CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Reem N. Awad

Project Number

J0601

Project Title

Saving the Oceans from Oil Spills: pH Edition

Abstract

Objectives/Goals

These days, people are using methods that clean oil out of the ocean fast but cause more harm than good to the environment. Today, there is a huge problem with the ocean's acidification. So this project was made to test the effect of oil spills on the acidity of ocean water and which method would affect the pH levels the least and retain the most oil to reuse.

Methods/Materials

Samples of ocean water and sand were collected and split into 11 different buckets. The pH was measured on the bottom right, left, and middle of each bucket before adding oil to the ocean water, after adding oil to the water, after 24 hours of the oil sitting in the water, after cleaning the oil, and 24 hours after cleaning the oil. There were three cleaning methods used: scooping the oil out manually with a spoon, adding Eco-friendly soap then scooping the out oil, and absorbing the oil from the surface with a reused, clean rag. Water and water and oil alone without cleaning were measured as a control factor throughout a number of days.

Results

None of the methods immensely changed the pH levels, but the scooping method changed the pH the least by an average of a 0.13 difference from the beginning until the end and retained the second most oil. When applying the Eco-friendly soap, it did not change the acidity much with a difference of -0.21 and retained the most oil. Lastly, the absorbing technique was the least efficient in both ways.

Conclusions/Discussion

The top method was scooping the oil, but the acidity changed by a very small amount. The absorbing approach was the least Eco-friendly, but coincidentally took the least amount of time. Even though the finest ways take a little more time and effort, it is a must for humanity to start working to help our planet. Although the scoping method did not retain the highest amount of oil, it is recommended to use this method more to reduce the acidification problems of the oceans.

Summary Statement

This project tests the effect of oil spills on the ocean's pH levels, which of three methods affect the acidity of the ocean water the least, and retains the most amount of oil to reuse.

Help Received

Mrs. Arwa Alkhawaja

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Kalin S. Baca

Project Number

J0602

Project Title

Enzyme, Break It Down! How Does Temperature Affect the Rate of Reaction of Catalase?

Abstract

Objectives/Goals

The goal of my project is to test the optimal temperature conditions for catalase activity.Since the human body's internal temperature is normally 37C, I hypothesized that catalase will breakdown hydrogen peroxide at an optimal range temperature range of 35-40C.

Methods/Materials

I extracted catalase from potatoes and indirectly measured its activity when exposed to hydrogen peroxide of different temperatures.To measure enzyme activity,I saturated filter paper with catalase solution and exposed it to hydrogen peroxide in a beaker. Intially,the filter paper sunk to the bottom of the beaker.As catalase broke down hydrogen peroxide to water and oxygen, the filter paper rose to the surface. I recorded the amount of time it took for the paper to sink and rise to the surface and used this time as an indirect measurement of catalase activity. I used the basis of this protocol from an online source,sciencebuddies.org. I modified the protocol for more rigorous testing,for example,I used a pipette to measure the amount of catalase in the paper.Some materials used include: scale,thermometer,beakers,flasks,P1000 pipette with tips,forceps,distilled water,potatos,3%Hydrogen Peroxide,filter paper, ice.

Results

Results of the experiment show that catalase had a shorter reaction time when its substrate's temperature was well above body temperature.The shortest average reaction time of 6.17sec was observed at hydrogen peroxide at 55C. The longest average reaction time of 35.92sec was observed at hydrogen peroxide at 3C.

Conclusions/Discussion

Results indicate that catalase reactivity is directly related to the temperature of hydrogen peroxide. However, there is a limit to how much heat catalase can be exposed to before it is denatured. At 60C, there was no observed activity, indicating that catalase is denatured. Results show a 6-fold increase in reaction time when catalase is exposed to hydrogen peroxide from 3-55C. That's an observed reaction time that is close to 600% times faster!

Summary Statement

I investigated the role of temperature to enzymatic activity.

