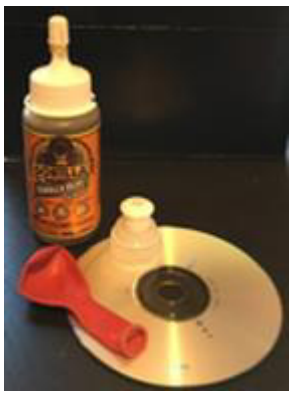
STEM At Home

Activity Index

Make a mini-Hovercraft



What you need: 1 CD • a sports water bottle cap • strong glue • a balloon.

What to do:

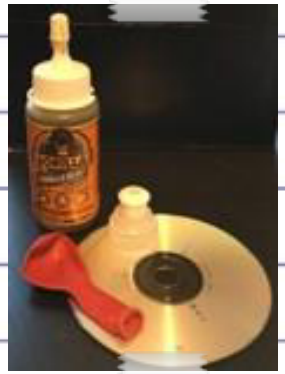
1. Glue the cap to the middle of the CD (over the hole). Make sure the cap is closed.
2. Blow up the balloon and slip it over the cap.
3. Place the hovercraft on a smooth surface and pop the cap.

Record your observations (mini-notebook next page):

- Why did the hovercraft move?
- Will it move when there is no air in the balloon?
- Can you describe what is happening?
- What if cap is only half opened?

Can you think of any improvements or changes?

Make a mini-Hovercraft



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- Can you describe what is happening?
- What if cap is only half opened?

Can you think of improvements?

Observations

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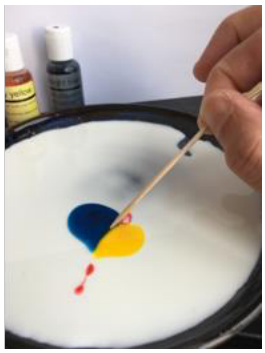
Milk Painting

What you need: a plate of milk · food coloring (2 – 4 colors) · liquid

soap · a toothpick

What to do:

1. Add 1 drop of each food coloring into the center of the plate of milk.
2. Dip the tip of the toothpick into the liquid soap.
3. Drag the toothpick through the milk in different places

Record your observations:

- What happens?
- Why do you think this happens?
- What happens if you change the liquid from milk to something else?
-

What's Happening?

Milk is made up of mostly water with droplets of fat in it. The droplets of fat (which are like a type of oil) don't mix well with the water. In fact - the fat and water in milk are very nicely balanced like a house of cards or a pyramid of marbles.

When you add in the soap - which can mix with both the water and the fat - that balance is disrupted. Just as if you removed a card from your house of cards or a marble from your pyramid of marbles, the remaining pieces now rush around to find a new balance.

In all that commotion of the water and fat trying to find a new balance, the food coloring gets taken along for a ride, and we get to see some beautiful designs.

Milk Painting

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Observations

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Salty Diamond Crown

What you need: finished toilet paper rolls - bowls - salt - water – scissors optional - markers or food coloring

What to do:

1. Cut the toilet paper roll into the shape of a crown. Fold the tips outwards a little bit.
2. In a bowl, add about 3 teaspoons of salt to 1 inch of water.
3. Place the crown in the bowl and put it next to the window.
4. Observe the crown for the next 5 days.

Record your observations:

- What happens?
- Why do you think this happens?
- What would happen if you made a shorter or taller crown? What if you color the crown or add food coloring to the water?

What's Happening

When you mix the salt and water the salt dissolves in the water. As the water is absorbed by the toilet paper roll the salt is also absorbed. As the water evaporates from the toilet paper roll the salt is left behind and salt crystals start to grow. The longer you wait, and the more salt you use, the bigger the crystals will be.

Salty Diamond Crown

(your picture here)

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Observations

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Salt and Pepper Magnet

What you need: balloon - plate - salt – pepper, optional - other spices

What to do:

1. Lightly sprinkle the salt and pepper on the plate so that they mix together. Can you separate them by hand? How long do you think it would take?
2. Blow up the balloon and tie it off.
3. Rub the balloon against your hair for at least 30 seconds.
4. SLOWLY bring the balloon closer and closer to the plate. At some point one of the two spices will jump up and stick to the balloon.

Record your observations:

- Which spice jumps up and sticks to the balloon first?
- If you keep moving the balloon closer what happens?
- Why do you think this happens?
- Do you think you could use something other than a balloon? What about a ruler (do you think it matters what the ruler is made out of)?

What's Happening

When you rub the balloon against your hair the surface of the balloon becomes covered with small particles called electrons. These electrons are the same particles that power the light bulbs or give you a shock in the winter when you touch the door handle after walking across the carpet!

Electrons have a negative charge and it will attract things that have a positive charge (like the salt and pepper). In general (but not always) the pepper is smaller and lighter than the salt, so it will "jump" to the balloon first.

