CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Emmalee M. Barlett

Project Number
S0501

Project Title
MOO...re from Your Milk: Varying Protein Levels

Abstract

Objectives/Goals
The objective was to find out which milk - whole, reduced fat, or fat free - had the highest protein level and determine if the process of skimming does indeed collect all of the proteins in the milk.

Methods/Materials
Materials needed for this project are as follows: different milk types # whole milk, reduced fat milk, and fat free milk; hot plates; spatulas; thermometers; beakers; measuring utensils; scale; and protein-level reading kit. To perform the experiment, first measure out the different milk types and pour into different beakers. Heat milk to start process of forming skim. Time how long each milk sample takes to achieve skim while heating. After heating, remove skim from top of milk samples and, through a series of chemical reactions, record the protein colors and temperatures of the skim and the remaining heated milk.

Results
All of the milks were high in protein before skimming, but after skimming, none of them contained protein. The whole milk had the closest color relationship with the protein reference solution. The hypothesis was proved correct. The average times to skim all milks were all fairly close to each other, being off by only thirty seconds between the three milks. The average skimming temperature was also similar with a range of only six degrees between the three milks.

Conclusions/Discussion
These results prove that the research and hypothesis are correct. Pediatricians agree that infants and growing toddlers need whole milk for its increased protein levels to help grow strong bone structures and digestive systems. Protein levels will vary in all milks depending on butterfat content and methods for processing. Further research might include the differences in protein levels between homogenized and non-homogenized milks and pasteurized and non-pasteurized milks.

Summary Statement
The protein levels in milk differ from milk type to milk type.

Help Received
Used lab equipment at Standard Middle School under the supervision of Mrs. Ana Williams; Mother helped put together board; Dad took pictures

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Jamie K. Blatter

Project Number
S0502

Project Title
Carved Pumpkin Preservation

Abstract

Objectives/Goals

The fun and beauty of carved pumpkins for Halloween can become unpleasant when the pumpkins rot. Rotting occurs because most diseases that cause pumpkins to rot occur when the pumpkin#s protective outer rind is cut. In my experiment, I am testing whether common household products (Lysol Kitchen Cleaner, Armor All Protectant, Comet Bathroom Cleaner, Tilex Mold and Mildew Remover, and Pledge Furniture Polish) can help preserve carved pumpkins. If successful, this may be a simple way to prolong the joy of having carved pumpkins at Halloween time, and to reduce some of the unpleasant clean up involved afterwards. The experiment will compare how each of the products affect the deterioration (rotting) of the pumpkins. I will treat five sets of pumpkins with one product each, and compare the results to an untreated set of pumpkins. I will measure the deterioration every few days for up to two weeks for each different pumpkin to determine which ones stay the best preserved.

Conclusions/Discussion

The point of my experiment was to test whether common household products can help preserve the appearance and physical condition of carved pumpkins. I observed and recorded the deterioration of ninety pumpkins (in six sets of fifteen pumpkins) four times over the course of twelve days. I recorded the data using both qualitative (visual observation) and quantitative (physical measurement) methods. I concluded that pumpkins sprayed with Lysol, Tilex, Armor All, and Comet deteriorate less than the Control (unsprayed pumpkins) and the pumpkins sprayed with Pledge deteriorate more. I validated my conclusions with statistical analysis. The results supported my hypothesis by demonstrating that some common household products designed to fight mold, mildew, and bacteria, can be used as a simple way to help preserve carved pumpkins by delaying the rotting process.

Summary Statement

My project tests if household products can keep a carved pumpkin preserved longer.

Help Received

Mother and Father helped to record observations and make corrections on my paper.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Debra C. Chang

Project Number
S0503

Project Title
Effects of Solution Composition on the Stability of Antibubbles

Abstract

Objectives/Goals
The purpose of this study was to determine the effects of solution compositions on the stability of antibubbles by examining size and lifespan. This project is the result of experimentation of nozzle sizes, polymer additives from varying liquids, and salt concentrations.

Methods/Materials
The stability of antibubbles was determined by means of injecting a liquid mixture of detergent and water into a specified solution, creating a pocket of liquid enclosed by a thin air film. The nozzle size experiment involved changing the diameter size of the jet stream injecting device from 3.0 mm (control), 2.0 mm and 1.2 mm. 10 mL of liquids, namely egg whites, honey and corn syrup, were added to the base solution to determine the effects of varying polymer additives. Lastly, salt concentrations were varied at 0.000945 g/ mL, 0.0025 g/mL, 0.0050 g/mL and 0.010 g/mL to determine their effects on antibubble stability.

Results
Results in the trials revealed that smaller nozzle sizes had lower diameters. The antibubbles from polymer additives also resulted in lower life spans compared to the control group. Lastly, the smallest salt concentration ended with the highest antibubble duration and diameter size.