Help Received

I performed the experiment myself. I modified the protocol of this experiment from sciencebuddies.org. I got help with experimental design, plotting of graphs on Word, proofreading of final report from Miriam Baca.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Anysia M. Callejo

Project Number
J0603

Project Title
The Surface Tension of Different Liquid Types

Abstract

Objectives/Goals
Surface tension strength really depends on many factors, not just electrical attractivity, adhesion, and cohesion. The chemicals and other molecules that may be within the liquid greatly affect the surface tension. The electrical attractivity can affect the strength between each of the molecules within a liquid, adhesion causes for these molecules to be more attracted to other surrounding molecules, and the cohesive forces cause for the molecules to be attracted and bond with the molecules within the liquid.
I will be testing how surface tension differs within the type of liquids. These liquids are to be categorized as ionic, polar, or nonpolar liquids. Each of these liquids has intermolecular forces that allow for surface tension to occur. The ionic, polar, or nonpolar bonds affect the strength of the intermolecular forces in the liquids and the electrical attraction between each of the atoms within the molecules. The surface tension of these different types will be tested to see which type of liquid is the strongest.

Methods/Materials
For my single-beam balance, I used a wooden board, thread, felt pads, 2 pieces of wood, 1 nut, a paperclip, tin can, 2 hooks, hot glue, and nails. Other materials were play-doh, AWS-100 Digital Scale, latex gloves, rice, 2 small containers, distilled water, vegetable oil, and bleach.

Results
My experiment resulted with bleach being the weakest, oil being the second strongest, and water being the strongest. The first round resulted with 1.94 grams for water, 1.43 grams for bleach, and 1.71 grams for oil. The second round ended with 2.25 grams for water, 0.91 grams for bleach, and 1.46 grams for oil. The third round ended with 2.38 grams for water, 1.06 grams for bleach, and 1.12 grams for oil.

Conclusions/Discussion
My project had unexpected results. The bleach was the ionic liquid but somehow ended up being the weakest. This is when I realized that it the type of bleach I used had affected my results. I had used "Splashless Bleach" and the other chemicals in it had changed the outcome. However, this just goes to show how other chemicals change the surface tension and behavior of the previous liquid.
My project can help others understand the science behind liquids and why they behave in the way they do. It shows how the structure, electrical attractivity, and other intermolecular forces affect the behavior of liquids.

Summary Statement
My project shows how surface tension changes with the different types of liquids, and the specific characteristics that account for their behaviors and the surface tensions.

Help Received
David Olvera had helped me with understanding surface tension. We had done labs to test measure the electrical conductivity of ionic liquids and molecular compounds. This made me take into consideration how electrical conductivity and attraction came into play.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Woori Choi

Project Number
J0604

Project Title
The Relationship between Conductivity and Temperature

Abstract

Objectives/Goals
My Objective of this study is to see the relationship between conductivity and temperature.

Methods/Materials
I used an AC power source which stands for alternative current, 2 multimeters, a thermometer, an electrical stirrer/hot plate, Volumetric flasks and beakers. I boiled the half molar solutions; CuSO## and Zn(NO#y)#ü. As the temperature goes up, I measured the Ampere (#E). I used copper for the CuSO## solution and graphite for Zn (NO#y)#ü solution as electrodes.

Results
I did 6 trials for both solutions and I found out as the temperature increases, the resistivity decreases and the electrical current increases. Also, I found out that the solution of Zn (NO#y)#ü carries more electrical current than the solution of CuSO##.

Conclusions/Discussion
In my first experiment with the CuSO## solution, I had a little problem. For example, there is missing data for the first three experiments. I fixed it and tried a new solution out of Zn (NO#y)#ü and using a new electrode called graphite (type of carbon). Also, I cleaned the rings that are oxidized and the electrolytes. Keeping the distance of the two electrodes helps improve my experiment. These modification helped me get better data.
As the temperature goes up, the conductivity increases, too. That is because as the temperature goes up, the ions¡# energy increases and become more active so the electrical current goes up as well.

Summary Statement
As the temperature goes up, the conductivity increases, too. That is because as the temperature goes up, the ions¡# energy increases and become more active so the electrical current goes up as well.

Help Received
My science teacher explained me about electrolytes and how to deal whith chemicals.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Omid Kevin Daliri; Ivor Benjamin Myers

Project Number

J0605

Project Title

What Is the Extent of Iron and Copper Corrosion In Different Saltwater and Acidic Solutions?