Salt and Pepper Magnet

(your picture here)

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Balloon – plate - salt - pepper
optional – other spices

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Observations

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Do It Yourself Shrinky Dinks

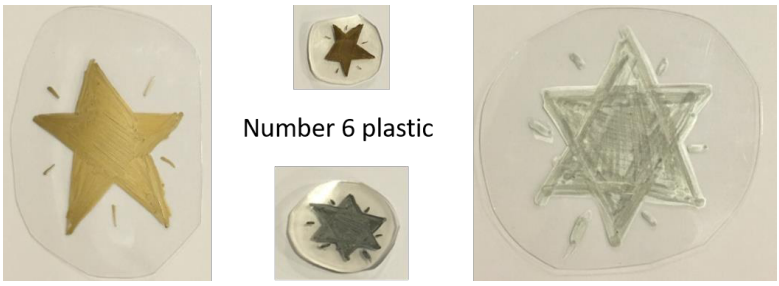
What you need: Clear plastic containers (ideally #6) - permanent markers - oven - scissors - aluminum foil tray

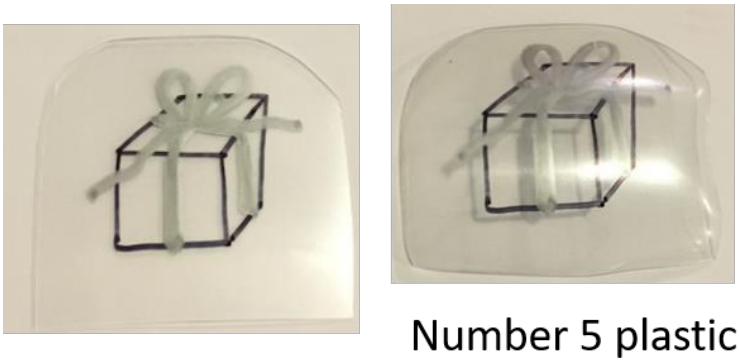
(This activity should be done with adult supervision)

What to do:

Preparation: Adults start by pre-heating the oven to 350 degrees Fahrenheit and move the rack to the bottom level.)

1. Cut the plastic container so that you have a flat surface. Measure the area and the thickness of your piece of plastic. If you have a kitchen scale, measure the mass of the plastic.
2. Draw your picture on the plastic using the permanent markers.
3. Once the oven has reached 350, place your design on the aluminum foil tray and carefully place in the oven.
4. Watch your plastic "cook" for the next 3 - 4 minutes. Record your observations in your STEM-At-Home mini notebook or your own home-made notebook.
5. After 3 - 4 minutes carefully remove your plastic from the oven.
6. When your plastic is cool, measure the area and thickness again.
7.





Number 5 plastic

Record your observations:

- Did your plastic piece shrink or grow? By what percentage?
- Is the change in plastic size different for different types of plastic? Do some work better than others?
- If you have a kitchen scale measure the initial and final mass of the plastic - did that change?
- Why do you think the plastic is changing when you put it in the oven?

What's Happening

The plastic you used for your design is made up of long *molecular chains* that look a little bit like spaghetti (only on a much smaller scale!). When the plastic - or polymers, their chemical name - are made into different types of containers the long "spaghetti" strands are pulled straight. The thing is, these strands would prefer to be all tangled up in a ball, so when you heat them up in the oven they curl back up and shrink to a smaller size.

Different types of plastics (or polymers) have a different amount of curl to them, so depending on what plastic you use, you're shrinky dink will shrink to a larger or smaller percentage of its original size.

DIY Shrinky Dink

(your picture here)

What you need

Clear plastic containers (ideally #6)- permanent markers - oven - scissors - aluminum foil tray

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Liquid Indicators

What you need:
Red cabbage - boiling water - 2 bowls - a knife - eye dropper or pipette - clear, colorless liquids - clear cups
(This activity should be done with adult supervision)

Starting materials and initial indicator

What to do:
Preparation: Adults start by boiling the water.

1. .Chop up two large handfuls of cabbage into small pieces (about 2 cups). Place the cabbage pieces into one of the bowls.
2. Have the adult pour about 1/2 cup of boiling water onto the cabbage and let that sit for 15 minutes.
3. .When the cabbage is done soaking, pour the liquid into the second bowl. This is your INDICATOR.
4. Using a notebook or your STEM-At-Home mini notebook, draw a 3-column table like the one below. Be sure to include a space to record the starting color of the INDICATOR.
5. Pour the first liquid into a clear cup. Make a guess (or prediction) of what color the INDICATOR will turn when it is added to the liquid.
6. Using the eye dropper or pipette add 10-20 drops of the INDICATOR to the clear colorless liquid (you may need more if you have a large glass). Record your observations.
7. Repeat steps 5 and 6 for each of the liquids you have. Be careful to fully clean the cups between each test.

Record your observations:

- Did the color change as you expected?
- Can you figure the pattern to the color change? For example, is it related to the temperature of the clear liquid? How about the sugar content?

- Do you think there are other vegetables in your house that might be able to produce a different type of INDICATOR?

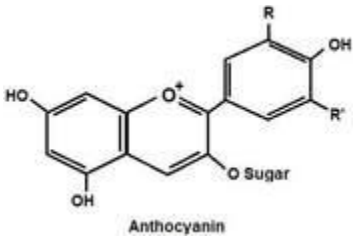
Liquids – before and after analysis

Left to Right – Vinegar, Lemon Juice, Water, Baking Power solution,

Baking Soda solution

What's Happening

The color molecules in the cabbage (called **anthocyanin)** are acid-base sensitive - similar to the chemicals in pH or Litmus paper. The molecule turns pink in acidic liquids and blue to green to yellow in basic liquids (depending how strong the base is). In neutral liquids it is purple.



Anthocyanin

Liquid Investigation

(your picture here)

What you need

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Observations

Starting **INDICATOR** color: _____

Clear Liquid	Indicator Color – Guess/Prediction	Indicator Color - Observation

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