Conclusions/Discussion
This project indicates that a decrease in nozzle sizes and addition of polymer additives lower durations and diameters. Also, an increase in salt concentration actually decreases the stability of antibubbles. The contributions of this project form a basis for future attempts to understand the mechanisms of antibubble formation and collapse to eventually create micron sized antibubbles for practical uses.

Summary Statement
My study presents the effects of nozzle sizes, polymer additives, and salt concentrations on antibubble stability and contributes towards future research on the practical uses of antibubbles.

Help Received
Borrowed basic lab equipment from Dr. Wenji Chang

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Daniel A. Crowley

Project Number
S0504

Project Title
Maximizing Hydrogen Production through Electrolysis

Abstract

Objectives/Goals
The objective for this project is to maximize hydrogen production using a high output hydrogen production unit.

Methods/Materials
Methods include testining the electrodes, and different factors on a small scall, and then encorparating the results into a final product.The materials include stainless steel electrodes, different levels of salinity, and differnt levels of electricity.

Results
Hydrogen production is maximized, using the highest possible levels of salinity, electricity, and surface area

Conclusions/Discussion
In conclusion, small factors make a big difference in the amount of hydrogen that is produced. There were obvious differences when outside factors were placed on the project. For example a solution with no salt, produced almost no hydrogen gas, while a solution with just one tablespoon of salt produced 3 ml#s a minute. Electricity levels are also imperative to fast production. The amount of hydrogen produced with 2 amps was almost half the amount produced with 6 amps. The biggest factor that was developed into the final product was surface area. Hydrogen production rose at almost the same rate the surface area did. The final conclusion was to build a hydrogen output unit with largest amount of surface area, to ensure maximum production. Then the solution that is used contained a maximum amount of salt. Another design that was incorporated into the unit was the separation of gases. These gases were separated, because of the need to have separated gases in a fuel cell. In order to keep the gases separate, plastic plates were placed in between the plates and a flow space was placed underneath these plates the idea behind the flow space, is the gasses can flow up, and the electricity can flow down. Overall, the maximum hydrogen unit was a success, and the design could be used in future models, and eventually in cars.

Summary Statement
Finding a way to produce the highest levels of hydrogen possible, using electrolysis.

Help Received
Neighbor helped set up display

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Kelsey Daly

Project Number
S0505

Project Title
A Novel Treatment to Increase the "Pop-ability" of Zea mays everta (Popcorn)

Abstract

Objectives/Goals
Cellulose plays an essential role in the "pop-ability" of popcorn. During the popping process the heat inside the kernel increases while cellulose rearranges itself and crystallizes, strengthening the pericap (outer layer of the kernal), and letting the kernel act like a pressure cooker.

Methods/Materials
Research indicated that cellulose is the key to the popping of the kernels, so this project investigated the pre-treatment of kernels with a cellulose suspension. More than 200 baches of popcorn (102 grams each) were weighted out and treated with 10 ml of a 15%, 5%, 2%, or 1% of a cellulose suspension or distilled water. After 25 minutes of presoaking, each batch was popped using an air popper at 177 degrees Celsius.

Results
Each batch was analyzed to determine the number of unpopped kernels (old maids), and the number of kernels ejected from the air popper. Using descriptive statistics, the mean number of old maids and the percentage of old maids was determined.

Conclusions/Discussion
Results show that it was not the water which caused fewer old maids, but the added cellulose. Addition of distilled water hindered popping and addition of cellulose solutions increased it.

Summary Statement
I devised a method to decrease the number of unpopped kernels of popcorn by utilizing a suspension of cellulose, thereby increasing the strength of the pericap.

Help Received
My teacher and brother helped me count the popcorn kernels.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Megan A. Futscher

Project Number
S0506

Project Title
Salt and Ice

Abstract

Objectives/Goals
My goal was to see if the speed at which a salt melts ice is related to the salt's molecular structure.

Methods/Materials
I used three types of salt: Sodium chloride, Potassium chloride, and Magnesium sulfate. I put a small measurement of each of the salts into cups with ice cubes and measured the length of time it took each salt to melt the ice cubes completely. I repeated the experiment 3 times.

Results
Sodium chloride melted the ice the fastest, followed by Potassium chloride. Epsom salt made the ice take longer to melt than the control.

Conclusions/Discussion
The salts with a cubic crystal form (Sodium chloride and Potassium chloride) were close in their melting times, and the salt that had an acicular (needle-like) crystal form took longer than the control to melt the ice. I think that these differences in crystal form have an effect on the speed at which a salt melts ice.

Summary Statement
My project looks at how the structure of a salt effects the speed at which it melts ice.

Help Received
My mother helped me narrow down my topic. I got part of the idea from the internet.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Sirisha Grandhe; Susan Iyican; Guy Rodgers

Project Number

S0507

Project Title

Compact Chemical Scrubbing System for Internal Combustion Engine

Abstract

Objectives/Goals

The objective of this project was to find a way to clean combustion engine emissions. Research indicated that the most efficient way to take the harmful pollutants out of the exhaust gasses was to react them with a solution of aqueous ammonia.

