of the string into liquid (the string should not touch the bottom of the cup).
- Set it somewhere where it will not get disturbed.

- Crystals will start to form after an hour but they should be allowed to grow for several days to a week to make large crystals.
- To make giant crystals, repeat the above process in a larger jar. Instead of adding a new string, add the one from before that already has crystals attached to it. This will help them grow even bigger.

### Step 2: Create static electricity

Have you ever gone to touch someone's hand and felt a zap instead? If you have, then you have felt static electricity. You are going to use a balloon to create static electricity and see what it does to paper and bubbles.

What you'll need:
- Inflated balloon from step 4
- Bubbles
- Paper strips

What to do:
- Rub the balloon on your hair to charge it.
- Place the charged balloon close to the paper strips and see what happens. Test this out with bubbles as well.
- What happens? Why does the charged balloon react to the paper and bubbles?
- Static electricity is caused when there is an imbalance of positive and negative charges on the surface of an object. Rubbing the balloon on your hair cause the balloon to take the negative charge from your hair. This means that your hair now has a positive charge and the balloon has a negative charge. That's why your hair sticks to the balloon – because opposites attract.

### Step 3: Dive into Density

Some things float in water. Other things sink in water. This is because they all have different densities. Density is how heavy an object is compared to its size. A small but very heavy object has a very high density because it is solid all the way through whereas a basketball has a very low density because it is full of air. You are going to be testing the densities of some objects in your house.

What you'll need:
- Large tub
- Water
- Lemons
- Limes
- Other fruits with peels

Testing density:
- Fill the tub with several inches of water.
- Place one lemon and one lime into to tub and see what happens.

- What happens? Why?
- Now peel the lemon and lime and test again to see what changes.
- Did anything change? Why?
- Test with a couple more fruits with and without their peels and observe results.

### Step 4: Make something bubble up

Did you know you can blow up a balloon with just a few common household products? Using vinegar and baking soda, you are going to cause a chemical reaction that makes carbon dioxide to fill the balloon.

What you'll need:
- Empty water bottle
- Balloon
- Baking soda
- Vinegar
- Funnel
- Measuring spoons

Inflating the balloon:
- Use the funnel to add 1 tsp baking soda to the balloon.
- Add 2 tbsp vinegar to the empty water bottle.
- Put the end of the balloon around the neck of the bottle.
- Lift the top of the balloon to dump the baking soda into the bottle.
- Observe the results.
- Why does the balloon inflate?
- Carefully take the balloon off of the bottle and tie the end so the air doesn't escape so you can use the balloon for step 2.

### Step 5: Play with science

Slime and playdough both involve science. Slime uses chemicals that you may have at home to create a gooey, stretchy substance. Playdough uses heat to create a squishy, moldable substance. Look at the recipes below and choose one to make. Feel free to find another recipe that works for you to continue the fun or replace the recipes below.

**Slime/Fluffy Slime:**
Supplies:
- School glue
- Borax (Sodium tetraborate) or Contact lens solution
- Food coloring
- Water
- Two bowls
- Stir stick or spoon
- Shaving cream (optional)

Steps:

- In one bowl mix together ½ cup of glue and ½ cup of water. If you want colored slime, add food coloring to the glue and water mixture. Lift some of the solution out of the container with the stir stick and note what happens.
- If you would like to make fluffy slime, stir in about 2 cups of shaving cream to the glue mixture.
- If you do not have borax or don't want to use it, contact lens solution can be substituted. If you use contact lens solution, skip the next step.
- In a separate bowl, combine 1 tbsp. of borax and 1 cup of water. Stir until all of the borax is dissolved.
- Add the borax solution or 1 ½ tbsp. of contact solution to the glue and water mixture and stir slowly.
- The slime will begin to form immediately. Lift some of the solution with the stir stick and observe how the consistency has changed.
- Stir as much as you can, then dig in and knead it with your hands until it gets less sticky. This is a messy experience but is necessary because it allows the two compounds to bond completely. Don't worry about any leftover water in the bowl; just pour it out.
- When not in use, store the slime in a plastic bag in the fridge to keep it from growing mold.

**Oobleck (Non-Newtonian fluid):**

Supplies:

- Cornstarch
- Water
- A big bowl

Steps:

- In the plastic mixing bowl, combine small amounts of water and cornstarch together to form a mixture that looks like heavy whipping cream and has the consistency of honey. The approximate ratio of the cornstarch to water mixture is 2 cups of cornstarch to 1 cup of water. It is best to start with less water and slowly add it until the desired consistency is reached.
- After making your mixture, gently lay your hand on the surface of the cornstarch-water mixture. You should notice that your hand sinks in the mixture like you would expect it to do. Move your hand through the mixture, slowly first and then trying to move it really fast. Was it easier to move your hand slowly or quickly through it?
- If your mixture is deep enough to submerge your entire hand in it, try grabbing a handful of the mixture and pulling your hand out quickly. Then try again, this time relaxing your hand and pulling it out slowly. Did you notice a difference?
- Try punching the cornstarch-water mixture. (Be careful not to hurt yourself on the bowl!) Make sure to hit the substance hard and pull your fist back quickly. Did the substance splatter everywhere or did it remain in the bowl? (If it splattered, add more cornstarch.)

**Play Dough:**

Supplies:

- 2 cups all-purpose flour
- 3/4 cup salt
- 4 teaspoons cream of tartar
- 2 cups lukewarm water
- 2 Tablespoons of vegetable oil (coconut oil works too)
- Food coloring, optional

- Quart sized bags

Steps:

- Stir together the flour, salt and cream of tartar in a large pot.
- Add the water and oil. If you're only making one color, add in the color now as well.
- Cook over medium heat, stirring constantly. Continue stirring until the dough has thickened and begins to form into a ball.
- Remove from heat and then place inside a gallon sized bag or onto wax paper.
- Allow to cool slightly and then knead until smooth.
- If you're adding colors after, divide the dough into balls (for how many colors you want) and then add the dough into the quart sized bags. Start with about 5 drops of color and add more to brighten it.
- Knead the dough, while inside the bag so it doesn't stain your hands. Once it's all mixed together you're ready to PLAY.
- Store the play dough inside the bags once done to keep soft. Keeps for up to 3 months.

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