S'mores Solar Oven

MATERIALS NEEDED

- ☐ S'mores fixings (marshmallows, chocolate bars, graham crackers — or whatever combination you like)
- ☐ Pizza box (or any thin box with a lid)
- ☐ Plastic wrap (or wax paper)
- ☐ Aluminum foil
- ☐ Black paper
- ☐ Scissors
- ☐ Tape
- ☐ Stick
- ☐ SUN! (make sure it's a hot, sunny day before you attempt to cook your s'more)

INSTRUCTIONS

1. Cut a flap in the lid of the box. Draw a square on top of the box that's just a few inches smaller than the lid. Cut the square on just **three** sides to create the flap.
2. Fold and tape aluminum foil around the flap (to attract the sun!).
3. Open the flap of the box and tape a piece of plastic wrap across the outside of the lid. The flap should open freely, revealing the plastic wrap. For best results, the plastic wrap should be as airtight as possible. Together, the aluminum foil and the plastic trap the heat from the sun.
4. Inside the box, tape a piece of black paper to cover the bottom.
5. Your oven is completely constructed! Put your oven on the ground outside in a very sunny spot.
6. Assemble a smore on the black construction paper: graham cracker, marshmallow, chocolate. Put the top graham cracker to the side of the s'more.
7. Close the lid and open the top flap. Prop the flap up with your stick and some tape.
8. Wait and watch. Depending on the temperature, you may have to wait up to an hour for your s'more to get nice and melty. Yummy things are worth waiting for . . .

HOW DOES THIS WORK?

The aluminum foil attracts the sun's heat to your oven and the plastic wrap traps that heat inside the box, melting your chocolate and marshmallow.

Mini Crystal Garden

MATERIALS NEEDED

- Epsom salt
- Glass jar
- Food coloring
- Warm water (microwave 2 cups of water for 2 minutes)
- Measuring cups

INSTRUCTIONS

1. Pour your Epson salt and warm water in the glass jar using a 1:1 ratio. This means, if you're using 2 cups of salt, you should add 2 cups of water.
2. Stir your mixture until the salt dissolves in the water. Add food coloring and stir more.
3. Immediately place your jar in the refrigerator and leave it there for 24 hours or longer.
4. Take your jar out of the fridge and very carefully pour out any leftover water at the bottom. What do you observe?
5. Continue playing with this method to see just how big your crystals can grow. Try playing with the salt and water ratio or the length of time it spends in the fridge to see what happens.

HOW DOES THIS WORK?

When you stir the salt into the water until it dissolves you have a saturated solution. This means that we have filled all the space in the water with salt, to the point where a few salt crystals may wind up at the bottom, unable to dissolve into the water. In warm water, the molecules spread out, allowing more salt to dissolve than in cold water. Once the water starts to cool, it sheds the salt crystals it can no longer hold. Over time, the water will evaporate, creating piles of salt crystals in different formations.

