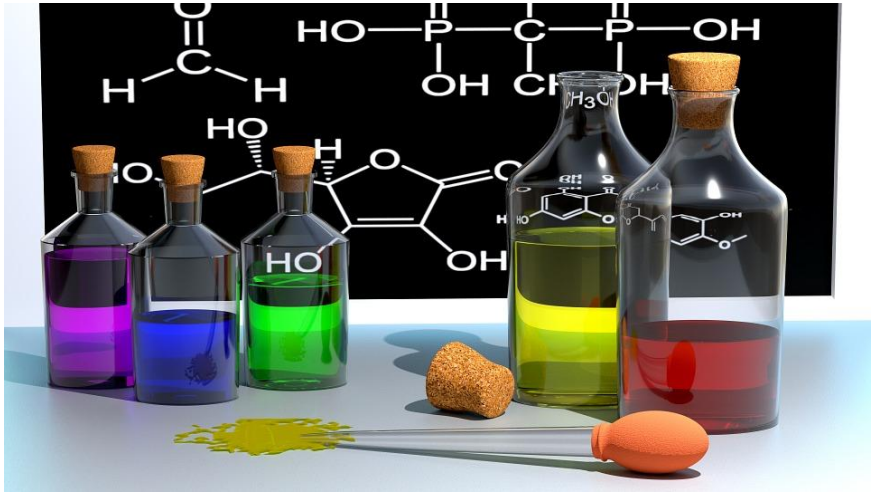
Science, Engineering, Technology & Math

Reaction Action



What do you see?

Class Structure *(Enter an overview of the class structure here...see Week#1 as an example)*

Week #1: Introduction (Easy Reactions)

- What causes a chemical reaction?
- Complete a Mentos and Diet Coke Reaction
- Complete a Vinegar Volcano Creative Challenge

Week #2: Heat Reactions

- Complete Yeast and Hydrogen peroxide reaction
- Complete Metal Box Project

Week #3: Color Change

- Complete Base Reaction
- Complete Vitamin C Reaction

Week #4: Cold Reactions

- Complete Inflating Balloons Reaction
- Complete Ice on a String Reaction

Week #5: “Explosive” Reactions

- Complete Exploding Lunch Bag experiment
- Complete Elephant Toothpaste Reaction

Week #6: Finish-up all projects

- **Complete trifold for Science Summit**

- **Before all projects and reactions teach a small seminar describing how each reaction works, what common ingredients are and anything else needed to understand what is going on.**

Week #1: *Mentos and Coke Reaction*

Nucleation- the beginning process to creating crystals. In this case production of CO2 is being created and needs to find a way out.

Experimental supplies-

- *Four, 2 liter bottles of Diet Coke*
- *Three packs of original mint mentos*
- *Funnel*

Experimental Procedure-

- *Decide on amount of mentos to put into each Diet Coke bottle gradually increasing number until all mentos are gone.*
- *Put mentos in the funnel but cover the bottom so they cannot fall out*
- *Open up Diet coke and place funnel in opening*
- *Release mentos and watch the reaction.*

Why did this reaction occur? Come up with your own hypothesis…

(Hypothesis- educated guess on why something is occurring.)

This reaction occurs due to a process called nucleation. This process ultimately forms crystals from a liquid, solid or a gas. In the case of this experiment, to create crystals a lot of carbon dioxide is created. This gas needs somewhere to escape, but because the reaction is so drastic, you get a huge geyser as evidence of this reaction. The mentos has hundreds of tiny holes in them, when the soda rushes through these holes carbon dioxide is created and gives us a pretty cool reaction in the process.

Week #1: *Vinegar Volcano*

Acid- Can donate proton or accept electron pair (pH scale- 6 to 0)
Base- Can accept proton or donate electron pair (pH scale- 8 to 14)

Experimental Supplies-

- *2-4 empty two liter bottles*
- *Large bottle of vinegar*
- *Box of baking soda*
- *Food coloring*
- *Any extra art supplies (markers, paint etc.) to decorate volcano*

Experimental Procedure-

- *Build the best, most creative volcano that you can (remember to utilize the two liter bottle)*
- *Adds tons of baking soda to the bottle*
- *Add food coloring to the baking soda (color combinations look awesome as an end product)*
- *Mix in vinegar until you get the reaction you want!*

Why does this reaction occur? Create a hypothesis...