Abstract

Objectives/Goals

Our project was about testing and finding the total amount of corrosion accumulated on iron and copper in different possible solutions. We experimented to find the extent of corrosion of the two metals in different saltwater and acidic solutions.

Methods/Materials

Six blocks of iron, six blocks of copper, labeled solutions (100% distilled water, 965 mL distilled water with 35 grams of salt, 900 mL distilled water with 100 grams of salt, 900 mL distilled water with 100 mL of vinegar, 500 mL distilled water with 500 mL of vinegar, and 100% vinegar), scale, salt, vinegar, distilled water. We left the metals in the water, checking regularly, for 3 weeks. At the end of 3 weeks we massed and photographed the metals.

Results

The masses of iron in the 100% distilled water and 3.5% salt solutions both increased by one gram. The iron in the 10% salt, 10%, 50%, and 100% vinegar solutions stayed constant.

The mass of the copper in the 100% distilled water solution increased by 1 gram. The copper in the 50% vinegar solution decreased by 1 gram. The copper in the 3.5% salt, 10% and 100% vinegar solutions stayed constant.

Our photos show that both iron and copper had a significant amount of change visually. The iron 100% Water, 3.5% Salt, and 10% salt solutions were covered in the pastel-orange color of rust. Iron in the 100% water had the most visible corrosion. The iron in the vinegar solutions became darker. The levels of gray deepened as the vinegar percentage increased. The copper 3.5% and 10% salt solutions covered the metals in a green patina. But the copper 3.5% salt was more covered than the 10% salt. The 50% and 100% vinegar solutions affected the copper similarly to the iron, turning the copper into an almost black color. The 10% vinegar solution, only caused edges to change colors.

Conclusions/Discussion

Our hypothesis was that the solutions with the highest percentage of vinegar and salt mixed in would have the most corrosion, the vinegar would cause the highest amount of corrosion overall, and between iron and copper, iron would be corroded the greatest in all solutions. Our hypothesis seems to be incorrect and inconclusive. We found that we had two ways of analyzing our data; visually and the recorded masses. Each metal was affected differently and the vinegar and salt solutions were affected the metals differently, so we were unable to compare the data against each other.

Summary Statement

Our test showed that different metals are affected differently by corrosion, and that acidic and saltwater solutions also affect the extent of corrosion and dissimilar metals differently.

Help Received

We received no help. We designed, executed, and analyzed our data by ourselves.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Yo-Jin J. Dittrich-Tilton

Project Number
J0606

Project Title
Surface Tension of Different Liquids

Abstract

Objectives/Goals
An experiment is conducted to measure the surface tension of four different liquids, specifically: water, cooking oil, isopropanol (rubbing alcohol), and a solution of dish soap in water. Which one will have the highest and which one will have the lowest surface tension? My hypothesis is that water will have the highest surface tension, followed by soapy water, isopropanol, and lastly cooking oil, based on the degree of hydrogen bonding in each liquid.

Methods/Materials
A weight balance is used to measure the force required to lift a needle off the surface of each liquid. To construct the balance, a fulcrum is drilled into the center of a beam, that is then placed on two supports. A needle is tied on one end of the beam with string, and a cup is tied on the other. The needle is placed horizontally on top of each liquid, and small weights are placed inside the cup until the needle is lifted off the liquid. Surface tension is defined by the following equation: $s = F/2d$. F is the force in newtons, which is derived from weight (in grams) required to lift off the needle, the factor of 2 is because the film of water pulled up by the needle has 2 surfaces, d is the length of the needle in meters, and s is the surface tension. First, the weight in grams is converted to the force in newtons. Then the formula, $s = F/2d$, is used to calculate the surface tension.

Results
Out of all the tests I conducted for my science project, I confirmed that water did have the highest surface tension out of all the liquids that I tested. Following water, the rank order of surface tension from highest to lowest was cooking oil > rubbing alcohol > solution of water with soap.