Methods/Materials

Water, aqueous ammonia, and heated aqueous ammonia were used as the solutions to be tested. For each test, the solution was contained in a device made from PVC, which was placed in the exhaust pipe of a leaf-blower engine. In each of the experiments, the engine bubbled exhaust gasses through solution, which was tested before and after to determine its pH, conductivity, and temperature. Three of these tests were conducted using each solution.

Results

The test results showed a drop in alkalinity of the solution to more neutral pH levels, and a decrease in electrical conductivity.

Conclusions/Discussion

This information, supported by further research, was evidence that the exhaust gasses dissolved in the aqueous ammonia, and that the resultant ions reacted to form new, more harmless products. This proved the hypothesis that an aqueous ammonia solution would be an efficient way to filter out the harmful components of combustion engine emissions.

Summary Statement

We built a device that will filter out the hazardous chemical components of internal combustion engine emissions.

Help Received

Used lab equipment from Argo Chemical Inc. under the supervision of Lucas Dobrzanski, M.S. Che.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Nicholas T. Johnson

Project Number
S0508

Project Title
The Effects of Temperature and Type of Container on the Concentration of Dissolved Carbon Dioxide in Soda

Abstract

Objectives/Goals
The purpose of this experiment was to find the effects of temperature and type of storage container on the concentration of dissolved carbon dioxide in soda.

Methods/Materials
The hypothesis was tested by placing a 2 L bottle of soda and a 2.625 L collapsible bag into a refrigerator and a 2 L bottle of soda into room temperature. 500mL samples were removed from the bottles and smaller samples of 30, 60, and 90 mL were taken from the larger sample and put into a small, sealed squirtbottle connected to a pressure sensor. The squirtbottle was shaken until the pressure no longer changed. The sodas were then shaken (to speed their equilibrium) and replaced in their environments. The values were used to create a line whose slope was the concentration of the sample (found through algebra). The process was repeated until the containers were empty and then repeated for multiple trials.

Results
The data supported the hypothesis. The refrigerated bottle easily had more dissolved CO2 than the room temperature bottle (.0919 moles/liter vs. .0598 moles/liter) and finished with slightly more than the room temperature bottle. The collapsible bag (kept in the refrigerator) retained most of its carbonation (73.7 % vs. 23.8 % and 28.7 % for the bottles) despite starting with less (because opening the bottle and transferring the soda caused it to lose carbonation). The overall percent deviation was 7.8%, making the data fairly precise.

Conclusions/Discussion
The bag worked best because its valve didn#t allow the CO2 in the headspace to escape, leaving more pressure above the liquid and more carbon dioxide in the soda. The refrigerated bag started with more dissolved CO2 simply because carbon dioxide is more soluble at lower temperatures.

Summary Statement
The effect of temperature and type of container on the amount of dissolved carbon dioxide (carbonation) in soda

Help Received
Borrowed sensors from my science teacher

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Audrina LeBlanc

Project Number
S0509

Project Title
Aquarium Filtration System

Abstract

Objectives/Goals
The first step in doing my science project was researching a potential idea to experiment with. Once I came up with the question "Which type of filtration system works best in an aquarium?" I researched it fully. Then, I interviewed some workers and teachers to get further information on my topic. After that, I got ready to start testing, so I had to gather some materials. Then, once I has all my materials I needed, I set up the tanks and the other supplies. I waited three days for the tempertures of the water to set before I started testing. Finally, the day came when I started testing and I tested in the morning and in the afternoon. I also took observations, wrote down my data, and wrote down what I did in a daily log. I did this everyday for exactley three weeks. When I was finally done testing, I did some calculations and then I came up with an answer to my question. When I actually got results my results I found that my hypothesis was correct. The filtration system that worked best in an aquarium was the chemical filtration system. The system that came in second was the mechanical filtration system, and the biological filtration system, and the biological filtration system came in third.

Summary Statement
I tested three different types of filtrations systems to see what would work better in an aquarium.

Help Received
A worker at petco named Jesus Garcia helped me get my ideas of how to test the filtration systems.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Richard J. Li

Project Number
S0510

Project Title
Biodegradable Nanoparticles: A Novel Approach to Chemotherapy

Abstract

Objectives/Goals
This study explored one of the potential applications of cutting-edge nanotechnology in medicine, aiming to develop an anticancer drug delivery system using biodegradable nanoparticles, to optimize the formation process, and to incorporate the anticancer drug, doxorubicin, into the created system.