How do baking soda and vinegar react? Baking soda and vinegar react as an acid-base reaction. Baking soda is a bicarbonate and vinegar is an acetic acid. When they react carbon dioxide is formed free of any other bonds that create molecules, meaning it does not dissipate and because of this it needs a place to escape. The carbon dioxide expands up and creates a volcano like reaction.

Week #2:Yeast and Hydrogen Peroxide

Catalyst- Something used to speed up a reaction (yeast will act as a catalyst in this reaction)

Experimental Supplies-

- 1 tsp of dry/active yeast
- ¼ cup of hydrogen peroxide
- Stirring Stick
- Thermometer
- Bowl

Experimental Procedure

- Pour hydrogen peroxide into bowl
- Place thermometer in liquid
- Allow the temperature to stabilize
- Add yeast to hydrogen peroxide
- Record Temperature change (did it get hotter?)

Why does this reaction occur? Create a hypothesis...

Naturally, hydrogen peroxide will decompose into oxygen gas and water. When yeast is added, yeast acts as a catalyst causing the reaction to occur much more rapidly. Because the reaction happens at such a fast rate, heat energy is released causing the temperature of the liquid to rise in a noticeable manner. This reaction is known as an exothermic reaction due to the release of heat.

Week #2: Homemade Oven

Radiation- heat transferred through electromagnetic radiation (light energy or the sun)

Experimental Supplies-

- *Multiple thermometers*
- *4 Boxes (small box, enough to hold watering can)*
- *Aluminum foil*
- *Magnifying glasses*
- *4 Metal cans (about the size of a large soup can)*

Experimental procedure-

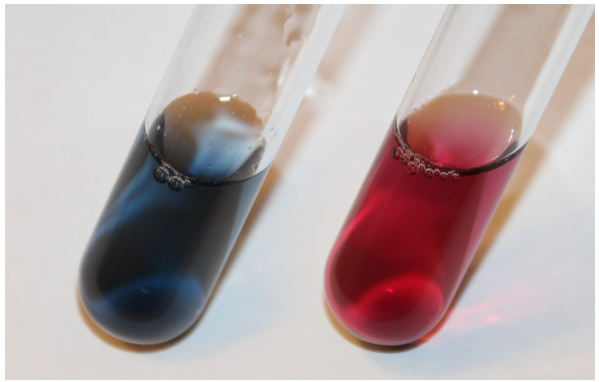
- *Using the given material develop and build a homemade oven that fits your metal can. (must place can inside box)*
- *Some good strategies include putting the aluminum foil over the inside of the box, placing the magnifying glass over the water etc.*
- *Place metal can about half filled with water inside box*
- *Place box outside in direct sunlight and let it sit for an hour*
- *After an hour measure the temperature change*
- *See which box had the highest temperature change and explain why you think this is so*

Why does this reaction occur? Create a hypothesis...

Radiation is emitted from the sun. This light energy can ultimately heat up different objects. With the use of reflective surfaces including aluminum foil and glass we can manipulate these objects to further strengthen the light energy emitted by the sun. By strengthening the light energy emitted by the sun we increase our chances of heating up water in our homemade oven.

Week #3: Rapid Color Change

Clock Reaction- a chemical reaction that can be altered to happen in different time frames



Experimental Supplies-

- 3 clear plastic cups (for each group you assign) 4 ounces or larger
- 1000 mg vitamin C tablets
- Iodine
- Hydrogen Peroxide
- Liquid Laundry Starch
- Small plastic bags

Experimental Procedure-

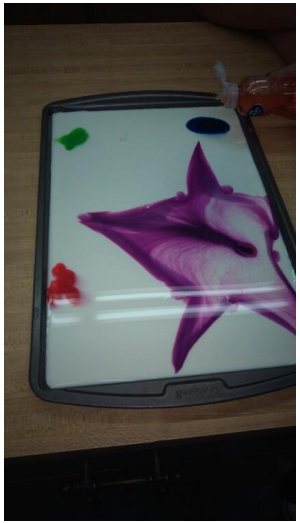
- Crush one vitamin C tablet in a small plastic bag
- Add powder to first cup and add 2 ounces of warm water, then stir for 30 seconds
- Put one teaspoon of the first liquid into a second cup, then add 2 ounces of warm water and 1 teaspoon of iodine (what happened to the iodine?)
- In the last cup mix 2 ounces of warm water, 1 tablespoon of hydrogen peroxide and 1 teaspoon of the liquid laundry starch
- Pour the second liquid into this cup and continue to pour the liquid in between two cups until you see a reaction (what color does the liquid turn?)

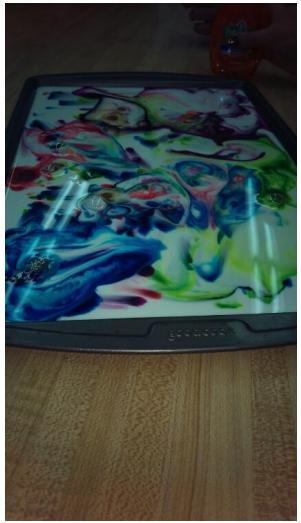
Why does this reaction occur? Create a hypothesis...

This experiment is an example of an iodine clock reaction. This mean you can control how long it will take for the final liquid to turn blue. Ultimately, this experiment shows a chemistry battle between the vitamin c and liquid laundry starch. The vitamin c wants to keep the liquid clear but the starch wants to turn the liquid blue. After a long battle, eventually the starch wins and turns the liquid dark blue.

Week #3: Color Explosion

Lyse- causing something to burst





Experimental supplies-

- A couple cookie baking sheets
- Food coloring (at least three different colors
- Whole milk (low fat milk will not work)
- Liquid Dish Soap

Experimental Procedure-

- Pour milk in the bottom of the cookie sheet so it just covers the bottom
- Add about 6-8 drops of food coloring into different positions on the cookie sheet
- Add about five drops of liquid dish soap on each food coloring spot
- Watch the explosion begin

Why does this reaction occur? Create a hypothesis...

How does it work? Simply, liquid dish soap was created to destroy fat molecules. Usually, these fat molecules are found on the plates and bowls you use for food. When the food coloring is added it combines with the whole milk (which is loaded with fat) so when you drop the liquid dish soap on each drop it lyses (causes them to burst) the fat molecules causing a cool explosion like effect.

Week #4: Inflating Balloons (Two Parts)

Air Pressure- the amount of force exerted on an object by the surrounding air.

Experimental Supplies-

- Pack of Balloons
- Freezer (Part One)
- Wide Mouth Jar that could fit a fully inflated balloon (Part Two)
- Matches or lighter (Part Two)
- Paper (Part Two)

Experimental Procedure-

Part One

- Blow up Balloon
- Measure the distance around the balloon (Circumference)
- Place Balloon in freezer and leave overnight
- Measure the circumference again the next day and record the difference

Part Two

- Blow up balloon
- Light a match, or light a small piece of paper on fire and put it in the wide mouth jar
- Place balloon on top so no air can escape.
- Wait a moment and try to pull the balloon out of the jar (it should have gotten sucked in just enough to where you will be able to pick up the jar)

Why does this reaction occur? Create a hypothesis...

Air pressure can affect balloons in very obvious ways. The colder the air, the balloon will shrink. The warmer the air, the balloon will expand (This is why hot air balloons float). This is because in a colder environment the air molecules stop moving around as much as they do in warmer temperature. Since they are no longer moving like they should the balloon shrinks. In warm air environments, the air molecules move around a lot faster, causing the balloon to expand.

Week #4: Ice on a String

Contaminate- something that does not belong and comprises the integrity of the object

Experimental Supplies-

- Ice Cubes
- Glass filled with Water
- String
- Salt

Experimental Procedure-

- Drop ice cube into glass of water
- Lay string across the top of the ice cube
- Sprinkle salt on the string and ice cube and wait a few seconds
- Pull string up and see if the ice attached to the string

Why does this reaction occur? Create a hypothesis...

Introducing a contaminate to the ice will instantly drop the freezing point below 32 degrees. The contaminate causes the ice to melt and by giving it a few seconds, it re-assimilates around the string. After this, you are able to pick up the string with the ice on it!

Week #5: Exploding Lunch Bag

Essentially the same as a Vinegar Volcano but in a different more entertaining form

Experimental Supplies-

- Small ziploc sandwich bags
- Water
- Bottle of Vinegar
- Pack of Baking Soda
- Box of Tissues
- Sink to perform experiment (large bowls work as well)

Experimental Procedure-

- Pour ½ cup of vinegar into sandwich bag
- Pour ¼ cup of warm water into sandwich bag
- Add 3 teaspoons of baking soda onto a facial tissue
- Wrap up baking soda in tissue and place in bag (this buys you some time)
- Close sandwich bag completely and shake a little
- Wait for bag to explode

Why does this reaction occur? Create a hypothesis...

Much like the vinegar volcano, the baking soda and vinegar react. This reaction causes a surplus of carbon dioxide gas and eventually the pressure build up is so great that the the lunch bag can no longer hold it all in and it explodes.