Conclusions/Discussion
I further researched to find out why the results were different from my hypothesis. I learned that the degree of hydrogen bonding in each liquid is what affected the surface tension the most, but it was also the other elements in different liquid molecules that prevented hydrogen bonding. For example, the soap in the solution have fatty acids that separates the hydrogen atoms from the oxygen atoms. This separation between the hydrogen and oxygen atoms is what prevented some of the liquids I tested to have a high degree of hydrogen bonding, which is the cause of lower degrees of surface tension.

Summary Statement
I conducted tests to measure the degree of surface tension in different liquids to demonstrate the principle of hydrogen bonding, and accomplished this by determining the force required to lift a needle off the surface of each liquid.

Help Received
I got help in understanding hydrogen bonding from my mom, and my dad assisted me with the power tools I used to build my balance. I conducted my experiments myself.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Alan C. Hernandez

Project Number
J0607

Project Title
Cold Pack Chemistry

Abstract

Objectives/Goals
My objectives and goals were to see a temperature difference in 200mL cup of water. I would use different amounts of ammonium nitrate, a crystal that has a chemical reaction with the water. The amounts were 10g, 20g, 30g, 40g, and 50g. My goal was to see if 50g would have the biggest temperature change when added to water. I was bascially trying to see which amounts of ammonium nitrate make the water temperature change the most.

Methods/Materials
The most important materials I used were ammonium nitrate, a crystal in coldpacks. I also used water to cause the chemical reaction, a scale to measure the ammonium nitrate ammounts, and the most imprtant, a thermometer to measure the temperatures as the chemical reaction is caused. This would all happen in a cup with 200ml of water, 1 for each amount of ammonium nitrate. Then taking the beginning temperature, 15-20 seconds later the middle termperature and so on til the temperature did not change. Lastly, subtracting the beginning temperature to the ending termperature, finding the temperature difference for each cup.

Results
I had 5 diferent results for the 5 different amounts of ammonium nitrate. All of them coming from subtracting the beginning temperature to the ending temperature. For cup #1, 4 degress in difference. Cup #2, 10 degrees in change. Then 14 degrees in change for cup #3. Lastly my biggest change in temperature, cup #4 and cup #5, 20 degrees and 25 degrees. Cup #5 proving my hypothesis that cup #5, 50g of ammonium nitrate would have the biggest change in temperature with 25 degrees.

Conclusions/Discussion
Using a digital thermometer was more successful than using a laser thermometer which made my temperatures innacurate at first. Though not with the digital thermometer which made my temperatures more accurate. I also concluded that I might have used ammonium nitrate crystals that had already started to dissolve since they looked pretty wet. Which did not let me have as big temperature differences. Though over all the bigest temperature difference was found when I used 50g of ammonium nitrate, a bigger amount than what they use in coldpacks.

Summary Statement
I measured the temperature difference in 5 cups of water with 200mL of water each with a different amount of ammonium nitrate a crystal that causes 2 chemical reactions one the endothermic reaction the other the exothermic reaction.

Help Received
My parents: Adriana Romo and Cesar Hernandez. My science teacher, Mrs. Simpson.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Aleksa E. Jarasunas

Project Number
J0608

Project Title
The Mpemba Effect: Does It Exist? Can I Change My Initial Experiment to Cause the Effect to Occur More Frequently?

Abstract

Objectives/Goals
The Mpemba effect is the observation that under certain conditions, warmer water can freeze faster than colder water. My objective was to determine if the Mpemba effect exists. Secondly, I wanted to change one constant in my initial experiment to investigate what causes the Mpemba effect to occur.

Methods/Materials
I filled three 50 ml beakers with 15 ml of water, inserted the probe of a thermometer into each beaker, and either heated or cooled the water in each beaker to 60°C, 40°C, and 20°C. I placed the beakers on insulating fabric in my freezer and recorded the temperature of the water in each beaker every 2 minutes, until the water in at least 2 of the beakers reached -10°C. For my second experiment, I kept the same setup and procedure but used 150 ml beakers. The larger beakers increased the effect of evaporative cooling by increasing the surface area of the water sample but decreased the effect of convection currents since the water columns were not as tall.

Results
The Mpemba effect occurred in 6 out of 10 trials in my first experiment but in only 2 out of 10 trials in my second experiment.