Methods/Materials
The nanoparticles were formed by mixing solutions of protamine and dextran sulfate with zinc sulfate as a cross-linking agent. Effects of polymer ratio (1:1-1:4, w/w), agitation speed (325-2500 rpm), pH (pH 5-7.5), temperature (3-40 deg. C), on nanoparticle formation were evaluated. Doxorubicin was loaded into the nanoparticles. The nanoparticles were characterized by zeta potential, size, polydispersity index, and nanoparticle counts.

Results
Nanoparticle formation was found to be pH-dependent with an optimum pH of 7.
An ANOVA statistical analysis showed that nanoparticles formed at neutral pH had significantly higher nanoparticle densities than those formed at acidic pH. More nanoparticles were formed at 1000 RPM than at other speeds. Nanoparticles at room temperature displayed a higher uniformity than those at other temperatures. The optimal conditions for formation of protamine-dextran sulfate nanoparticles were polymer ratio 1:1 (w/w), pH 7, stirring speed of 1000 RPM, and room temperature. The nanoparticles were within a size range of 100-250 nm, an adequate size for drug delivery purposes. Doxorubicin, an anticancer drug, could be loaded into the nanoparticles. Loaded particles displayed a size of 30-180 nm with negative zeta potential.

Conclusions/Discussion
A novel biodegradable nanoparticle delivery system for chemotherapy was developed using ionic interactions between positively-charged protamine and negatively-charged dextran sulfate. This nanoparticle delivery system has two major advantages over drug delivery systems previously reported in the literature. It uses biodegradable, naturally-occurring polymers and simplifies the nanoparticle preparation process by using the charge interactions principle. This system could potentially be used to sustain the release of doxorubicin and reduce toxic side effects in the body.

Summary Statement
A biodegradable nanoparticle drug delivery system, potentially useful in chemotherapy, was developed and characterized.

Help Received
I used lab equipment at the labs of Dr. Xiaoling Li, Dr. Bhaskara Jasti, and Dr. Guo at the University of Pacific under the supervision of Dr. Ravichandrian Malihingan.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Smita Mascharak

Project Number
S0511

Project Title
Identification of the Determinants of Antimalarial Drug Action

Abstract

Objectives/Goals
1) Identify which structural features of quinoline-based antimalarials prevent heme polymerization (therefore killing the malaria parasite Plasmodium with free heme inside the cell)
2) Find out whether such features can be systematically assembled in a molecule (and employed as possible antimalarials).

Methods/Materials
First, conditions were established that allowed heme polymerization studies in a non-enzymatic manner. The capacity to deter heme polymerization of several known antimalarials (like quinine and chloroquine) and chemicals with similar structures was assesed. Typically, ~50 mg of hemin was heated with ~10 mg of drug in 5M Na-acetate buffer (pH 7) at 70 degC for 60 min. The resulting product was filtered, washed, dried and identified by infrared spectroscopy (bands at ~1660 and 1210 cm-1 indicated presence of heme polymer: beta-hematin). Through these experiments, three structural features that appeared responsible for the prevention of heme polymerization were identified. Next, two analogues with and without these structural features were synthesized via standard peptide synthesis protocol. The analogues were identified by Nuclear Magnetic Resonance Spectroscopy and employed in heme polymerization reactions.

Results
The results clearly indicated that the specified structural features (a ring nitrogen, a long carbon chain with a positively charged terminus at the 4 position with respect to N) are indeed critical for the suppression of heme polymerization.

Conclusions/Discussion
The design of new antimalarials to combat Plasmodium resistant to commonly used drugs could use these features. This approach eliminates the need to search for novel natural products.

Summary Statement
My project identifies which chemical structures in common antimalarials are most essential for their drug action.

Help Received
Alegra Eroy-Reveles supervised me in the lab and helped me in data handling. Dr. Raman Afshar provided help in plotting the NMR spectra. Mike Rose superivised the synthesis of the 2 analogues. Finally, Dr. Pradip Mascharak helped in obtaining materials and in background research,

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Meenakshi T. Mukherjee

Project Number
S0512

Project Title
Comparison of Turmeric and Curcumin: The Effect on Metal Ions

Abstract

Objectives/Goals
Turmeric, a household spice, is thought to help in Alzheimer"s Disease (AD). Plaques are formed in the brain that causes AD. Turmeric (and curcumin, which is 70% component in turmeric) may reduce these plaques by directly removing them, or by reducing their formation. To form these plaques metal ions are needed. My question was to investigate the difference in how metal ions complex with turmeric and curcumin.

Methods/Materials
MATERIALS: Turmeric, Curcumin, zinc acetate, copper (II) acetate, iron (II) acetate, manganese (II) acetate, ethyl alcohol, Vials, Spatula, Analytical balance, Water Bath, TLC sheets, Parafilm, Centrifuge.
METHODS: Turmeric, curcumin, and metal ion salts were dissolved in ethyl alcohol. The metal ion solutions were added to turmeric and curcumin solutions. All 16 different mixtures were then put into the water bath at 37 oC. The complexes were isolated, washed and dried and used for analysis. I had two variables: 1) different metal ions 2) different concentrations of turmeric or curcumin. The sample size was 8 for turmeric and 8 for curcumin. Isolated complexes were weighed to calculate the yield of the complexes and analyzed using electrospray mass spectrometry for molecular weight.

