GSBS VIRTUAL
SCIENCE NIGHT
2021

Materials List &
Activity
Instructions
Materials List

Materials for each activity in the pre-assembled kits are marked with colored stickers. The color next to the activity name indicates the sticker color.

Activity: Lava Lamp Module (Green)
2 15 mL test tube with screw cap
5 mL canola oil
5 mL water
1-2 drops food coloring

Activity: Endothermic Reaction (Orange)
1 balloon
3 Tbsp baking soda
250 mL vinegar (about 1 cup)
1 empty water bottle
1 twisty tie

Activity: Banana DNA Extraction (Yellow)
1 ripe banana
½ cup water
1 tsp salt
½ tsp liquid dish soap
1 quart-size zip-top bag
rubbing alcohol
1 coffee filter
1 plastic cup or any cup
1 coffee stir stick or wooden stick
1 test tube *optional: used to store DNA
(https://www.amazon.com/gp/product/B07KF4GL84/ref=ppx_yo_dt_b_asin_title_o02_s00?ie=UTF8&psc=1)

Activity: Rock Crystals (Blue)
2.5 cups granulated sugar
1 cup water
few drops of food coloring
wooden stick for rock candy to grow on
1 plastic or glass cup
small piece of plastic wrap
2 clothespins *keep rock candy stick suspended in the cup
**Activity: Invisible Ink (Red)**
2-3 cotton swabs
¼ cup baking soda
¼ cup water
2-3 sheets white printer paper
1 small paint brush
¼ cup colored grape juice *if you purchase white grape juice use food coloring to add color to the liquid*

**Activity: Chromatography Flowers**
1 Dixie cup or small glass
colorful markers (primary colors work best)
4 Coffee filters
2 Green pipe cleaners
½ cup water

**Activity: Slime**
¼ cup water
¼ cup glue
30mL liquid starch
few drops of food coloring

**Activity: Squishy Circuits**
4 AA batteries
1 Playdoh
1 modeling clay
1 battery pack
5 LED lights
4 alligator clips
4 wires
Activity: Lava Lamp (Green)

Instructions:
1. *Prep for kit:* Put 5 mL water into 1st tube and 5mL oil + food coloring into 2nd tube
2. Add 5 mL oil containing food coloring to 5mL water
3. Invert the tube and watch

WHY IT WORKS: This experiment demonstrates how liquids with different densities interact with each other. The water and the food coloring both have the same density, but the oil is less dense, or lighter, than the water. That is why the oil sits on top of the water, and why the food coloring doesn’t mix with the oil, but instead sinks to the bottom to mix with the water.

Activity: Endothermic Reaction (Orange)

Instructions:
2. Remove twisty tie from balloon filled with baking soda
3. Gently put balloon over the top of the water bottle containing 250 mL vinegar
4. Once the balloon is secured to the bottle, dump the baking soda in the balloon into the vinegar
5. While holding on to the balloon and water battle, watch the reaction!
6. Consider these questions! Does it feel hot or cold? What happened to the size of the balloon? What is inside of the balloon?

WHY IT WORKS: This experiment shows what happens during an acid-base reaction. Vinegar, the acid, reacts with baking soda, the base, to produce a gas called carbon dioxide. The gas then expands and moves through the bottle, up into the balloon, which leads to the balloon inflating. The more gas that is created, the more the balloon will expand. In addition to this being an acid-base reaction, it is also an endothermic reaction. This means the reaction consumes heat because energy is required to break the chemical bonds present in the vinegar and baking soda.

Activity: Banana DNA Extraction (Yellow)

Instructions:
1. Peel and cut a ripe banana in half
2. Place ½ peeled ripe banana into the resealable zip-top bag.
3. Mash the banana inside of the bag for about 1 minute, until all the lumps are gone and the texture looks like pudding.
4. Next, mix ½ cup warm water with 1 tsp salt. Stir the salt into the water until it is dissolved.
5. Carefully pour the saltwater into the bag containing the mashed banana.
6. Seal the bag and gently mix the saltwater and banana together for 30-45 seconds, until the mixture is completely mixed (homogenous).
7. Add ½ tsp dishwashing soap to the bag. Seal the bag. Gently mix the contents and avoid making too much foam. [Note: Foam can be reduced by removing as much air from the bag prior to sealing the bag.]
8. Take coffee filter, and fold into a cone-like shape and place into a plastic cup.
9. Carefully and slowly pour the banana mixture into the coffee filter. Watch the liquid gradually seep out of the filter. [Note: This step takes time to filter all the bag contents.]
10. Once the liquid has drained from the filter, discard the filter in the trash.
11. Take glass, tilt the glass slightly on its edge, and slowly pour the alcohol down the side of the glass until the alcohol is about 1 inch above the liquid below.
12. Wait 8 minutes [If you watch, you will see bubbles and cloudy material moving around the alcohol. This is the DNA!]
13. Use the stirring rod to move or grab on to the DNA at the alcohol banana mix interface.

WHY IT WORKS: Like us, bananas are made up of cells! When we mash a banana, we break the cells apart from each other. However, DNA is INSIDE of cells in an organelle called the nucleus. To extract DNA, we have to first open up cells, and the nucleus, to release DNA. Dish soap breaks up lipid molecules (like fats and oils), that are found in the outer layer of cells (cell membrane) and the nucleus. The addition of salt water helps DNA strands bind to each other when the cells are broken apart by soap. Finally, alcohol is added to encourage DNA clumping for extraction, since DNA is not soluble (cannot be dissolved) in alcohol.

Activity: Rock Crystals (Blue)

Instructions:
1. Boil 1 cup water over medium heat in a saucepan. Add two cups of sugar one cup at a time and stir occasionally until sugar is dissolved.
2. Once all the sugar is dissolved remove from heat and let cool to room temperature.
3. While the sugar solution is cooling, add a few drops and mix. (Optional: add a 1 teaspoon of flavoring and drops of food coloring)
4. Prepare the wooden skewers by dipping them in the sugar solution (or water if the sugar isn’t sticking well, depending on the type of skewer being used). Pour the extra sugar onto a plate and roll the skewers in sugar to coat them. Allow them to dry fully.
5. Once the sugar solution is cooled, pour the solution into a plastic cup.
6. Clip a clothespin or two to each skewer and place into the plastic cup. Be careful to keep the skewer from touching the cup.
7. Cover the cup with plastic wrap to keep bugs out of your experiment.
8. Wait 3 to 7 days, the longer you wait the larger the rock candy.
9. Unwrap the cups and remove the skewers. If rock candy gets stuck to the cup place in warm water for a couple of minutes.

WHY IT WORKS: Crystals are solids formed by a network of repeating patterns of molecules held together by atom bonds. Crystals that share the same chemical composition can be small
or large but they always come together to form the same shape. The crystals that make up the rock candy grow larger when the sugar in the sugar solution bind to the seed crystals that you rolled onto the skewer.

**Activity: Invisible Ink (Red)**

*Instructions:*

1. Mix 1/4 cup baking soda with 1/4 cup water.
2. Use a Q-tip to write a message on a piece of paper. Let the paper dry.
3. Paint grape juice concentrate across the paper to reveal your secret message.

**WHY IT WORKS:** Mixing a base (baking soda) and an acid (grape juice) together creates a chemical reaction. The chemical reaction causes a change in the color making the invisible message appear.

**Activity: Chromatography Flowers**

*Instructions:*

1. Using your marker, draw a thick circle around the center of the coffee filter where the ridged part meets the flat center.
2. Fold the coffee filter in half and then in half again, forming a cone shape.
3. Get a short glass or cup and fill it just a bit with water. Open the top of the cone shaped coffee filter so it balances right on the glass with the tip of the cone just touching the water. (Be sure NOT to let the marker circle go in the water, just the uncolored tip of the coffee filter cone. You’ll know if the marker got into the water because the water will change color. If this happens just start again with a new glass of water and coffee filter.)
4. Let it sit and watch what happens as the water begins to flow up the paper. It takes about 20-30 minutes for the water and marker to completely filter to the edge of each cone.
5. Repeat the same process with different colored markers and watch what happens.
6. After the water has reached the outer edge of the coffee filter, place it on a newspaper or other paper to dry.
7. Once the coffee filters are dry, observe the results. Pretty cool!
8. Trim the white part off your coffee filter, and fold in half, in half, and in half again, and round out the edges of your filter using a pair of scissors.
9. Wrap the corner of your filter with a little bit of the pipe cleaner to make a stem.

