CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Alhassan Alhassan

Project Number
J0601

Project Title
Dissolve, Act, and React: The Effect of Temperature on Reaction Rate

Abstract

Objectives/Goals
The objective of the experiment was to determine the effect temperature has on the chemical reaction rate of Alka-Seltzer and water.

Methods/Materials
Four clear identical cups were prepared, each filled with the same amount of water (4 oz.) at various temperatures initially measured by a thermometer for each trial and recorded on a data sheet. The cups were labeled with four treatments: very hot (>69 C°), hot (55-66 C°), warm (30-47 C°), and cold (8-20 C°). One whole Alka-Seltzer tablet was dropped into each of the four cups, and the reaction time was obtained through a timer. The amount of time the tablets took to completely dissolve was measured in seconds, and was recorded in a data table. The experiment was conducted three more times, completing a total of four trials for each type of treatment (temperature). The average reaction time for each of the four water temperatures, in each trial, was calculated and also recorded in a data table. Statistical plots displaying the data were made, analyzed, and the conclusion was drawn.

Results
According to the data collected, with the temperatures ranging from hot to very hot, the Alka-Seltzer tablets appeared to dissolve more rapidly, taking about 17-27 seconds to do so. For the temperature condition labeled as warm, the tablets took about 29-37 seconds to completely dissolve. However, with each cold temperature used, it took about 74-143 seconds for the tablets to dissolve, with bubbles still visible even after a few more minutes. The average reaction rates for the Alka-Seltzer tablets in the four trials were 19 seconds for the very hot water, 24.25 seconds for the hot water, 32.75 seconds for the warm water, and 115 seconds for the cold water. The results showed that the higher the temperature, the faster the chemical reaction.

Conclusions/Discussion
According to the experiment and results, the Alka-Seltzer tablets dissolved more quickly as the temperature increased. These results fully supported my hypothesis which stated that the higher the temperature of water, the faster the rate of the chemical reaction. Molecules move faster when the temperature is higher and as a result bicarbonate ions contact hydrogen to trigger the chemical reaction and produce carbon dioxide bubbles to speed up the reaction rate.

Summary Statement
The purpose of my project was to determine the effect temperature has on the chemical reaction between an Alka-Seltzer tablet and water.

Help Received
My parents helped me with the graphs using Excel spreadsheet and provided the materials needed for the project.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Colton Allen; Gabriel Sigala

Project Number

J0602

Project Title

Column Chromatography: The Type of Stationary Phase Makes a Difference

Abstract

Objectives/Goals

Our project was to determine if using different materials like silica gel and space sand as a stationary phase in column chromatography affect the way sodas' dyes separate.

Methods/Materials

We tested two different stationary phase materials in a student created column chromatography system. The two stationary phase materials tested were Space Sand and silica gel beads. Columns were created with stationary phases compacted into 30mL syringes. Columns were then prepared with distilled water and alcohol before adding the testing material. Materials tested were four processed drinks with various color sources and dyes - our mobile phases. Eluate was collected in fraction cups, observed visually for color and then run through the spectrometer.

Results

The columns with the sand as the stationary phase separated the color sources and dyes from the mobile phase. The columns with the silica gel beads separated some of the dye but also absorbed the mobile phase. The visual observations for the sand trial of one of the sodas, grape soda, were recorded as red, plum, violet and light blue and the spectrometer readings confirmed those colors. The visual observations for the silica gel bead trial of the grape soda were recorded as bright purple and dark pink, again confirmed by the spectrometer.

Conclusions/Discussion

We believe the sand trials worked because the materials within the sand, i.e. silica, are similar to stationary phases used in laboratories and therefore could attract dyes such as the red dye #40 and blue dye #1 the best. The silica gel beads were not successful as a stationary phase. They did not separate the dyes well because they expanded, absorbed liquid and formed solid masses within the syringe. It was not the correct form of silica for our column chromatography experiment.

Summary Statement

Our project is about testing different stationary phases in a student designed column chromatography system.

Help Received

Used laboratory and equipment at Clovis Community College Center under the direction of Shawn Flemming PhD; Our mothers helped us purchase our materials, type our documents and helped us with our graphs in Excel.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Sophie Carter; Cameron Gomez

Project Number

J0603

Project Title

Kinetics of the Inversion of Sucrose

Abstract

Objectives/Goals

Our goal was to use polarimetry to measure the activation energy of the inversion of sucrose in the presence of a catalyst. Sucrose inversion occurs when it is dissolved in water in the presence of a catalyst such as an acid or an enzyme. Sucrose is broken into glucose and fructose, two other sugars. Because sucrose, glucose, and fructose are optically active, they rotate the plane of linearly polarized light. Each has a different specific rotation, so the rate of inversion can be measured using polarimetry.

Methods/Materials

We built a homemade polarimeter for our experiment. We used a white laptop screen as a polarized light source. The sugar solution was placed on top of the screen and viewed through a polarizing filter. The polarizing filter was rotated until light from the laptop could no longer be seen. We found the difference between the angle of polarization of the solution and that of the laptop to determine the effect of the solution.

Results

The angle of rotation of the solution changed as the sucrose converted to glucose and fructose. By measuring the angle over a period of time with our polarimeter, we were able to determine the reaction rate. We observed that the reaction proceeded much faster at higher temperature and calculated the rate constant by fitting the specific rotation with an exponential function. With these rate constants, we used the Arrhenius equation to calculate the activation energy of the reaction.

Conclusions/Discussion

We succeeded in building a homemade polarimeter and using it to measure the rate of an important chemical reaction in biochemistry and the food industry. We showed that, by measuring the rate at multiple temperatures, we could calculate the activation energy of the reaction.

Summary Statement

A homemade polarimeter was built and used to determine the activation energy of an important chemical reaction in biochemistry and the food industry.

Help Received

Paul Carter helped us understand concepts in chemistry and math needed for the project

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Gladis Castillo

Project Number
J0604

Project Title
The Effect of Mint on Water Temperature

Abstract

Objectives/Goals
The purpose of my experiment is to find out if mints cause a temperature decrease. I believed that the fresh, cooling sensation that you feel in your mouth was due in part to a reduction in temperature.

Methods/Materials
I used hot tap water starting at 93.3 °C (200°F) and measured the temperature before and after adding my mints for a set time period. Using three glasses of hot water, I left one alone (control group), put one Mentos in the second glass and two Icebreakers in the third glass.

Results
My results showed that the Mentos cooled the water temperature more than the Icebreakers.