Results
Curcumin (MW=368) showed a clean mass peak at 390 (M+Na-H), whereas turmeric mass spectrum showed other components as well such as curcumin II (360), and sodiumcuruminate (412). The mass spectra of curcumin to metal ions showed clear peaks of all metal complexes. In the turmeric-iron mass spectra there are some traces that could be a complex with iron and curucuminoids.
In the majority of the turmeric mass spectrum there are high traces of curcumin (390), curcumin II (360), and sodiumcuruminate (412). There are other components of turmeric that were not seen in the mass spectra. This could be due to the fact that when dissolving the turmeric there was some difficulty. In the curcumin 2:1 mixture, mass spectrum revealed 2:1 complexes actually are effective.

Conclusions/Discussion
The effect of curcumin on metal ions vs. the effect of turmeric on metal ions is very different. While the curcumin and metal ion mixtures formed #beautiful# complexes the turmeric and metal ion mixtures were less definable and were harder to decode. This may have been because of interference from other components in turmeric such as curcumin, curcumin II, curcumin III, sodiumcurcuminate, ar-turmerone, etc.

Summary Statement
Turmeric and curcumin form metal-ion complexes but are not identical in nature.

Help Received
Used lab equipment at University of California-Irvine.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Anthony T. Nguyen

Project Number

S0513

Project Title

A New Quantum Mechanical Approach in Determining the Octanol Water Partition Coefficients of Organic Aromatic Compounds

Abstract

Objectives/Goals

The octanol-water partition coefficient (Kow) measures a solute's distribution between competing organic and aqueous phases, determining its environmental fate and safety. Current experimental methods to determine Kow are subject to human error and require many resources. How can quantum computational modeling be used to determine the Kow of organic aromatic compounds? The objective is to develop a new efficient and practical method to predict Kow.

Methods/Materials

The calculations were run with the Gaussian 98 program. The project considers two organic families, chlorophenol and chlorobenzene. Four probes molecules simulate the aqueous and organic phase. A water molecule represents immersion in water. Argon, neon, and benzene represent the organic phase because octanol itself is too large and inefficient. First, I optimized the geometry and vibrational frequencies of all molecules. Second, I added a probe molecule above the center of the ring. Next, I calculated the zero-point energy of the complex using the counterpoise method. Finally, I plotted the various energy parameters versus experimental logKow and assessed the strength of linear correlation. The procedures are repeated for different probe molecules, probe distances, and molecular geometries.

Results

There is a moderately strong linear correlation between logKow and Electron Correlation energy, or pure dispersion forces, of the octanol probe-solute complex ($r^2=0.95$). Stronger correlations were found between logKow and the Hartree-Fock energy, or pure dipole-dipole interactions of the water-solute complex ($r^2=0.98$). Finally, the strongest linear correlations were found when plotting logKow with the difference of the dispersion and electrostatic contributions ($r^2=0.99$). The strengths of the linear correlations are statistically acceptable for the extrapolation of logKow of similar compounds.

Conclusions/Discussion

The results confirm that Kow can be derived from computational methods. Also, the logKow of four chlorophenol congeners were predicted from the linear correlations. Because the water probe correlations are strong enough, dipole-dipole interactions can be used solely to predict Kow. Overall, the project successfully validated a new method to determine Kow, which can be applied to other organic compounds with limited experimental data. The computational approach saves many resources and diminishes the chance of human error.

Summary Statement

A new computational method is developed to accurately predict the octanol-water partition coefficient (Kow) of organic pollutants, and is subsequently used to predict the Kow of 4 chlorophenol congeners with uncertain experimental data.

Help Received

Dr. Fu-Ming Tao of California State University, Fullerton mentored the research project and provided the computational facilities; family helped assemble presentational materials.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Aurora L. Ostrom

Project Number
S0514

Project Title
How Much Food Coloring Is in Soda Pop and Kool-Aid?

Abstract

Objectives/Goals
The goal of this project was to spectrophotometrically determine how much food coloring is in soda pop and Kool-Aid.

Methods/Materials
A Cary 5E spectrophotometer was used to measure the absorbance of visible light through colored solutions. First, the wavelength of maximum absorbance was determined for red, yellow, and blue food coloring. Second, solutions with increasing concentrations of food coloring were prepared for each color. Next, the absorbances were measured to generate a calibration curve. Finally, the absorbance of different flavors of Kool-Aid and soda pop were measured and the concentration of food coloring was determined from the calibration curves.

Results
The results showed that very little food coloring is actually in soda pop and Kool-Aid. The spectra show that when you make a solution purple there is blue and red food coloring in it. This is also true when making something green or orange. To make a green color you need yellow and blue, and for orange you need yellow and red. The results also showed that there is more food coloring in soda pop than Kool-Aid.

Summary Statement
This project uses light absorbance to determine the concentration of food coloring in various samples of Kool-Aid and soda pop.

Help Received
Father gave tutorial on the spectrophotometer & concepts researched in this project, and completed this application. Used lab equipment in the research department of the Naval Base at China Lake.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Will G. Pritchett

Project Number
S0515

Project Title
How Do You Make the Fluffiest Pancake?

Abstract

Objectives/Goals
The objective is to determine which combination of ingredients results in the pancake with the lowest density.

Methods/Materials
Four experiments were performed. In three of the experiments, amounts of baking powder, baking soda, and milk were tested as independent variables. In the fourth experiment, three different types of flour were tested. In total, 15 recipes and 54 pancakes were tested.

Results
The pancakes made with 2 teaspoons of baking powder were determined to have the lowest densities.

Conclusions/Discussion
Changing flour and milk had little effect on density, but it was found that increasing the amounts of baking soda and baking powder clearly decreased the density of the pancakes. This is the way to make fluffier pancakes.

Summary Statement
This project analyzes the effect of changing ingredients on the density or fluffiness of pancakes.

Help Received
Used mother's kitchen; Used a triple-beam balance loaned from the school science department; Father helped monitor cooking times.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Nitya Rajeshuni

Project Number
S0516

Project Title
Antacids in Action!

Abstract

Objectives/Goals
The purpose of this experiment was to determine whether name brand antacids or generic brand antacids are better for consumers in relationship to cost and efficiency. I hypothesized that name brands would be better for consumers because they are recommended by doctors, they are the complete focus of the corporation, and they are more expensive.

Methods/Materials
The name brands tested were Tums and Rolaids and the generic brands tested were Equaline (Albertsons), Safeway (Pavilions), and Kroger (Ralphs). The main ingredient in each of these antacids was calcium carbonate (CaCO3). In reverse titration, I added excess acid to the antacid, so part of the .200 hydrochloric acid (HCl) was neutralized by the antacid. I then titrated the solution against 0.192 sodium hydroxide base (NaOH) to neutralize the remaining acid. Using the amount of NaOH taken before the endpoint was reached and the weight of each tablet, I was able to calculate the efficiency (moles/gram) of each antacid per tablet.

Results
Out of the five antacids tested, Rolaids was the most efficient, and Tums was the least efficient. In between these two, the order of efficiency was Kroger, Equaline, and Safeway. In relationship to cost, Tums was the most expensive and Safeway was the least expensive. Rolaids was more expensive than both Kroger and Equaline, which cost the same price.

Conclusions/Discussion
My hypothesis proved incorrect. Although Rolaids was the most efficient, it was too costly; therefore, out of the five antacids tested, Kroger is the best antacid to purchase. It was the second most efficient, and after Safeway, it was the least expensive. Equaline and Safeway had proportionately the same efficiency and cost, whereas Tums was extremely expensive and inefficient. Thus, the generic brands were better for consumers than the name brands. These data suggest that consumers must be careful when buying medications such as antacids, for the most famous and expensive are not necessarily the most efficient.

Summary Statement
My project was to determine whether name brand antacids are more efficent than generic brands in relationship to cost and efficiency.

Help Received
Used lab equipment of Pasadena City College under supervision of Dr. Padma Gani (for safety reasons), who did not assist in the actual project.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Robert A. Ray

Project Number
S0517

Project Title
The Effect of Temperature on the Affinity of Carbon Dioxide to Molecular Sieve 4A

Abstract

Objectives/Goals
The purpose of my experiment is to find the optimum temperature for absorbing CO2 in molecular sieve 4A.

Methods/Materials
I first heat up my column to the test temperature. Then, I take a sample of 10% CO2 and 90% air with my input gas syringe. I then push this air through my column until there is no space left in the syringe. I simultaneously fill up the output syringe, #syringe 2,# to the same level that syringe 1 was at after filling it with air. I then heat up my oven to the maximum temperature and take a gas chromatograph sample of syringe 2. I then open the valves leading to the peristaltic pump and pump the gas in the column into syringe 3. I then take a sample of this gas and run it three times through my gas chromatograph.

Results
The data for sample 1 showed that the average percent in relation to the amount of air desorbed is 69.7% CO2 at 50°C. The data for sample 2 showed that the average percent of CO2 in the desorbed air is 74.6% CO2 at 100°C. The data for sample 3 showed that the average percent of CO2 in the desorbed air is 62.1% CO2 at 150°C. The data for sample 4 showed that the average percent of CO2 in the desorbed air is 64.4% CO2 at 200°C.

Conclusions/Discussion
I can conclude that the optimum temperature for carbon dioxide absorption into molecular sieve 4A with minimal absorption of air is around 100°C. My Student#s t-Tests show that there is a significant difference between the data of each sample.

Summary Statement
My project is about helping the problem of global warming by filtering CO2 from the atmosphere.

Help Received
My dad supervised my setting up of a high pressure helium system and gas chromatograph use.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
David P. Shelton

Project Number
S0518

Project Title
Electrocleaning... Zap!

Abstract

Objectives/Goals
I was trying to find out if I could clean a coin preparatory to electroplating by electrocleaning only, and, if so, which of three methods works the best. The methods I tested were electrocleaning in a hot lye bath, in a recommended basic mixture, and anodizing. My hypothesis was that anodizing would work best.

Methods/Materials
I took three sets of five pennies and cleaned each set with a different method. Then I took out of each set the pennies that looked clean enough for plating. I attempted to plate these as the ultimate test of cleanness.

Results
Of the pennies cleaned in the lye only 2 were cleaned and plated. From the basic mixture two pennies also were cleaned and plated. One of these pennies plated the best of all the pennies. All of the pennies that were anodized came out looking worse than they did before cleaning.

Conclusions/Discussion
I concluded that it is not practical to prepare coins for electroplating by electrocleaning only unless the coin is already relatively clean. The results do not support my hypothesis that anodizing would be the best, in fact anodizing failed to work at all.

Summary Statement
I am trying to find a short,effective way to clean coins before electroplating them.

Help Received
Mother typed report from dictation, used lab equipment at school, teacher mixed sulfuric acid solution

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Yu Sun

Project Number
S0519

Project Title
An Alternative Source of Energy: Can Sawdust Be Catalyzed into Fuel?

Abstract

Objectives/Goals
The objective of this project is to create an environmentally friendly source of renewable energy. The goal is to turn discarded sawdust, which is 42% cellulose by mass, into a bio-fuel with structures and properties similar to gasoline.

Methods/Materials
The experiment was divided into two parts: A and B. First, through acid hydrolysis [using different acids: HCl, HBr and H(2)SO(4)], the cellulose was hydrolyzed and transformed into glucose. Experiments were neutralized with NaOH. The remaining sawdust was separated from the glucose solution using a vacuum and funnel filter. In part B, the glucose solution was treated with ZSM-5 catalyst [Mn3024]. With catalytic activity and high temperatures of 350C, the reaction between the glucose and the ZSM-5 catalyst was carried out in a parr bomb. The products were then analyzed by Gas Chromatography/Mass Spectrography.

Results
Products contained carbon chains in the range of 1-5, and all contained oxygen contaminants. Even though gasoline-like fuel was not produced, other valuable products such as Butyrolactone and Methoxytetrahydrofuran were found.

Conclusions/Discussion
The oxygen atoms are all parts of hydroxyl groups and were not removed to become H(2)O due to the lack of proton donation. In future experiments, experiments will be carried out in a similar fashion except with a source of proton donation to hydrolyze the hydroxyl groups.

Butyrolactone have a wide variety of uses including roles in plant growth regulators and pharmaceuticals. The Methoxytetrahydrofuran class of products is currently being researched to replace MTBE, which is a fuel additive. MTBE is a possible carcinogen and pollutes our underground drinking water.

Summary Statement
To find an alternative source of energy via turning discarded sawdust into a gasoline like fuel through acid hydrolysis, catalytic activity, and high temperatures.

Help Received
Dr. Eric McFarland, professor of Chemical Engineering at UCSB, provided me with a lab and equipment. Dr. Shouli Sun and Dr. Mike Wrysta, senior scientists of GRT Inc. supervised my experiments.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Kelly C. Tang

Project Number

S0520

Project Title

Optimal Chromatography Conditions and Antioxidant Activity in Blackberries

Abstract

Objectives/Goals

The experimental objective is to determine the optimal chromatography conditions for separating flavanoids in blackberries so that spectral analyses and an antioxidant activity assay can be performed. The project objective is to ultimately compile a collection of labs, procedures, and experiments for students of different education levels so that they can learn about multiple aspects of chromatography that are not discussed in current chromatography labs and be educated on nutritional aspects of foods in particular antioxidant activity in blackberries.

Methods/Materials

Using three common classroom methods (paper, thin layer, and column), blackberry extract prepared and extracted using various solvents, multiple trials were conducted under regulated conditions. The chromatograms were compared to each other using the Rf (Retention Factor) value. The separated flavanoids were then eluted off of the stationary phase back into solution to perform the spectral analyses and iron-reducing Ferrozine assay.

Results

Paper chromatography using a 20% methanol-water solution and blackberries extracted in acetone yielded the best results of the common classroom solvents tested. Column chromatography was too cumbersome to set up efficiently in the classroom and did not yield sufficient separation for further analyses. Thin layer chromatography did not provide the distinct separation that the paper did. The ferrozine assay colormetrically showed that the purple flavanoid in blackberries gave the most antioxidant activity. The spectral analyses showed that the brown flavanoid provided the absorbance at visible range and the purple flavanoid provided the absorbance at the near ultraviolet/visible range.

Conclusions/Discussion

My results are one of the many steps that will be going into achieving my ultimate objective because in completing these trials using the several methods, several procedures and labs were developed as well as extensive research that can be organized into hands-on, educational activities. This project is important to the academic community because school is where most young scientists develop their inspiration and hands-on work in the classroom on labs that teach multiple aspects of chemistry and health provide students with a diverse medley of skills and knowledge.

Summary Statement

Using common classroom chromatography methods and materials, optimize chromatography conditions so that a compilation of educational labs and materials using a variety of analytical methods can be developed for the academic community.

Help Received

Pauline Lee, PhD from the Scripps Research Institute (helped centrifuge extracts)

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Nilesh Tripuraneni

Project Number

S0521

Project Title

A Novel Nanocrystalline Chlorophyll-Based Photoelectrochemical Cell:H2 Production via the Light-Driven Redox of Seawater

Abstract

Objectives/Goals

Hydrogen, a clean-burning fuel, has the potential to replace fossil fuels as the worlds# primary energy storage medium thus eliminating pollution and global warming. Current hydrogen generation systems have been unable to attain an effective balance of cost and efficiency. My aim was to develop a novel photoelectrochemical cell to cheaply and more efficiently produce hydrogen. The cell design, electron transfer mechanism, was modeled after nature#s PS I and PS II photosystems. In fact chlorophyll, designed by nature to photo-oxidize water intracellularly, was utilized as the primary light harvesting and redox molecule.

Methods/Materials

To serve as the electron transfer and reduction mechanism I formulated a procedure to coat a transparent, heat-resistant ceramic composite with conductive SnO2 glass successfully lowering the resistance to 3-5 ohms. Subsequently a TiO2 colloid was fused to the conductive glass in order to create a nanostructured TiO2 matrix. This allowed a large surface area for chlorophyll adsorption and serve as a suitable structural anchor for the chlorophyll. An orange leaf-acetone extraction produced the chlorophyll which was adsorbed to the TiO2 films. In order to determine the efficiency of the assembled photoelectrochemical cell, current and voltage were measured by the photoelectrolysis of seawater, in addition to capturing hydrogen gas via a self-built gas capture system. This was then coupled with free energy calculations and incident light intensity measurements to determine the efficiency of the cell.

Results

The data analysis revealed that the chlorophyll-based redox reaction yielded an average calculated efficiency of 17.9 % derived from eight H2 gas capture samples. Current-voltage measurements of 15 samples generated a maximum photocurrent of 1.10 mA with a maximum photovoltage of 0.541 V. Overall the highest observed solar-to-hydrogen efficiency was a respectable 0.875 %. In fact the chlorophyll-enhanced electrodes produced over 30 times the photovoltage of the TiO2 film controls.

Conclusions/Discussion

In essence, my results showed that the chlorophyll-based system produced hydrogen efficiently compared to the controls. I was able to demonstrate in a novel, self-constructed, photoelectrochemical cell (that mimics nature) that chlorophyll can be harnessed to photo-oxidize water for hydrogen production.

Summary Statement

A new chlorophyll-enhanced Ti(O)2 cermaic electrode modeled after photosynthesis was developed and successfully tested to determine its efficiency in hydrogen production by the photoelectrolysis of seawater.

Help Received

Parents helped assemble board, Mr. Figueroa and Mr. Garabedian provided equipment, Used lab equipment at California State University Fresno in Dr. Zhang lab. Creative Materials and DeGussa provided free materials

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Tadeh Vartanian

Project Number
S0522

Project Title
Voltage of a Tin-Copper Galvanic Cell as a Function of Temperature

Abstract

Objectives/Goals
To study the relationship between the voltage output of a tin-copper cell and the temperature of the two solutions. From this, values such as change in entropy and enthalpy can be determined

Methods/Materials
I first heat up each individual tin(II) chloride and copper(II) chloride solution to a certain temperature. I then pour them into a pourous vase cell with copper and tin plates, salt vase, and electrodes in place. The voltage is measured, and the solutions are dumped out. This is done for various temperatures, and many trials, or cycles, are performed for accurate results.

Results
A positive correlation exists between temperature and voltage. Changes in enthalpy and entropy are calculated, and they are compared to expected values.

Conclusions/Discussion
The differences between expected and calculated values are fairly close, and the experiment went fairly well. Sources of error do exist, but overall the results were quite accurate.

Summary Statement
What is the relationship between voltage and temperature, and how does this affect electric appliances?

Help Received
Father helped with experimentation, revised report, and provided materials; Chemistry teacher provided materials and reference books.