Conclusions/Discussion
My hypothesis that the Mpemba effect exists was correct. I also concluded that strong convection currents may be necessary for the Mpemba effect to occur. My experiments controlled for loss of mass due to evaporation by covering the beakers with plastic wrap. Since dissolved gases are thought to contribute to the Mpemba effect, I used previously boiled tap water that had cooled to room temperature in these experiments. Additionally, to prove my experimental set-up before running my experiments, I ran 1 trial using room-temperature previously-boiled tap water and saw that the water samples cooled uniformly down to -10°C.

Summary Statement
I demonstrated that the Mpemba effect exists and that strong convection currents may be necessary for the Mpemba effect to occur.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Samarth (Sam) E. Kadaba

Project Number

J0609

Project Title

Better Batteries: A Study of Galvanic Cells

Abstract

Objectives/Goals

The experiment I am conducting consists of testing the amount of voltage produced by different materials in galvanic cells as well as the best way to connect the parts that form a galvanic cell (whether a porous cup or ionic salt bridge). My hypothesis predicted that if a galvanic cell was made of a copper cathode and lead anode then this particular combination would produce the most voltage. When I set up the cell, it would contain a tw0 half cell connected through a salt bridge. I will repeat these combinations however I will use porous materials to establish how two half cells can be connected without the need of a salt bridge . This experiment will test the best combination of half cells as well as the effect of porous cups in comparison to salt bridges.

Methods/Materials

The materials I am using include copper and copper sulfate, aluminum and aluminum sulfate, zinc and zinc sulfate, magnesium and magnesium sulfate, and lead and lead nitrate. For the porous barrier I am using terracotta pots, whereas for the salt bridge I constructed my own through the use of plastic tubing, salt water, and cotton swabs to hold the solution within the bridge.

Results

My results disproved my hypothesis. I found that a Magnesium and Copper combination produces the most voltage in a galvanic cell with a salt bridge. I recognized that the top four combination of half cells all used magnesium as an electrode. I also found that porous cups tend to decrease the voltage produced by a cell by about 24.6% rather than a salt bridge However, interestingly, the porous cup augmented the voltage in a magnesium and aluminum cell demonstrating that magnesium is augmented in voltage by porous cups.

Conclusions/Discussion

Knowing that conventional batteries are made of zinc and copper or aluminum, my experiment identified a flaw in modern battery engineering. With the need for clean, powerful sources of enegery gradually overtaking society, my project adresses a progressing field in modern day sciences. With the results of my project, I have established that there are more efficient ways to engineer batteries with new and unique materials.

Summary Statement

My project addresses how different materials can affect the voltage produced by a galvanic cell; it is centered around two main focus questions that ask which combination of metal electrodes and solutions would produce the most voltage and

Help Received

Los Cerritos Middle School- provided the chemicals, Mrs.Armstrong

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Ani A. Karajayan

Project Number
J0610

Project Title
Electrolysis

Abstract

Objectives/Goals
The objective of my goal was to see which electrolyte solution would conduct electricity the best through the process of electrolysis-saltwater, sodium bicarbonate + water or citric acid + water.

Methods/Materials
To conduct my project I used 10% of the electrolyte and 90% distilled water to make the different solutions, a multimeter to check the voltage and amperage of each solution, a light bulb for conductance,and battery as a power source.

Results
The different electrolyte solution's voltage, amperage, and conductance was measured at three temperatures in three different trials. My investigation showed that the saltwater solution conducts electricity the best in all the different temperatures I tested because it has the highest voltage, amperage, and conductance.

Conclusions/Discussion
How well a liquid or solution conducts electricity all comes down to if it has a supple of ions in it. The movement of the ions in the solution is what makes it conductive. Without the ions that are being attracted to the cathode and anode that are placed in the solution it wouldn't be conductive.Because most of the molecules in the saltwater solution break up and form ions, the flow of ions in the solution is high and it conducts an electric current well.When citric acid is dissolved in the water, only a small amount of the molecules become ions. Therefore there is a less flow of ions and less electricity is produced. The sodium bicarbonate solution was as almost as good of a conductor as saltwater. It had slightly less ions therefore less electricity produced.Since my results show that saltwater is the best conductor electricity, we can think about using the oceanwater as an alternative of saltwater. Although it is expensive to find a powerful energy source that can separate the ions in the solution, it is convenient for us since 97% of much of the water we have on our planet is saltwater but also because while we're producing energy, we are also producing chemical substances at each electrode that can be used for many purposes.We can also think about using the sun's energy as the power source to separate the ions in the solutions and also to heat the liquid since my results prove that as the temperature increase so does the conductivity of the solution. Why can't we use the ocean water and sunlight, two renewable energy sources, to provide us with energy and chemical substances we use in our every day lives?