**WHY IT WORKS:** Colors are made up of many different molecules that mix together to create the single color we see with our eyes. Through the process of paper chromatography, we can separate the different colors so our eyes can see all the colors that mixed together. As the water travels through the coffee filter, it separates the colors. Different molecules move across paper at different rates allowing us to see all the hues that make up a color.
**Activity: Slime**

*Instructions:*

1. Mix ¼ cup water, ¼ cup glue, 30mL liquidstarch in a zip-top bag
2. Make observations about the slime within the bag
   a. How does it feel?
   b. What does it look like? What is its shape?
   c. How does it compare to other materials?

**WHY IT WORKS:** Based on the age of child, decide if the focus of the demo should be:

A. States of Matter
B. Molecular Cross-linking

**A. States of Matter:**

Slime is a non-Newtonian fluid. A non-Newtonian fluid is neither a liquid or a solid. Slime can be picked up like a solid, but will also ooze like a liquid. Slime does not have its own shape, and can change its shape to fill whatever container it’s placed in. Similarly, slime can bounce like a ball because it is elastic.

**B. Molecular Cross-linking:**

Slime is all about polymers! A polymer is made up of very large chains of molecules. The glue used in slime is made up of long chains of polyvinyl acetate molecules (that’s why we recommend PVA glue). These chains slide past one another fairly easily which keeps the glue flowing. Chemical bonds are formed when you mix the glue and slime activator together.

Slime activators (borax, saline solution, or liquid starch) change the position of these molecules in a process called cross linking! This is the reaction between the PVA glue and the borate ions in your slime activator. Instead of molecules flowing freely, the molecules become tangled and create a slimy substance. Think wet, freshly cooked spaghetti versus leftover cooked spaghetti! Cross linking changes the viscosity.

**Activity: Squishy Circuits**

*Instructions:*

1. Assemble 4 AA-batteries into the battery pack and attach alligator clips to the black and red wires from the battery pack
2. Test your battery pack: (Optional)
   a. Attach the alligator clip on the black wire to the short end of a diode of the LED light
   b. Attach the alligator clip on the red wire to the long end of a diode of the LED light
   c. Watch the diode light up
3. TEST THE CONDUCTIVE DOUGH in 1 piece:
   a. Form conductive dough (playdough) by rolling it into a single long roll
   b. Insert alligator clips into each end of the playdough
c. Insert each diode of the LED light into separate sides of the playdough
d. Watch the LED light turn on!

4. Get creative: TEST THE CONDUCTIVE DOUGH in 2 pieces:
   a. Break the conductive dough (playdough) piece into two separate rolls
   b. Insert alligator clips into each end of the playdough
   c. Insert each diode of the LED light into separate rolls
   d. Watch the LED light turn on!
   e. Optional: Add additional LED lights in a similar manner as step 3c

5. TEST THE INSULATING DOUGH:
   a. Wrap the insulating dough (modeling clay) around the conductive dough (playdough).
   b. Connect the alligator clips to either end of the conductive dough, as done in step 3.
   c. Test how the LEB light turns on when inserted into the insulating dough vs the conductive dough

WHY IT WORKS: Squishy circuits explore the basics of electricity and electrical circuits. Circuits allow electrical current to flow in a closed, circular path. This is how we power our cities, homes, and more! Conductive materials allow energy, like heat or electricity, to pass through them easily (like metals), while insulators are poor conductors of energy (like plastic and wood). Here, the conduction dough (playdough) contains high amounts of salt and water, which allows it to conduct an electrical current and turn on the LED light. The insulating dough (modeling clay), does not contain salt, and resists electricity from flowing through it, explaining why the light does not turn on when placed in the insulating dough. However, insulators usually surround conductors to make circuits safer.
**DISCLAIMERS:** Do NOT eat or drink any items or materials used in these activities. All materials are for educational purposes only. Complete all experiments with adult supervision.

Follow along with step-by-step instructions, found on our YouTube channel!

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