Conclusions/Discussion
My hypothesis was supported by the data because the results showed a temperature reduction for both mints. If I did this project again I would like to test a greater variety of mints, such as Altoids and Tic Tacs to see if this trend continues.

Summary Statement
This project is about the effect of mints on water temperature.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Alan P. Chen

Project Number
J0605

Project Title
Will Ice Cubes Melt Faster in Fresh Water or Salt Water?

Abstract

Objectives/Goals
It is well-known that salts help melt ice/snow faster. I wonder if ice will melt faster in fresh water or salt water.

Methods/Materials
two bowls; ice cubes; table salt; chopsticks; iPhone; quarter coins

Results
I did three sets of experiments.
In the first experiments, I filled two bowls with 2 cups of water each, and added 0.5 cup of table salt to one of them, stirred it with a pair of chopsticks to dissolve the salt. I then got two ice cubes (1" long) and dropped them into the bowls (no stirring). I used an iPhone to time how long it took to melt the ice cubes on top of the water. Results from 4 repeat measurements showed that on average ice cubes actually melted almost three times faster in fresh water (about 11 min) than in salt water (about 28 min). This seemingly unusual result was actually due to water circulation around the ice cubes. In fresh water, the water around the ice cube was heavier than the water below. So the circulation between them brought in warm water that made the ice cube melt faster. In salt water, the water around the ice cube was lighter than the water below, so there was no circulation and the ice cube remained surrounded by cold water and melted slower.
If this explanation was correct, I could stir the water and make the water circulate, then the ice cubes should melt faster in salt water than in fresh water. I repeated the tests three times, and indeed ice cubes melted slightly faster in salt water (average 3.4 min) than in fresh water (3.8 min).
In light of these two experiments, if I kept the ice cubes at the bottom of the bowl rather than float on the water surface, then in fresh water there would be no circulation between the water around the ice cube and the water above, but in salt water, water circulation would take place. This means that ice cubes would melt faster in salt water than in fresh water. So, before putting the water into the freezer to form ice cubes, I added a quarter into the ice cube tray. When put into water, the ice cubes now sank to the bottom of the bowl. Results from three repeat tests showed than indeed ice cubes melted two times faster in salt water (7 min) than in fresh water (14 min).

Conclusions/Discussion
1) How fast ice cubes melt depends on the circulation of the water. 2) In general, ice cubes melt faster when water circulation takes place. 3) Under the same circulation condition, ice cubes melt faster in salt water than in fresh water.

Summary Statement
Water circulation is important in determining how fast an ice cube melts.

Help Received
Mom helped make the ice cubes.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Sebastian C. Clancy

Project Number

J0606

Project Title

Using Lasers to Measure the Sugar Content of Liquids through Refraction

Abstract

Objectives/Goals

My objective was to learn if a laser's path becomes changed more with the amount of sugar, and if it can be used to measure sugar content.

Methods/Materials

To make a glass prism apparatus: Microscope slides Waterproof caulking or epoxy Small glass for base Duct tape Laser pointer To test sugar content in liquids: Piece of paper and pen to mark laser#s path Kitchen Scale and Containers For Calibration Phase: Sugar/water in 5%, 10%, and 20% concentration For Application Phase: Sprite, 7Up, Fanta, Crush, Coke and Pepsi

Results

My results indicated that laser testing is not the most exact way to measure. I had a 6% error, meaning that the actual result according to the label was 6% away from mine. I found this by taking the arctangent of the measured distance from the beams unaltered path over the distance to the wall from the center of the prism.

Conclusions/Discussion

Yes, my hypothesis was correct in that I could measure the sugar content with a laser. However, my results were not extremely accurate. This could have been caused by the color of the liquids, or the apparatus used to measure the laser. It also could have been caused by the difference between Corn Syrup and Cane Sugar. I will attempt to repeat my results if time allows for it.

Summary Statement

My project is about using lasers to measure the sugar content of liquids through the measurement of refraction.

Help Received

My dad helped me by providing the laser and by helping me glue the prism.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Sarah Danon; Nicole Dersahakian

Project Number
J0607

Project Title
Which Blonde Is Best?

Abstract

Objectives/Goals
The experiment was to measure the amount of force that hair which has been bleached, dyed, and lightened with hydrogen peroxide can withstand before breaking. It was expected that the bleached hair would be able to withstand the least amount of force because bleach penetrates the outer cuticle layer of the hair to remove the natural pigment leaving the hair dry and brittle.

Methods/Materials
Four groups of hair from the same person were each treated once with either bleach, dye, or hydrogen peroxide, leaving one group as a controlled. Each group was then studied under a microscope and tested using a spring scale for the amount of force that the different strands can withstand.

Results
The bleached group of hair withstood the least amount of force and the controlled group withstood the most amount of force. It is to be noted that the different between the amounts of force were so minute that the results may be slightly inaccurate.

Conclusions/Discussion
The conclusion is that bleaching hair is the most harmful method of lightening hair, whereas hydrogen peroxide is the least harmful.

Summary Statement
In out experiment, we lightened hair using hydrogen peroxide, dye, and bleach to see which method of lightening left the hair with the most amount of tensile strength.

Help Received
Our science teacher, Mrs. Van Zyl, allowed us to use a microscope and spring scale for our experiment.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Amanda S. Dawley

Project Number
J0608

Project Title
Can We Stop Corrosion?

Abstract

Objectives/Goals
The goal of my project was to stop or slow the rate of corrosion in a saltwater electrolyte using either magnets or petroleum jelly.

Methods/Materials
AC/DC transformer
multimeter
digital scale
metal test strips
magnets
petroleum jelly
alligator clips & wire
camera

Results
All test results showed corrosion. Each test was weighed before and after to determine change over 20 hour period. The control test and magnet test lost about the same amount of metal. The petroleum jelly test lost less metal than other tests.

Conclusions/Discussion
Magnets had no effect on the rate of corrosion as compared to the control test. The petroleum jelly prevented corrosion but failed to stick to the metal test strips.

Summary Statement
My project attempts to stop or slow corrosion in a saltwater or marine environment.

Help Received
My dad taught me to use AC/DC transformer from train set, multimeter, Microsoft Excel tables and digital scale; My grandfather suggested pertrolium jelly as method to stop corrosion.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Cookie F. Dutch

Project Number
J0609

Project Title
Do Solutes Affect the Heating Process of Water?

Abstract

Objectives/Goals
About 17% of the energy used daily in the US is used for heating water. If heating water became faster and more efficient, people wouldn#t waste time and money trying to heat things. If you were cooking a meal and knew that adding a certain solute would change the time it has to heat, you#d save energy. Speeding up the heating process of water would also make restuarants more efficient. The kitchen would be able to get orders out faster and using less energy. An acceleration in the heating of water would greatly benefit everyone who heats anything on stoves, microwaves, etc.

Methods/Materials
236.5mL of each solute; Medium pot; 3 L distilled water; Thermometer(celsius); Timer.

Pour 473mL of water and 236.5mL of salt into designated pot, whisking until salt dissolves. Place pot on the burner. Let the solution heat for 3 minutes, recording temperature every 30 seconds. At 3 minutes, record the final temperature of solution. Wash and dry pot. Let pot cool for 5 minutes. Repeat steps 1-4 for each of the remaining solutes. Pour 473mL of water into pot and place on the burner on high heat for 3 minutes, recording the temperature every 30 seconds. At 3 minutes, record final temperature of the water.

Results
Water had the fastest rate of temperature change at 10.6C per 30 seconds and sugar+water had the slowest rate of temperature change at 4.3C per 30 seconds. The solution with the second fastest rate of temperature change was salt+water, at 8.5C per 30 seconds and the solution with the second slowest rate of temperature change, at 6.3C per 30 seconds, was flour+water. The two solutions that almost had the same rate of change were baking powder+water and baking soda+water, at 7C per 30 seconds and 7.5C per 30 seconds. These two solutions# rates of temperatures were similar because they are very similar substances with similar chemical compositions. Water had the fastest rate of change because it was not mixed with any solutes.

Conclusions/Discussion
My hypothesis was incorrect. I thought that flour would make the most difference in the heating process of water, but I was wrong. Sugar slowed the heating process of water the most because sugar has the highest boiling point or heat capacity of all the solutes. Even though it may be thought that salt would have sped up the heating process, this is not accurate. My conclusion is that all of the solutes I tested slowed down the heating process of water.

Summary Statement
Heating solutions and observing their temperature changes.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Jessie A. Ellico Franks

Project Number
J0610

Project Title
Are "Chameleon Eggs" Still Acid Indicators if You Use Different Drinks Instead of Grape Juice?

Abstract

Objectives/Goals
I think spheres (I call Chameleon Eggs for the rest of my experiment) will change color after sitting in lemonade (an acid) if the liquid used to make the spheres has a low pH level (is an acid) and if it contains anthocyanins.

Methods/Materials
First I brought the juices or drinks that I was using close to a neutral pH with baking soda. Then I added sodium alginate to the liquid so that it would become thicker. Then I crushed calcium chloride and magnesium hydroxide and put that powder in water. After this, I took some of the thickened liquid and dropped it, using a syringe, into the calcium chloride and magnesium hydroxide mixture. This created spheres or Chameleon Eggs. Then I strained the water and put the eggs into lemonade.

Results
When I put the grape, cherry, and red cabbage juice Chameleon Eggs in the lemonade, there was a change from blue to red. The Red Bull and Capri Sun eggs did not change color.

Conclusions/Discussion
My hypothesis was correct. Eggs made from juices containing anthocyanins did change color, while eggs made with artificial drinks, which have no anthocyanins did not change color. Anthocyanins are a pH indicator and turn the eggs red as the acid is absorbed.

Summary Statement
I created spheres with sodium alginate and different liquids and then put them in lemonade to see if their color change indicates the presence of whether it is an acid or a base.

Help Received
Mom typed. Dad painted back of the board.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Alyssa J. Fraser

Project Number
J0611

Project Title
Soaking Shells

Abstract

Objectives/Goals
My objective was to determine if shells will become weaker after soaking them in vinegar for 5 days. I think that the soaked shells will lose weight, size, and color. They will also get smoother and become easier to break with a hammer.

Methods/Materials
Three different shell types were used, Pecten, Turban, and Saucer, and I selected four of each. I made measurements and soaked half the shells in vinegar for five days. Daily, I noted how the shell's appearance changed over time. At the end of five days, I repeated the measurements on the soaked shells and used a hammer to break both soaked and not soaked to measure strength.

Results
All shells lost over 25% of their weight and the Saucer shells lost half their size. Over all, the shells lost color and were soft and slimy. The shells that were soaked in vinegar took less hits to break compared to the ones that were not soaked.

Conclusions/Discussion
My conclusion is that the shells soaked in vinegar will become weaker, softer, or even dissolve. Even though the vinegar effected all the shells, the Turban was the most resistant and strong while the Saucer more weak and fragile.

Summary Statement
I selected three different kinds of shells and did several measurements to see if soaking shells in vinegar will have an effect on them.

Help Received
My mom helped me by showing me how to make my graphs. My dad cut the paper for the board.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Nicholas A. Hammons

Project Number
J0612

Project Title
Kitchen Synthesized Magnetite Nanocrystals for Removing Arsenic from Water

Abstract

Objectives/Goals
In this project, I synthesized magnetite nanocrystals in my home kitchen using everyday household supplies.

Methods/Materials
The ingredients for the synthesis of nanocrystals include oil, vinegar, soap, rust, thermometer, grater, spoons, funnel, pan, and stove. My experiments are broken up into three main areas: The soap synthesizing process, fatty acid mixture from soap process, and magnetite nanocrystals synthesis. Below, the reactions of the three experiments are listed.
Vegetable Oil+Drain Opener(NaOH)=Soap; Vinegar+Soap=Fatty Acid Mixture(Oleic Acid)
Rust+Fatty Acid Mixture (Oleic Acid)=Magnetite (Fe_3O_4)Nanocrystals

Results
Black slurry was created for each case of fatty acid mixture and rust except the second run with 20% acidity vinegar. The overcooked 20% vinegar only showed rust in the pan. The other three runs had various amounts of nanocrystals formed. The third run seemed to have the largest amount of crystals. With the third run, I was able to measure the temperature of the reaction with an optical thermometer throughout the run.

Conclusions/Discussion
I show that not only can you synthesize nanomaterials in the home using everyday household supplies and using home kitchen facilities but also provide feedback on the viability for using this process as an open source technology. To support arsenic removal on the scale of a small town, the production of nanocrystals could easily grow beyond what normal people could realistically produce. While the suggested cost reduction of materials from lab grade to everyday grade is more than 100x less, the industrialization of the process will increase the cost for utilization. An alternative to industrialization of the kitchen process is to setup a "blood bank" for nanocrystals where people from the local town would grow and donate nanocrystals to a government-owned facility. This social network would make use of the open source technology keeping the cost low with continual improvements in the kitchen synthesis of magnetite nanocrystals.

Summary Statement
I grew magnetite nanocrystals for arsenic removal from water in my kitchen using open source nanotechnology.

Help Received
Mrs. Allen helped with the application process and abstract; my parents helped with the hazardous parts of my project.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Rithik Jain

Project Number
J0613

Project Title
Bang for Your Buck: The Effect of the Type of Fuel on Energy Content

Abstract

Objectives/Goals
Dirtier, nonrenewable fuels, like diesel and gasoline, seem to be used much more extensively that the cleaner burning and renewable fuels, like biodiesel and ethanol. This experiment was designed to determine whether gasoline and diesel really have the best advantages in terms of energy content. The question was asked, which common automotive fuel, diesel, gasoline, biodiesel, or ethanol, has the most energy content? The hypothesis was formulated that diesel would have the highest energy content.

Methods/Materials
Since 100% pure biodiesel was not available commercially, it was produced at home using canola oil. 1.5 grams of potassium hydroxide (KOH) was mixed with methanol. The resulting solution was poured into 200 mL of canola oil. After agitating the solution, it was allowed to sit for 24 hours in order for the glycerin to separate out from the pure biodiesel. To compare and measure the relative energy content of all four fuels, calorimetry was performed. Each of the four hydrocarbons was burned in an alcohol burner under 500mL of water in a covered beaker. The temperature increase of the water and the weight reduction of the fuel were measured. This procedure was repeated 5 times for each fuel, and the average energy transfer in calories per gram for each type of fuel was calculated and recorded.

Results
After the data was analyzed and the average calories per gram transferred from each fuel was found, it was determined that diesel had the highest energy content that could be released through combustion. Diesel had an average of 3300 calories per gram. It was followed by biodiesel with 3000, gasoline with 2700, and ethanol with the lowest of 2300 calories per gram.

Conclusions/Discussion
The results from the experiment proved the hypothesis correct. Surprisingly, biodiesel contained more energy than gasoline, a much more commonly used fuel, and only 10% less than diesel. Even though diesel had the highest energy content, the amount of soot produced during the experiment makes biodiesel a better option. Along with the minor difference in energy content, biodiesel also has other advantages, such as the fact that it is clean burning and renewable, unlike both diesel and gasoline. Therefore, biodiesel seems like the best fuel overall, having a high energy content and better impact on the environment.

Summary Statement
The purpose of this project is to test which common automotive fuel, diesel, biodiesel, gasoline, or ethanol, has the highest energy content.

Help Received
I would like to thank my father for supervising potentially dangerous parts of my experiment and my teacher Mrs. Nguyen for her mentorship.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Thomas M. Karpishin

Project Number

J0614

Project Title

Just Microwave It: Developing Fingerprints with Microwave Radiation

Abstract

Objectives/Goals

I developed a new method for developing latent fingerprints on porous surfaces using microwave radiation. I compared my method to two other commonly used development methods and also optimized the development solution. I read several research sources and could not find indications that my method has been used in forensics labs.

Methods/Materials

I used the chemical ninhydrin which reacts with amino acids in sweat creating a purple fingerprint. To develop a fingerprint requires heat, and I compared my microwave method to the common methods of the steam iron and the conventional oven. I also compared acetone and ethanol solutions of ninhydrin which are both commonly used in forensics labs. Numerous fingerprints were analyzed by different people to determine which method gave the clearest and darkest fingerprints. I also optimized the development solution by testing artificial fingerprints. These were made by using different dilutions of a common amino acid dotted and dried on filter paper. This was done because it was easier to consistently measure the development rather than using actual fingerprints which vary from print to print.

Results

These experiments showed that the microwave heating method is a better method than the other two heating methods. The microwave prints were slightly darker and clearer than the prints obtained from the oven. Also, the microwave prints were not smudged like the ones heated with the steam iron. In crime labs, it is important not to destroy or alter the evidence. I noticed that the oven and iron heated samples started to curl at the corners, whereas my microwave heated samples stayed flat like the air dried ones. I also showed that the optimized solution for developing fingerprints using a microwave contains 1% water and 0.62% ninhydrin in ethanol.

Conclusions/Discussion

This project showed that using a microwave to develop fingerprints on porous surfaces is a very effective method. It conserves time and money, while providing a fingerprint that is clear and dark. I showed that using a ninhydrin solution in ethanol with 1% added water will make the darkest and clearest prints. I believe that my work will aid forensics labs across the country because my method is faster, gentler, and saves money.

Summary Statement

I believe that my new method of developing fingerprints on porous surfaces will aid forensics labs because it is more effective, convenient, and saves money.

Help Received

My dad helped me get the chemicals I used and helped with some of the planning of the optimization procedures.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Larisa C. Laborin

Project Number
J0615

Project Title
Think Before You Drink

Abstract

Objectives/Goals
In this science fair project I will be testing which of the following beverages stains your teeth the most in the least amount of time. The beverages I will be using are Coca Cola, Coffee, Black Tea and Grape Juice. This will show people what not to drink on a daily bases. My hypothesis states #If teeth-staining fluids stain at different rates, then I believe coffee will stain in the shortest period of time. And the question I plan to solve is #Which liquid solution causes the most teeth degradation?# After retrieving all the necessary data to answer my questions, I finally found the answer I was searching for. The beverage that causes the most teeth staining is #GRAPE JUICE.#

Methods/Materials
Materials List: 24 eggs, Grape juice, Coca Cola, Coffee, Black tea, Plastic reusable plastic, cups.

Procedures
1. Set up reusable plastic cups on a flat surface to begin
2. Brew the coffee and tea and leave aside to let it cool down
3. Place the eggs in each plastic cup
4. Pour beverages into plastic cups until egg is completely covered
5. Set up a time limit to know how long the eggs have been submerged
6. Take one egg out every 2 days to know if you see a change in the color

Results
When I got my results I was surprised at the outcome. In my hypothesis I had stated that the one that stained the most in the least amount of time was going to be Coffee. It turns out the one that stain the most in the least amount of time was #GRAPE JUICE.# It had the greatest jump from one color to the next shade on the color fan.

Conclusions/Discussion
In my hypothesis I had stated #If teeth-staining fluids stain at different rates, then I believe coffee will stain in the shortest period of time.# So my prediction was in fact wrong, unfortunately. At first while doing the project coffee looked darker than the rest, until one beverage over through it##GRAPE JUICE.# Grape juice started out very lightly stained, until it made a huge jump up the color scale and over through coffee.

Summary Statement
Which liquid solution causes the most teeth staining

Help Received
Parents helped me to get supplies

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Rachel H. Lin

Project Number

J0616

Project Title

Which Type of Water Is Better for Electrolysis: Natural or Synthesized Water?

Abstract

Objectives/Goals

The goal of this experiment is to investigate whether naturally-collected waters are better than synthesized salt solutions for water electrolysis. My hypothesis is that those solutions with more salts, such as ocean water and synthesized solutions containing salts, will be more efficient for electrolysis.

Methods/Materials

An electrochemical cell is assembled using nickel electrodes in a beaker of solution and a breadboard circuit connected to two, 9 V batteries, a 1 or 10k Ohm resistor, and a voltmeter. Natural sources of water are collected from the environment (ocean, gutter, runoff, rain, tap, and distilled water) and solutions are synthesized from a variety of salts (NaCl, Epsom salt, and baking soda) in 0.1 M and 1.0 M concentrations. The cell voltage is measured for each solution. The solutions that exhibit the lower voltage drops across the cell are more efficient.

Results

All of the synthesized solutions exhibited cell voltages less than around 3 V. However, most of the natural waters displayed cell voltages greater than 3 V except for ocean water which already contains electrolytes. Results show that the best synthesized solutions are the NaCl solutions and the best natural water is ocean water. The natural waters, i.e. tap, gutter, runoff, rain and distilled, all exhibited much higher voltages (3.6 # 17 V); thus, they are less desirable for electrolysis.

Conclusions/Discussion

My hypothesis was correct. Ocean water and all of the synthesized solutions were better for electrolysis than the remaining natural waters. The former displayed the lowest voltage drops, so they required the least voltage for electrolysis, making them the more efficient solutions for electrolysis. For water electrolysis to become more widespread as a clean, renewable, source of energy to power machines, finding solutions requiring lower cell voltages will be essential. My experiment showed that ocean water and NaCl solutions were the best solutions with the smallest voltage. While making NaCl solutions synthesized in a manufacturing plant would add cost to the technology, ocean water is plentiful as well as free.

Summary Statement

I measured the cell voltage of natural waters & synthesized salt solutions to determine which is more efficient for electrolysis.

Help Received

Dad helped to set up the electronics and built the magnetic stirrer. Mom bought the chemistry supplies and helped to set up the electrochemical cell.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Kyley A. Linn

Project Number
J0617

Project Title
Stovetop Madness

Abstract

Objectives/Goals
The objective is to distill 200 ml of pulp free orange juice and receive a pH of 7 (neutral).

Methods/Materials
Materials: deep-cooking pot, lid for pot, 2000 ml of pulp free Simply Orange,20 Micro Essential Laboratory pH strips, gas stovetop burner and 100 ml graduated cylinder.
Methods: 1: Measure, pour, and heat 200 mL pulp free orange juice in distillation apparatus (picture of apparatus in paper and on display board). 2: Boil the juice for 10 minutes. 3: After the time is over save the collected juice in the bowl (distillate). 4: Test the distillated juice for its pH. 5: Compare the test strip with pH chart. 6: Test the non-distillated orange juice for its pH. 7: Compare the test strip with the pH chart. 8: Record data and repeat procedure for 10 trials.

Results
In tests four-eight the pH went up to 7 for the distilled juice and the orange juice pH still stayed the same. From test eight to nine the pH of the distilled juice went down two. In that same test (nine) the orange juice still had the same pH as the first eight tests. The last test was ten and the distilled juice had a pH of 7 (neutral). In test ten the orange juice had a pH of 4. The average of the orange juice 4 and the distilled juice had a pH of 6.4.

Conclusions/Discussion
My hypothesis was that the distilled juice would have a pH of 7 (neutral). Some of my results support my hypothesis and some don't. Six out of ten tests support my hypothesis because the distilled juice had a pH of 7. However four of the tests don't support my hypothesis because they were lower than the pH of 7. The results also don't support my hypothesis because the average pH of all the distilled liquid tests were 6.4.
I think all the tests went well, but I think the main reason for the pH going down to 5 in two of the tests was because the orange juice in the bottom of the pot caramelized. I think I didn't put the heat on medium exactly, but a bit higher. In the future I would have a heat source that can be set at a certain number of degrees.
This experiment applies to the world in many different ways. One way is that distillation is used to make dehydrated food such as dehydrated fruits and vegetables. Another way is that pH can be used to see if a body of water is safe for sea life to live in it. It is also used to see if the water is safe for land animals to drink out of it.

Summary Statement
To distill pulp free orange juice and test the pH of both the distilled liquid and non-distilled juice.

Help Received
Joel Linn helped with pH formula.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Donald J. MacArthur

Project Number
J0618

Project Title
The Effect of a Cooler Condenser in Distilling Freshwater from Saltwater

Abstract

Objectives/Goals
The objective was to determine whether the temperature of the condensing surface in a distillation process affects the rate at which freshwater is produced from saltwater.

Methods/Materials
A distillation unit was placed on top of a pot of boiling saltwater. Another pot was placed on top of the unit, with the bottom of the top pot serving as the condensing surface. The freshwater produced in fifteen minutes was measured for three temperatures. First, the top pot was filled with tap water, and the temperature maintained by removing water and adding tap water. Second, the top pot was filled with ice and water, and the temperature maintained by removing water and adding ice. Third, the top pot was filled with tap water, and brought to a boil before the trial.

Results
The freshwater produced in fifteen minutes was an average of 344.3 milliliters with the condensing surface at the temperature of tap water, an average of 325 milliliters with the surface at the temperature of ice water, and an average of 73.3 milliliters with the surface at the temperature of water brought to a boil.

Conclusions/Discussion
My hypothesis was that a cooler condensing surface would produce more freshwater.

The data proved the hypothesis to be partially correct and partially incorrect. The production from the tap water temperature and ice water trials was much greater than the production from the hot water trials. However, the production from the tap water temperature trials was greater than the production from the ice water trials.

Summary Statement
My project is about whether the temperature of the condensing surface in a distillation process affects the rate at which freshwater is produced from saltwater.

Help Received
My Dad helped with the boiling water, and removing water from the pot.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Catherine G. McQueen

Project Number
J0619

Project Title
What's in Your Water Bottle?

Abstract

Objectives/Goals
The objective of my experiment was to learn if an increase in temperature affected the amount of bisphenol A released in polycarbonate plastic water bottles.

Methods/Materials
I had four groups of water bottles with three water bottles within each group. Each group of water bottles was subjected to different temperature water. Each temperature mimicked the interior temperature of a car at different temperatures. I subjected the water bottles to heat by placing them in a metal pot full of water that was over a burner. I had a thermometer sticking out to regulate the temperature. Then, I tested my water bottles for BPA by using a UV-Vis spectrometer.

Results
In the end, I found that the internal temperatures of cars are not extreme enough to release BPA in water bottles. Although I found no BPA in any of my test samples, I did find an unknown contaminant that increased in my samples with the temperature they were subjected to.

Conclusions/Discussion
After completing my project, I found that although there was no BPA in my samples, there was an unknown substance. Instead of focusing on BPA, which was not present at all, society should be more concerned about this contaminants and others, as they could be potentially just as harmful as BPA. Additionally, water bottle users should not be concerned with leaving their water bottles inside of their car simply because of BPA, as the temperatures are not extreme enough to leach BPA.

Summary Statement
My project focused on whether temperature affected the amount of BPA released in polycarbonate plastic water bottles or not.

Help Received
Used lab equipment at UCSB's Materials Research Lab under Amanda Strom

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Faatima Zahra Motala

Project Number

J0620

Project Title

Got Biodiesel? Transesterification of Plant Oils into Fatty Acid Methyl Ester

Abstract

Objectives/Goals

In this project I set out to make biodiesel from plant oil. I wanted to see which plant oil would produce the most biodiesel using only a single cup of plant oil. I chose red palm oil and soybean oil. Based on my research, palm oil and soybean oil are among the top three most sustainable oils for the production of biodiesel. My hypothesis was that palm oil would yield the most biodiesel and that it would burn the hottest.

Methods/Materials

Through the process of transesterification, I made biodiesel. I was able to use my catalyst (potassium hydroxide) and methanol to separate my glycerin molecule from my triglycerides. With this, the vegetable oil breaks down creating biodiesel. Using the "Dr. Pepper Method" I washed the biodiesel in a 2-liter soda bottle at least 5 times. Lastly, I compared the heat output of my biodiesel to petroleum diesel to test efficiency. I did this using an alcohol burner with a wick, and measured the heat output of oil using a laser thermometer.

Results

On average the palm oil yielded more oil. The average amount of biodiesel made for the soybean oil was 230ml while the palm oil was 245ml. Palm oil also had a higher heat output than both soybean and petroleum diesel. At their highest temperatures, red palm oil was 502°F, soybean was 388°F and petroleum diesel was 404°F

Conclusions/Discussion

Saturated plant oils yield more biodiesel and have a higher flashpoint making them ideal for the production of biodiesel, proving my hypothesis correct. Red palm oil is a saturated fat that contains many triglyceride molecules. This makes red palm oil ideal in the production of biodiesel.

Summary Statement

The trransesterification of plant oils into fatty acid methyl-ester.

Help Received

Under supervision of my mum.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Zara Mubin

Project Number
J0621

Project Title
Lead: The Hidden Enemy

Abstract

Objectives/Goals
The objective of this project was to see what the most effective way for testing lead is. Prior to beginning this project, I believed that pure water solutions would work better than vinegar as it would help speed up the chemical reaction, yet it wouldn#t interfere too much with the actual reaction (apart from speeding it up) as it has no acetic acid.

Methods/Materials
Sixteen Plastic Cups were filled with 50 mL of liquid each (different concentrations of vinegar and water) and labeled accordingly. There were two controls: one containing 100% water and the other containing 100% vinegar. The fourteen cups were then split into two groups of seven # one being for the four hour testing cups and the other being for the twenty-four hour testing cups. Both groups had cups with the same solutions. The pH levels of these solutions were then checked. Then, lead sinkers were placed into the fourteen cups which weren#t controls. After four hours, I tested the controls and all the four hour testing cups. Using an eyedropper, I took 0.75mL out of the solution being tested and placed it into a 3mL test tube. I then dipped a cotton swab into a container containing sulfide solution, put this cotton swab into the test tube, and waited 90 seconds. The color of the solution in the test tube changed if there was lead present. After twenty-four hours, I repeated this process with the controls and the seven cups in the twenty-four hour testing group.

Results
I repeated this project three times and every time this project was repeated, the results were the same. The controls were always detected to have no lead. The more vinegar in the solution, the more lead was detected. Also, the twenty-four hour testing group mostly detected more lead than the four hour testing group.

Conclusions/Discussion
The results disproved my hypothesis. In this experiment, I discovered that acidic substances are better for testing for lead than neutral substances. Next time I conduct a project like this, I will focus on other acidic substances more to see if the acidity is the factor which affects lead testing, or if it is some other factor present in vinegar.

Summary Statement
My project was about discovering the ideal solution to test for lead.

Help Received
My father helped take pictures and proofread my board material.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Frederick Nitta

Project Number
J0622

Project Title
Anthocyanin and the Behavior of Electrons: Will Anthocyanin Help Produce More Electric Current after Electrolysis?

Abstract

Objectives/Goals
This study is aimed to determine if more electric current is produced with more concentration of anthocyanin after electrolysis.

Methods/Materials
Anthocyanin was extracted by boiling red cabbage. I named this the 100% anthocyanin liquid (Absorbance 1.27 at 580 nm wavelength measured by iPhone spectrometer software) to use for basis and I made 50% and 33% anthocyanin liquids by adding distilled water. One gram of agar power and 0.59 grams of table salt were added to make 100 ml of anthocyanin-agar mediums of each concentration level. The 0% anthocyanin-agar medium has no anthocyanin, but has agar and salt.
Using these 4 levels of solid anthocyanin-agar mediums as electrolyte solutions, the procedure of electrolysis was conducted with electrodes made with aluminum foil. After 10 minutes of electrolysis, the alligator clips attached to the battery were reconnected to the digital current meter and the electric current was measured for 10 minutes.

Results
For the first 60 seconds, all of the 100%, 50%, and 33% anthocyanin-agar medium settings generated more electric current than the 0% medium setting. The 100% medium generated most electric current by 31% at the start, and secondly the 33% medium by 20%, and lastly the 50% medium by 7%, compared to the 0% medium which produced the lowest electric current.