Summary Statement
My experiment was conducted to see if we can use saltwater to provide peoplewith energy and chemical substances through the chemical process of electrolysis since we have so much water on our planet that we can use.

Help Received
I learned how to read a multimeter by myself and watched videos about the process of electrolysis to understand why saltwater is the best conductor of electricity.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Gregory R. Levesque

Project Number
J0611

Project Title
Simulated Artificial Pancreas Model

Abstract

Objectives/Goals
The objective of my project was to construct and calibrate an electronic circuit that effectively simulates the functionality of an actual artificial pancreas

Methods/Materials
Utilized electronic circuit components, a conductivity sensor and a pump that I calibrated using a neutral solution to automatically pump vinegar (mock insulin)into a test solution when the pH level of the test solution measured high (mock high blood glucose), thus neutralizing the test solution.

Results
My first attempts at neutralizing the pH level of the test solution failed. The model was redesigned to correct errors in the circuit and also improve the mounting and calibration of the conductivity sensor. After the redesign, the pump successfully defended the hypothesis by turning off the pump when a neutral pH level of the test solution was achieved. Multiple retests were conducted to ensure the accuracy of the results.

Conclusions/Discussion
My project used a simple electronic circuit model to mimic the functionality of an artificial pancreas. It demonstrated how a carefully calibrated sensor could be used to start or stop a liquid pump based on a measurement taken from the liquid. My test gave me confidence that a real life artificial pancreas could be created using electronics and software algorithms, this would revolutionize the treatment of Type one diabetes by helping to regulate blood glucose levels for up to 3 million Americans.

Summary Statement
I created a simulated artificial pancreas model that neutralized the pH of a basic solution (mock high blood glucose) by pumping in vinegar (mock insulin) until the solution was pH neutral.

Help Received
I built the model and conducted the experiments myself. My father helped me to identify an error within the circuitry.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Gwenyth M. Love

Project Number
J0612

Project Title
Ice, Ice Baby

Abstract

Objectives/Goals
I want to determine if liquid nitrogen or dry ice will work better to freeze a banana.

Methods/Materials
I put three containers in my garage. I filled one with liquid nitrogen, another with dry ice and the last with dry ice and rubbing alcohol. Then I put a banana into each of the freezing agents for a predetermined amount of time. After, I took the temperature of each of the bananas and recorded the temperature in a notebook.

Results
the results that I received was that the banana got colder in the liquid nitrogen than in the other freezing agents.

Conclusions/Discussion
My conclusion was that, with the trials that I did, the liquid nitrogen worked better to freeze the banana. If i had left the banana with the peel on, it would probably not work as well because the peel would keep it insulated.

Summary Statement
My project is about which is a better freezing agent, liquid nitrogen or dry ice.

Help Received
Blair Gonzalez, Steve Waitt and Matthew Love

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Julia Magnone

Project Number
J0613

Project Title
Which Homemade Fire Retardant Works Best on Cotton?

Abstract

Objectives/Goals
The objective of this study is to determine which homemade fire retardant works the best on cotton.

Methods/Materials
3 yards of cotton, Lighter, Safety glasses, gloves, spoons, metal pot, alum, Boric acid, Ammonium chloride, Ammonium phosphate, Sodium silicate, and a safe open area to burn.

Results
Several pieces of cotton were soaked in various homemade fire retardants and set out to dry. Each piece of cotton was burned and timed. 2 trials were repeated for each retardant. Some of the results were similar and some had large differences.

Conclusions/Discussion
Two trials with all of the cotton samples resulted in interesting results. