Project ID: 581

Junior Division

Chemistry

Ilyas Amin
Bright Horizon Academy
Gr. 7

Colorful Chemistry: Creating Natural pH Indicators

AWARDS:

WateReuse Association - San Diego Society - Winner

Did you know that pH indicators tell if a solution is acidic or basic? pH indicators are very useful to test things in everyday life. The purpose of this study is to see if natural pH indicators are able to be relied on instead of synthetic pH indicators. Natural indicators are made of natural substances and do not create waste when produced.

Synthetic pH strips create lots of waste, they are not always available, and when they are available, most of them are costly. Based on the conducted research, it is hypothesized that natural pH indicators will not end up with the same results as synthetic ones because natural substances may not be as precise as chemical substances.

I carried out this experiment by choosing two of the most popular natural pH indicators.The first indicator was made from turmeric and the second was made from red cabbage. To make the turmeric strips, I mixed turmeric powder in water and then soaked plain white paper strips in it. To make the red cabbage strips, I blended red cabbage and strained it for the juice.

My results indicated that for many of the substances, natural turmeric indicators usually had a higher pH than the synthetic ones. This shows that natural turmeric indicators do not come out with the same results as synthetic ones. I concluded that the turmeric indicators cannot be relied on to show the correct pH. My results also indicated that substances tested with cabbage indicators, anything lesser than 8.5 and greater than 5 had closer to accurate results.

To conclude, both turmeric and red cabbage indicators cannot be relied on, therefore, to get clear results, you must use the synthetic pH indicators. Analyzing the tables, I found out that the figures closer to 7, the more results would be accurate.

Project ID: 582

Junior Division

Chemistry

Jonathan Brough
La Jolla Country Day School
Gr. 6

Electrolytes in Drinks

AWARDS:

CSEF Qualified

The purpose of this project was to determine what drinks have the most electrolytes. A multimeter was used to measure the electrical resistance in Gatorade, Prime, Red Bull, Orange Juice, Milk, Coconut water, and Tap Water. After testing, Orange Juice had the highest amount of electrolytes with 14.02 milliamps as the average resistance. Prime came in second with 12.34 as the average resistance. Water had the least amount of electrolytes with 1.01 as the average resistance.

The hypothesis that stated Red Bull would have the most electrolytes was not correct. The results could have come out the way they did because of the high amounts of minerals in Orange Juice. Prime, which finished second, also has high amounts of minerals and contains coconut water, which came in third, and that could explain why it was so high.

Project ID: 583

Junior Division

Chemistry

Zhizhen Chen
The Cambridge School High School
Gr. 7

Effect of Temperature on Oxidation Speeds

AWARDS:

American Chemical Society - San Diego - 1st Place
CSEF Qualified

My experiment was conducted on the oxidation speeds of apples. I wanted to figure out how temperature affected the speeds of its oxidation. I hypothesized that when put in warmer temperatures, the fruit would oxidize faster, and in cold temperatures slower.

I experimented by placing equally sized Honeycrisp apple slices at different temperatures. I placed one in my room (70 degrees), one in the fridge (20 degrees), and one in a yogurt maker (90 degrees). I compared them to an already fully oxidized apple and took the times.

I found that the data supported my hypothesis and the apples oxidized faster in warmer temperatures and slower in colder ones. I also found out that different types of apples oxidized at different speeds. After addressing this problem I did another experiment but this time using Gala apples and they resulted in oxidizing much faster. But even with different oxidation rates, the two experiments still supported my hypothesis that oxidation occurred faster when in hotter environments and slower in cooler environments.

The results of my experiment show that people should put their sliced apples in the fridge for longer perseverance. If I had more time I would also like to look at other things that could affect the oxidation speed of apples other than temperature.

Project ID: 584

Junior Division

Chemistry

Finley Collins

Mt. Helix Academy

Gr. 7

How Does Sugar Affect Cookies

This project shows how different kinds of sugar reacts to the same cookie recipe. The experiment showed that even though the cookies did bake it didn't bake like a regular cookie. I think the cookies would come out not that great because all the sugars have different things mixed in with it, such as the brown sugar. It was a bit moist. First I got all the ingredients, Then I baked each cookie batch separately then monitored how each batch came out. Each cookie came out flat, smelled bad and had different textures. The Monk Fruit sugar being the worst cookie of them all by being flat too buttery and had weird holes in the middle of the cookie. But they all weren't terrible. The Coconut sugar cookie was the best one out of all of them. It had a bit more of a thickness to it, it smelled better, had a good texture but was still burnt after baking for a little time and also had weird holes in it. The brown sugar cookie was okay. It wasn't bad but it wasn't good. It looked burnt but it was just the sugar so you have to make sure you watch them carefully while baking. The cookies also had a bad smell to them that made them unappealing. But this would be good to try out if you like to bake and want to try something new.

Project ID: 585

Junior Division

Chemistry

Gregory Croff
Nazareth School
Gr. 7

Which Animal Fat Makes the Hardest Bar of Soap?

AWARDS:

CSEF Qualified

Every year my family makes soap for Christmas gifts. We have used various animal fats and plant oils throughout the years. We've even used bear fat! It got me wondering, "Which Animal Fat Makes the Hardest Bar of Soap?" I hypothesized that beef tallow, one of the three animal fats I am using, will be the hardest bar because it was the thickest at room temperature. I tested the bars of soap by running three different trials. The first was the soak test. The soap was placed under shower-like conditions for one hour. Lard lost the least amount of mass. The second test was the drag test. In the drag test, the soap was dragged along a concrete floor with weight pushing down on top of it, to see how much wore off. Duck fat performed the best in the drag test. The final test was the push test. In the push test the soap had a probe pressed into it, simulated the Brinell hardness test. Duck fat performed best in the push test. I ran two more tests to determine if the results are consistent in further batches. I found that each fat except the one that I picked for my hypothesis was harder in different trials.

Project ID: 586

Junior Division

Chemistry

Fuaad Dodi

Bright Horizon Academy

Gr. 7

Does Cooking Method Affect Protein Content?

AWARDS:

American Chemical Society - San Diego - 2nd Place

CSEF Qualified

Thermo Fisher Scientific Junior Innovators Challenge Nominee

The topic we have chosen is determining whether or not cooking methods affect the protein content in kidney beans. We chose this project because it can help people truly know how much protein they are eating. This will allow for more accessible nutrition and dietary health. We have conducted this experiment for the purpose of determining and comparing the protein content in kidney beans using four distinct cooking methods: boiling, stir-frying, slow-cooking, and baking. This will be achieved through protein strip analysis and the Bradford assay. The findings of this project will help provide valuable insights that help people make informed decisions about their dietary choices and overall nutrition. It is hypothesized that stir-frying will preserve the most protein because it keeps all other nutrients intact, while baking will preserve the least because it will burn the nutrients up. For the experiment, we have stir-fried, slow-cook, boiled, and baked kidney beans. We then used the Bradford assay to determine the amount of protein in the beans. The results show that our hypothesis was wrong and that baking actually preserved the most protein, whereas slow-cooking preserves the least. In conclusion, our study shows that the method of cooking beans affects the amount of protein you get from them. Baking is the best way to keep protein levels high, followed by slow-cooking. On the other hand, stir-frying and boiling don't preserve protein as well. These findings emphasize the importance of choosing the right cooking method to get the most nutrition from food, especially if you want more protein. By understanding how cooking affects protein levels, people can make smarter choices about what they eat in order to stay healthy. Further research could help us learn even more about the best ways to cook different foods for maximum nutrition.

Project ID: 587

Junior Division

Chemistry

Myla Fitzgerald

De Portola Middle School

Gr. 8

Spherification vs. pH: A Molecular Gastronomy Experiment

AWARDS:

American Chemical Society - San Diego - 3rd Place

This project explored the relationships between the pH of water, balsamic vinegar, Gatorade, apple cider, and mango juice and how well it spherified. The hypothesis was that liquids with a pH of 3-7 in the acidic range would have the most spherified balls. The different liquids were tested for pH, combined with sodium alginate, and dropped into a calcium chloride bath. Then the balls formed were measured in height and length with graph paper. To find the ratio (r) the height (h) was divided by the length (l) using this equation: r=h/l. Additional data was measured by manipulating the pH of the liquid using increasing grams of sodium citrate by 0.5g up to 2g. Results showed that liquids with a pH of 5 created the most spherical with ratios closest to one. Results also proved that liquids with a pH lower than 3 could not spherify. Further research into different types of spherification can determine the best ways to create a fun dessert experience.

Project ID: 588

Junior Division

Chemistry

Brooklyn Hellbusch

St. Gregory the Great Catholic School

Gr. 7

Temperature vs. Glow Sticks: Are Glow Sticks Affected?

This experiment was called "Temperature vs Glow Sticks: Are Glow Sticks Affected?" and the hypothesis was if glow sticks are put in a cold, hot, and room temperature environments the result would be that the colder environments make the glow sticks dimmer than the other environments and the room temperature environment would make the glow stick not as dim as the colder environments but not as bright as in a hotter environment the glow would just be neutral. The yellow glow stick will be the brightest because it contains less fluorescent dye than other glow sticks.

After testing 5 colors of glow sticks at 32°, 40°, 75°, 85°, or 90°F, the results were that the warmer the temperature the brighter the glow stick, and the colder the temperature the dimmer the glow stick. The average of the pink glow stick was 9.366 Lux. The purple glow stick was 9.534 Lux. The blue glow stick was 21.6 Lux. The green glow stick is 44.34 Lux. Last, the yellow glow stick was 35.394 Lux. The glow stick average is all under 45 lux. The green glow stick was consistently the brightest except at 32°F, which showed yellow as the brightest. At 40°F, the green glow stick was 7.3% brighter than the next brightest glow stick, at 75°F it was 10.7% brighter, at 85°F, 11.4% brighter, at 90°F, 44.9% brighter. At 32°F, the yellow glow stick was 34.3% brighter. On average the green glow sticks were 24.9% brighter than the next brightest glow stick.

The first and second results were expected as shown in the original hypothesis but the third was unexpected. In conclusion, glow sticks are affected by temperature/color and are truly a glowing phenomenon!

Project ID: 589

Junior Division

Chemistry

Stasha Raschtschenia

Mt. Helix Academy

Gr. 7

Frozen vs. Fresh

This project was to see if frozen fruits such as strawberries and blueberries were better quality than fresh fruits in muffins. I used the exact measurements (see on raw data) for the fresh and frozen fruit muffins. The fresh fruit muffins did not rise or brown and were dry and the slightest bit raw, however the frozen fruit muffins rose and were colored nicely. The fresh blueberries in the muffins were buried and gushy, but the frozen blueberries stayed intact. For the fresh strawberry muffins, the fruit all sank to the bottom of the muffin, but frozen strawberries were spread out around the muffin. The frozen fruit muffins were colored the tint of the berries that were used, resulting in dark blue and pink muffins. Almost every fresh fruit muffin was small and unrisen, however 10 out of 12 frozen muffins were fully risen. The baking time on every batch was the same, and every time the frozen muffins came out much better in looks. Frozen fruits release little capsules of frozen water and makes the muffin fluffier, rise more, and the fruit won't burst as much. In conclusion, using frozen blueberries and strawberries results in more fluffy and risen muffin

Project ID: 590

Junior Division

Chemistry

Jenna Stoneman
De Portola Middle School
Gr. 8

Freezing Point of Ice Cream

AWARDS:

CSEF Qualified

This science project will explore freezing point depression which is a key factor required to make ice cream. Increasing the freezing point depression can be done by adding chemicals. The purpose of this project is to determine if salt and/or sugar will increase the freezing point depression and if so by how much. I thought that adding more salt to the ice bath would increase the freezing point depression and lower the freezing point. My hypothesis turned out to be correct because test liquid 3 (which had the most amount of salt) had the highest freezing point depression and lowest freezing point for both measured and expected.

The procedure I followed was to make an ice bath, then place my solution in a test tube into the ice bath and wait for ice crystals to form. Once the crystals formed I recorded the temperature of the solution in my notebook. That gave me the data I needed to calculate the freezing point depression of each solution. The results of my experiment told me that adding more salt to the ice bath would lower the freezing point and increase the freezing point depression. This is an important fact that will help you make delicious ice cream.

Project ID: 591
Junior Division
Chemistry

Alexandra Wrotslavsky
San Diego Hebrew Day School
Gr. 8

Suncreen and Pollution

How does sunscreen affect the pollutant levels in various types of water? It was hypothesized that if different types of sunscreen were put in water, then the chemical sunscreen would pollute the water more than mineral sunscreen. To test, buckets were filled with 4 variations of water (combinations of pool water and salt water, at room temperature or heated). A TDS water meter was used to measure particles. One drop of sunscreen, chemical or mineral, was applied to an orange peel, which was placed in the water for 15 minutes. After 15 minutes the orange peel was removed, and the water level was tested again. The results were that the chemical sunscreen on average had about eight percent higher particle increase compared to mineral sunscreen. A potential reason for this being because chemical sunscreens are absorbed into the skin, and with humans constantly sweating, the sunscreens may be released more easily compared to mineral sunscreens, which create a coat on the skin. The largest difference was room temperature salt water. Chemical increased an average of 21% and mineral an average of only 3%. The only condition where mineral sunscreen polluted more was in the heated pool water with about a three percent higher increase. A potential explanation is when zinc oxide comes into contact with certain fatty acids at higher temperatures, the resulting reaction can disintegrate the sunscreen. To sum up, chemical sunscreen may be worse for oceans and pools than mineral sunscreen when it comes to potential pollution.

Project ID: 592

Junior Division

Chemistry

John-Paul Zwolinski

St. Gregory the Great Catholic School

Gr. 7

The Effects of Temperature on Salt Crystal Growth

The purpose of this project was to see how different temperature levels and types of salt affect crystal growth. The hypothesis was that higher temperatures across all three salts would result in more growth. To test the hypothesis, I measured crystal growth for three salt types (Calcium chloride, Magnesium sulfate, and Iodized salt) and three temperatures (low/38 degrees, medium/70 degrees, and high/98 degrees). The dependent variable was crystal growth measured by weight. Each of the 11 trials included 9 combinations of salt type and temperatures, which resulted in 99 total samples. After 7 days of storage in a refrigerator (low), or one of two incubators (medium and high temperatures), the crystals were removed and weighed using a kitchen scale. The results showed temperature did affect crystal growth. The mean growth across salt types was 2.66 grams for low temperature and 0 grams for both medium and high temperatures. The results also showed that the mean growth for salt types across temperatures was 2.66 grams for Magnesium, and 0 grams for both Calcium chloride and Iodized salts. The only crystal growth observed was for Magnesium in the low temperature (mean = 8 grams); there was 0 grams of growth for the other two salts across all three temperatures. Although the hypothesis was not supported, temperature did impact salt crystal growth differently. Future research should examine how other kinds of salt growth are affected by these temperatures, and whether changing the salt saturation techniques used here will influence the results.