Conclusions/Discussion
My hypothesis, which was that more concentration of the anthocyanin in agar would produce more electric current after electrolysis, was partly supported. This can be restated that the anthocyanin increases the electric current after electrolysis but the relationship between the level of anthocyanin concentration and the produced electric current might not be linear, unlike I expected.
Based on my literature research, it seems that this experiment is about figuring out the effective electrolyte part of mechanism in aluminum electrolytic capacitors. If this is correct, the electric current comes from static electricity near the surface of aluminum electrodes. Charged anthocyanin near electrodes must have helped to increase the electric current. Future experiments could include more concentrated anthocyanin in the electrolyte medium. I would like to find out if there is anything anthocyanin can contribute to store electricity.

Summary Statement
My project shows that the anthocyanin in electrolyte solutions increases the electric current after electrolysis.

Help Received
My parent purchased the materials and occasionally became my assistant for my experiment.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Ayinde B. Olukotun

Project Number
J0623

Project Title
How Does Your Crystal Grow? Understanding the Effects of Temperature and Water Purity on Crystal Growth

Abstract

Objectives/Goals
The objective of this science fair project is to use alum crystals to better understand crystal growth and formation in different temperatures, and in purer and less pure water.

Methods/Materials
I grew alum crystals at three different temperatures, in distilled and tap water. I grew the crystals in cold, warm and hot environments. I measured the growth of the crystals and observed their structure and clarity to determine the effects of the different temperatures and the different water purity on crystal growth and formation.

Results
Ideally, alum crystals grow in a regular, repeated fashion, resulting in the shape of an octahedron. The alum crystals in my experiment that most resembled an octahedron grew in the warmest temperature and in purer, distilled water.

Conclusions/Discussion
My conclusion is that crystals form best (1) at warmer temperatures, due to the greater solubility of the crystal salt dissolved in the water, and (2) in purer water, where the crystal can grow in its regular, repeated fashion, without having to reject so many impurities. Warmer temperatures and purer water mean the crystal has ample time to grow, and time to eject impurities that otherwise would disfigure the crystal.

Summary Statement
This project is about the impact of temperature and water purity on crystal formation and growth.

Help Received
My mother supervised my measurements and heating in the kitchen.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Mia B. Pardo

Project Number
J0624

Project Title
The Pink Catalyst

Abstract

Objectives/Goals
To show how catalysts affect the kinetics of a chemical reaction.

Methods/Materials
100-mL of 0.21M potassium sodium tartrate was added into a 500-mL beaker which was then warmed on a hot plate to 70°C. Simultaneously, 0.4g of cobalt chloride was added to 10-mL of distilled water in a 50-mL beaker and stirred until homogeneous. Once the potassium sodium tartrate solution reaches 70°C a 6% hydrogen peroxide solution was added to the 500-mL beaker. At this point reaction is very slow. To facilitate the reaction, the cobalt chloride solution was added to the reaction. The reaction proceeds at a faster rate indicated by the rapid production of carbon dioxide.

Results
The solution starts out pink due to the color of the cobalt chloride catalyst. The solution turns green forming an intermediate between the catalyst and sodium tartrate. The solution returns to the original pink color confirming that a catalyst does not get used up in a chemical reaction. Based on experimental findings, the following reactions can be suggested as taking place in the Co(II)-H2O2- tartaric acid system. On the action of hydrogen peroxide, the cobalt (II)-tartrate becomes oxidized to a green, probably binuclear, Co(III) tartrate compound. This cobalt (III)- tartrate is reduced both by tartrate acid and hydrogen peroxide to Co(II)- tartrate with a concomitant evolution of CO2 and O2 respectively. Since the color of the solution is green throughout the reaction, and most of the cobalt is present as Co(III), then the first step (oxidation) is most likely faster than the reduction of Co(III)- complex. This also demonstrates kinetics- the effect of temp or the rate of a chemical reaction. For each 10 °C increase in temp., the reaction rate will approximately double. The reaction was timed at various temps. Suggested temps and their corresponding reaction times are the following; 50 °C- 200 sec; 60 °C- 90 sec; 70 °C- 40 seconds.

Conclusions/Discussion
The two reagents, potassium sodium tartrate and hydrogen peroxide, are involved in a redox reaction. A redox reaction is when electrons are exchanged between molecules, here potassium sodium tartrate loses an electron and hydrogen peroxide gains an electron. The speed of the reaction is slow without a catalyst. To speed up this reaction, cobalt (II) salts was added. This causes the reaction to proceed more readily because the cobalt ion is more reactive than the two reagents.

Summary Statement
How catalysts affect the kinetics of a chemical reaction.

Help Received
Used the lab at Seebach Family Chemistry and Physics lab at Ribet Academy under the supervision of Mr. John Shirajian

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Kyra E. Pretre

Project Number
J0625

Project Title
Harmless or Deadly? Is There Benzene in the Air?

Abstract

Objectives/Goals
The goals of this experiment were testing levels of deadly benzene in commonly used products and raising awareness about products that could be affecting people's health.

Methods/Materials
The products that were tested were oil-based paint, latex paint, beeswax candles, scented candles, liquid wrench penetrating oil, fuel injector cleaner, and Weed B Gon weed killer. A Uniphos Air Sampling Pump and three 12-sets of Uniphos Benzene Gas Detector Tubes were used to sample 200mL of fumes from above the products.

Results
The fuel injector cleaner has the most benzene, an average of 67 parts per million (ppm). The oil-based paint has almost as much, with an average of 50ppm. The liquid wrench was third with an average of 14 ppm. All the other products and the control test, regular air, had 0ppm of benzene. The hypothesis, that the liquid wrench would have the most benzene, was incorrect.

Conclusions/Discussion
People should be aware of amounts of benzene in home products and minimize their usage of these products as much as possible. Perhaps benzene detection methods for home use can be developed in the future and the amount of benzene properly disclosed on the labels of products containing it.

Summary Statement
I tested the amount of benzene in commonly used products to alert people of unknown dangers.

Help Received
Ion Science was very helpful by lending the testing pump and selling the testing tubes that were usually used for businesses. My mom purchased all the materials I needed for my experiment.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Rishi Shah

Project Number
J0626

Project Title
Energy from C(2)H(5)OH / H(2)O(2)

Abstract

Objectives/Goals
To determine if the energy released by ethanol is increased when mixed with various concentrations of hydrogen peroxide: 95% ethanol 5% H2O2 v/v, 90/10 v/v, 85/15 v/v, 80/20 v/v.The control was water. I hypothesized that addition of H2O2 will increase the energy released by the ethanol.

Methods/Materials
The change in the temperature of 50mls of water was measured after it was heated for 60 seconds by the ethanol/ hydrogen peroxide blends. The procedure was repeated 5 times for each of the different samples.

Results
The heat energy transferred by the ethanol / hydrogen peroxide blends to the water was calculated using the Heat Formula: Q = m x c x delta T ,where Q= Energy (J), m= mass of water (g), c= specific heat capacity of water (J/g°C), delta T = change in temperature of the water (°C). The Heat of Combustion (J/mol) = Q/moles ethanol used.
My results are the average heat of combustion for Ethanol/ H2O2 (kJ per mole): 5%: 380.124, 10%: 365.077, 15% : 417.355, 20%: 411.745. Average heat of combustion of Ethanol with control H2O (kJ per mole): 5%: 417.062, 10%: 426.618, 15%: 348.958, 20%: 372.821.

Conclusions/Discussion
My hypothesis was supported at 15% and 20%, but not at 5% and 10%. Lower results at 5% and 10% compared with the control may be because the decomposition of hydrogen peroxide is concentration dependent. Errors due to heat loss were minimized by surrounding the apparatus with polystyrene foams wrapped in several layers of aluminium foil. Also, the heat absorbed by the apparatus was not taken into account in the calculations. Next steps of the project would be to: determine the octane numbers of ethanol with H2O2; investigate if combustion of ethanol with H2O2 is environmentally friendly and the effects it might have on vehicles.
Incorporating H2O2 to the current ethanol and gasoline blends in vehicles can make them more efficient.

Summary Statement
The purpose was to determine if the energy released by ethanol is increased when mixed with hydrogen peroxide.

Help Received
My mom helped me: get materials and supplies; supervised and properly disposed of the hazardous materials; proofreading my report and putting the display board together.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Jada Smith

Project Number
J0627

Project Title
Biodiesel: Heat of Combustion

Abstract

Objectives/Goals
My goal was to compare the heats of combustion of three different fuels I made from peanut oil, olive oil, and canola oil.

Methods/Materials
I used a mini camp stove, water, three different vegetable oils, separating funnel, digital thermometer, digital scale, methanol, sodium hydroxide, steel cans for calorimeter, paper towel and a paper clip to make the wick. I used the sodium hydroxide and methanol to transform the vegetable oil into bio diesel. Next, I used the camp stove to burn the fuel in a homemade calorimeter to calculate the heats of combustion.

Results
Peanut oil fuel's average heat of combustion was 13,774 joules per gram. Fuel from olive oil had an average heat of combustion of 9,939 joules per gram. The Canola oil diesel had an average heat of combustion of 14,022 joules per gram.

Conclusions/Discussion
Although the average heats of combustion for each fuel differed from each other, my experiment was inconclusive. Because my scale only rounded to the nearest gram, I can't be sure that the differences in heats of combustion aren't just due to the imprecision of my scale. Also, some issues with the procedure I used led to the fuel flaring up, so I'm not as confident in the accuracy of my results.

Summary Statement
Because burning fossil fuels increases green house gasses, I wanted to compare the heats of combustion of three renewable biofuels.

Help Received
My sister helped me with the transesterification process. My dad helped me burn the fuel and discussed the scientific terms with me. My dad also helped me make the graphs. My mom proofread my work and helped me set up the board.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Chloë Blue J. Steckart

Project Number

J0628

Project Title

The Degradation of Ascorbic Acid: Effects of Electromagnetic Radiation, Convection, and Time

Abstract

Objectives/Goals

The objective of this project was to determine how Vitamin C in fruit juices is degraded in three conditions: exposure to open air (time), electromagnetic radiation (microwaving), and convection current (stovetop boiling).

Methods/Materials

Four different fruit juices (orange, lemon, lime, and grapefruit) were tested for Vitamin C content using dichloro-indophenol titration methodology. Using a Luer-lock syringe, juice samples across the three conditions were dropped into a .025% indophenol solution (indicator solution), 1/10th of a milliliter at a time, until the color change reached an endpoint. The number of milliliters required to change the solution were determined five times at each level of each condition; averages across the trials were recorded. Conditions included baseline measures, plus daily measures of juice left in open air condition for five days (time); baseline, plus measures after one to five minutes of exposure to microwave radiation (microwave); and one to five minutes of boiling (convection). Comparison to a standard Vitamin C solution was used to calculate milligrams/milliliter of Vitamin C. These data were transformed to milligrams of Vitamin C in an 8-ounce serving for a practical reference.

Results

While the basic hypotheses that time and heat are destructive forces to Vitamin C levels were supported, the magnitude of destruction was about the same for both of the heating conditions. Microwave trials showed slightly more degradation as averaged over juices and conditions. There were differential results among juices with respect to microwave and boiling conditions. Time (open air exposure) proved to be most destructive to Vitamin C content.

Conclusions/Discussion

The implications for these findings suggest that food storage may be a more important consideration for Vitamin C retention than food preparation. Juices should still be kept away from direct heat sources (refrigeration) and definitely sealed in an airtight container to preserve nutrients.

Summary Statement

Heat is less of a destrictive force to Vitamin C than time and exposure, with only minor differences in Vitamin loss between radiation and convection currents.

Help Received

Dr. Norwan Moaleji answered questions regarding concentrations and chemical solutions.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Lachlan K. Signa

Project Number
J0699

Project Title
SFI: Science Fair Investigation

Abstract

Objectives/Goals
How does the concentration of bleach solution affect the effectiveness of the chemiluminescence of luminol on surfaces of varying type and with varying degrees of hydrophobia?

Methods/Materials
Bleach and water solutions of varying mixtures
Chemically Synthetic Blood
Luminol (chemical compound C8H7N3O2)
Sponges
Spray Bottle
Surfaces: Jeans, Clean wood, Concrete block, Vinyl, Tile, Polyester Rug

Results
The effectiveness of the chemiluninescence of the luminol was affected by two factors: the materials and the bleach concentration. The higher the amount of bleach in the distilled water mixture, and the lower the hydrophobia of the material, the more effective the luminol worked to show blood evidence.

Conclusions/Discussion
Higher concentrations of bleach have a negative impact on the effectiveness of luminol universally, regardless of the surface. However, variables in the hydrophobic properties of surfaces do impact the degree of chemilumiscence that can be detected with bleach solutions.

Summary Statement
How does concentration of bleach affect the detection of chemiluminescence of luminol on surfaces with varyiant hydrophobic properties?

Help Received
My mom took photos of me when I was mixing luminol, bleach solution, and spraying surfaces