Invisible Ink

MATERIALS NEEDED

- Lemon
- Small bowl
- Water
- Paintbrush or q-tip
- White paper

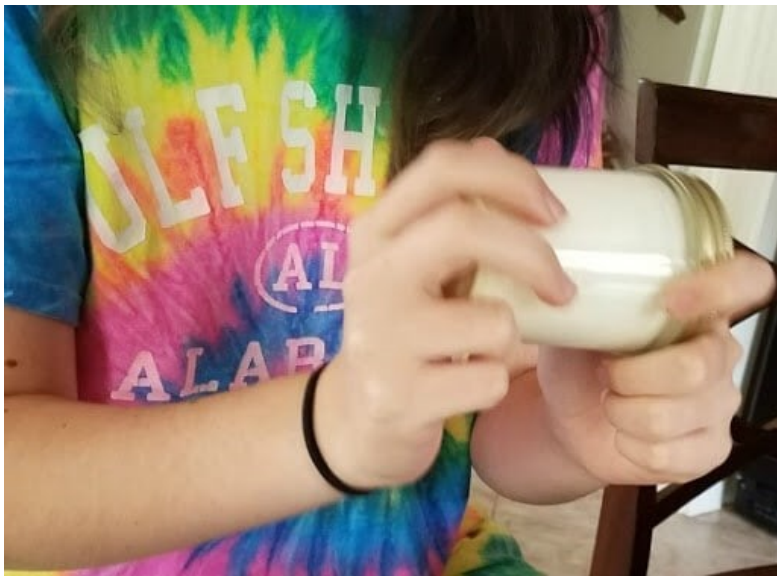
INSTRUCTIONS

1. To make the invisible ink, cut the lemon in half and squeeze the juice into a small bowl. Fish out any seeds with a spoon.
2. Add a few drops of water and stir.
3. Take your paint brush and dip it into your invisible ink mixture. Draw or write something onto your paper. Let dry completely.
4. Now you have a secret message! Take the message and hold it over a heat source, like a lamp or an electric stovetop on low (ask an adult for help!). Slowly, your message will start to appear.
5. Try using other acids like vinegar or orange juice, to see what works best.

HOW DOES THIS WORK?

Chemistry! Lemon juice contains the chemical element, carbon. When you add heat, it disrupts the chemical bonds in the lemon juice, releasing the carbon. This appears as a somewhat brown color.

Making Butter



MATERIALS NEEDED

- Small jar with lid
- Heavy whipping cream

INSTRUCTIONS

1. Fill the jar about halfway with the heavy whipping cream.
2. Screw on the lid and make sure it is very tight.
3. Start shaking! Every 5 minutes, look through the jar and see if the cream is starting to thicken and turn into a solid (at some point you'll actually have whipped cream!). When you feel like your mixture is no longer moving around as much in the jar, open the lid and see if most of your liquid is now a solid.
4. Depending on how big your jar is, it may take up to 15 minutes of shaking to get your cream to turn to butter, You will have some liquid left in your jar once the butter forms a ball — this is buttermilk!

Optional: Upgrade your butter by adding some fresh herbs or honey to taste. Need some bread for your butter? Check out the Bread in a Bag recipe in the Boredom Busters: Cooking & Baking PDF.

HOW DOES THIS WORK?

Cream has a good amount of fat in it. When you start disturbing the liquid by shaking it, the fat molecules begin to separate from the rest of the liquid. Eventually, the separated fat molecules will clump together, forming a solid.

Bottle Rocket

MATERIALS NEEDED

- 2 liter bottle
- Baking soda
- White vinegar
- Cork that fits the bottle
- 3 pencils
- Packing or duct tape
- Tissue
- Funnel

INSTRUCTIONS

1. Place cork into the empty bottle.
2. Next, we'll use pencils to make a tripod or 3 "legs" for the bottle so it can stand upside down without wobbling. Hold the plastic bottle cork-side down so that it touches the ground. Tape a pencil to the side of the bottle, so that the eraser is touching the ground. Tape the other two pencils around the bottle evenly so that your bottle is securely standing.
3. Measure 2 cups of vinegar and use the funnel to pour it into the bottle.
4. Measure 2 tablespoons of baking soda in the center of a tissue.
5. Fold each side of the tissue over the pile of baking soda so that none escapes. Continue to roll the tissue into a long log. It will need to fit into the mouth of your bottle (see photo).
6. Slowly begin to wedge the rolled up tissue into the mouth of the bottle. You DO NOT want it to drop into your bottle, yet.
7. Once the part of the tissue containing the baking soda is hanging into the mouth of the bottle, cut off the excess tissue, but continue to hold it in place.
8. Be as quick as possible with this step! Cork in hand, drop the tissue into the bottle and quickly push the cork in. Give the bottle a quick shake, tip it over and place it on it's pencil legs, upside down.
9. Stand away from the bottle! It will take approximately 60 seconds for your reaction to work and force the bottle into the air.