Week #5: Elephant Toothpaste

Exothermic Reaction- a reaction that releases heat causing something to feel warm to the touch

Experimental Supplies-

- Two liter soda bottle
- 20 volume hydrogen peroxide (6% solution)
- Dry/Active Yeast
- Warm Water
- Liquid Dish Soap
- Food Coloring
- Small Cup

Experimental Procedure-

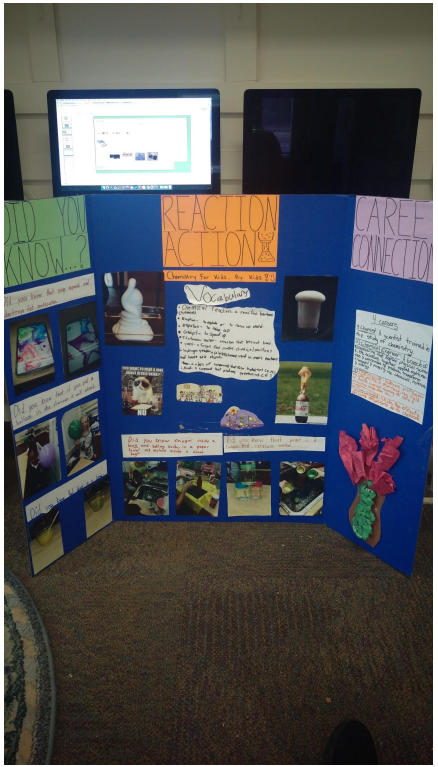
- Add 8 drops of food coloring to one of the two liter bottles
- Add 1 tablespoon of liquid dish soap to the bottle and mix it
- In a small cup add 3 tbs of warm water and 1 tbs of dry yeast, mix for 30 seconds
- Add hydrogen peroxide to the bottle
- Add the yeast mixture to the bottle and watch the reaction
- (Do this experiment outside)

Why does this reaction occur? Create a hypothesis...

Once again the yeast in this experiment acts as a catalyst and quickly removes all the oxygen from the hydrogen peroxide. Because of the speed at which this happens a lot of bubbles are created. These bubbles need to escape their confined space so they moved upward causing an eruption. The reaction also creates heat, meaning it is exothermic.

Week #6: Complete Trifold

Science Summit- a fun get together of all YouthCity sites to show off some amazing science knowledge!



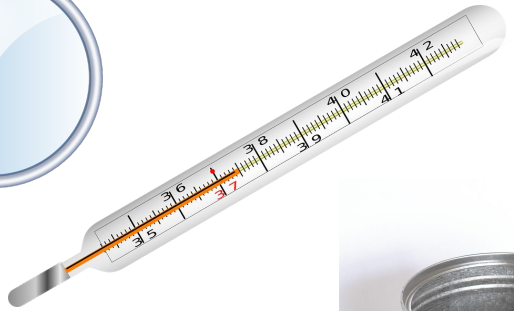
This week your goal is to complete a Science Summit trifold to show off the knowledge that the children have learned over the last six weeks. Each trifold should include-

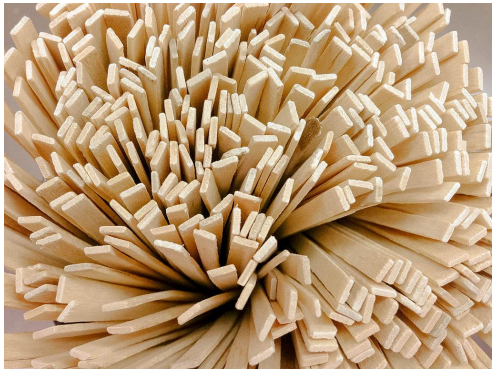
1. 5 “Did you know” questions, each displaying a new piece of knowledge the kids learned
2. 5 new vocabulary words
3. 4 career connections (jobs the kids could attain with a chemistry background)
4. Photos of the kids doing science experiments
5. A visual representation of what you have done over the last six weeks (this can be a short experiment, when I did this we performed the exploding lunch bag experiment at Science Summit)

Why does this reaction occur? Create a hypothesis...

At this point, you are just about done with this Science Summit extravaganza! Congratulations! Hopefully, the children as well as yourself learned something handy in the process!

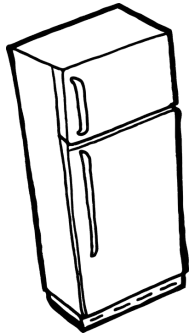
(Reaction Action) Tools Week #1





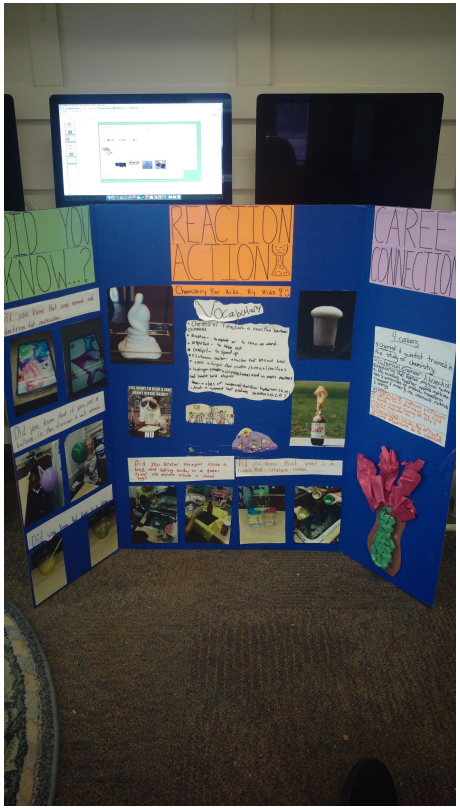
(Reaction Action) Tools Week #2

(Reaction Action) Tools Week #3



(Reaction Action) Tools Week #4

(Reaction Action) Tools Week #5



(Reaction Action) Tools Week #6

Creative Challenge:

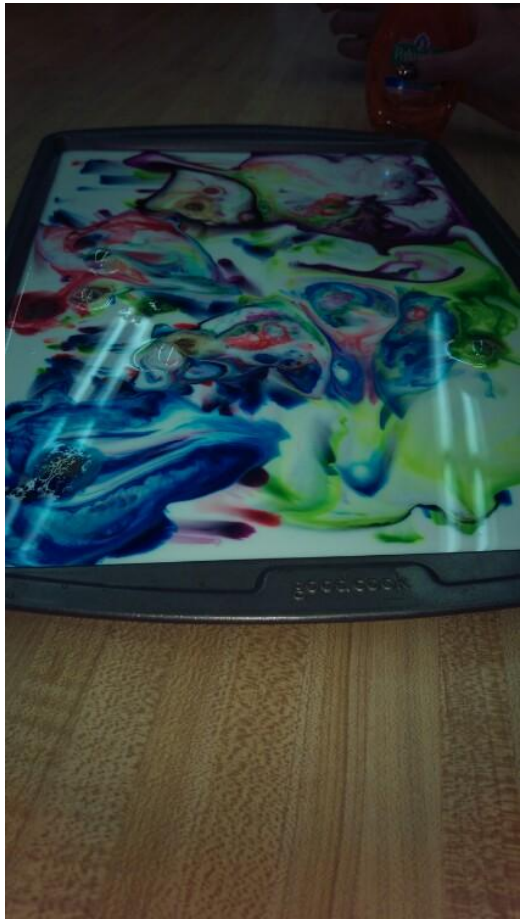
Week #1- Understand the concept of chemistry. It is such an important topic and can open the door to so many options. For the vinegar volcano, give out

rewards for the most creative volcano, "prettiest" eyc.

Creative Challenge:

Week #2- Give the kids the task of trying to make the most effective oven with the least amount of resources. See who can do it with little aluminum foil or no

magnifying glass.



Creative Challenge:

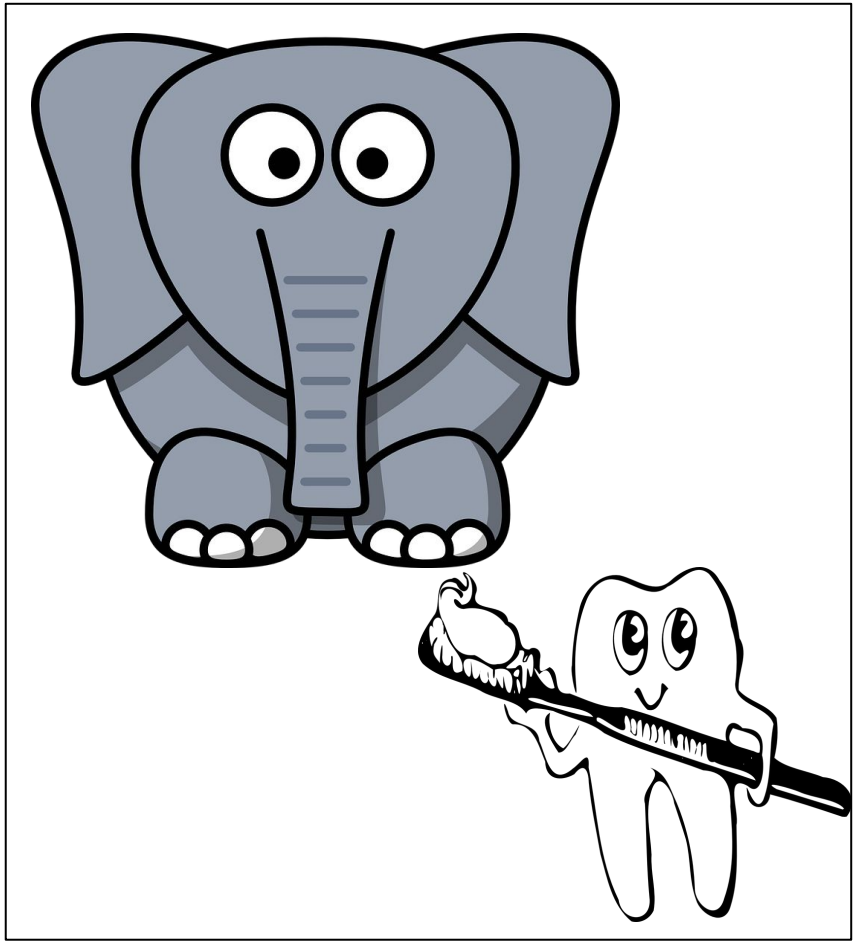
Much like the first week, make a determination on who made the "coolest" looking color scheme. Give them a picture and see who can get the closest to imitating the

image.

Creative Challenge:

Who can create the strongest bond between the ice and the string. At the same time all hold up the strings

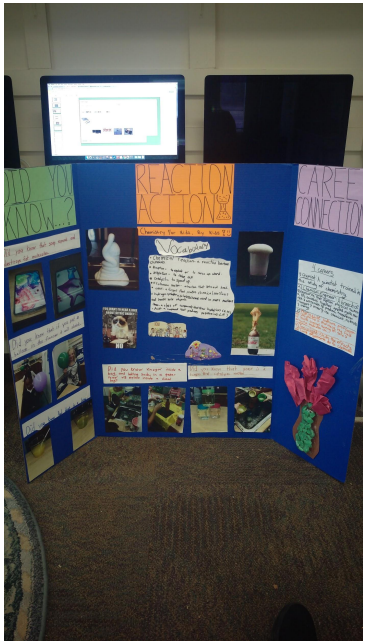
and see who's lasts the longest without falling.



Creative Challenge:

During the elephant toothpaste experiment you are trying to find the group that create the most extreme geyser! The most colorful, the highest, whatever you

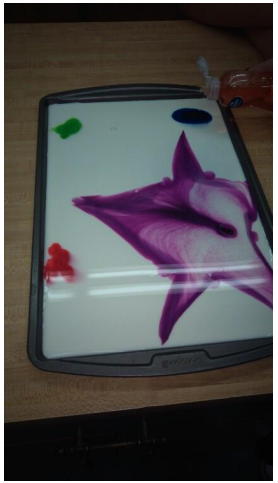
are feeling, the sky is the limit!

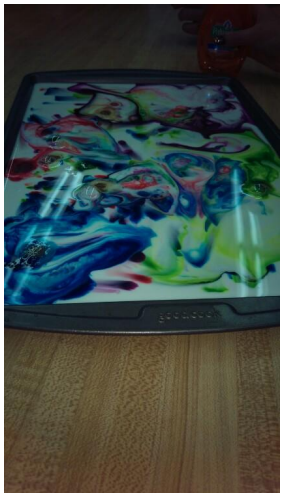


Creative Challenge:

Try to create 3D objects to put on the trifold. It will

make it pop more!





Pro Tips by Joshua Meyers

- *Show the video clips at the beginning of the class to give some background knowledge on the topic.*
- Do most of these experiments outside if at all possible. Many of them can get very messy.
- Have the kids take notes in a notebook. This may include making hypothesis', writing down vocab etc. so they can remember stuff to put on their boards after the six weeks is over.
- Remember to take pictures of the kids, parents love seeing pictures of their kids.
- Have a good time!

Resources:

- *https://www.stevespanglerscience.com/*
- *https://sciencebob.com/category/experiments/page/2/*
- *http://www.sciencekids.co.nz/experiments.html*