If your bottle rocket is unsuccessful, try again! Experiment with how loose or tight your cork is, or how you roll the tissue containing your baking soda. If you're successful, the rocket should be able to shoot up to 20 feet in the air!

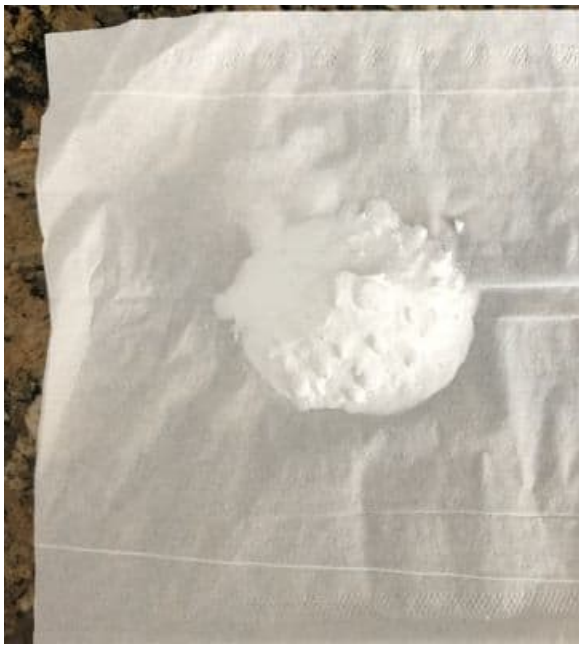
HOW DOES THIS WORK?

When baking soda is mixed with vinegar, the baking soda takes a proton from the vinegar. This reaction makes carbon dioxide, a gas, causing the force of bubbles that shoots the rocket into the air. It's pretty cool!

Exploding Bag

MATERIALS NEEDED

- ☐ Sandwich bag
- ☐ 2 tablespoons of baking soda
- ☐ 1/2 cup of viegar
- ☐ 1/2 cup of warm water
- ☐ Tissue
- ☐ Food coloring (optional)



INSTRUCTIONS

1. Add ½ cup of warm water and ½ cup of vinegar in the sandwich bag. Add a few drops of food coloring to the water/vinegar solution, if you like.
2. Lay a tissue flat on the table and add 2-3 tablespoons of baking soda in the center.
3. Wrap up the baking soda inside the tissue by folding the tissue into a little square with the baking soda in the middle.
4. Go outside (or do this experiment over the kitchen sink or bathtub) so the explosion doesn't get all over the floor.
5. Open the bag and insert the baking soda packet carefully. Hold the packet above the liquid while you zip the bag all the way closed.
6. Once the bag is sealed, drop the baking soda packet in the liquid and shake the bag a few times.
7. Gently place the bag on the ground and watch the bag fill up with gas.
8. Step back and watch the bag get bigger and bigger until it pops!

HOW DOES THIS WORK?

When baking soda is mixed with vinegar, the baking soda takes a proton from the vinegar. This reaction makes carbon dioxide, a gas, causing the bag to inflate and the bubbles to explode the bag open.

Naked Egg

MATERIALS NEEDED

- Raw egg
- Large jar or glass (it must be larger than the egg because it will expand in size!)
- White vinegar
- Food coloring (optional)

INSTRUCTIONS

1. Place a raw egg in a jar and completely cover with vinegar.
2. Leave for 24 hours.
3. Carefully remove the egg, pour out the vinegar and add fresh vinegar to your jar with the same egg.
4. Let sit for another 2—3 days.
5. The shell should be completely gone. Gently rinse the egg with warm water and explore their fun (yet delicate) membrane that covers the egg.
6. Will it bounce? Test it and see!

HOW DOES THIS WORK?

The shell of an egg is made of calcium carbonate. When you place the egg into the vinegar, you see bubbles, which is the chemical reaction of the acid in the vinegar reacting with the calcium carbonate to produce carbon dioxide. You'll also notice that the egg gets larger as it sits in the vinegar. That is because some of the vinegar is absorbed in the egg through its semi-permeable membrane!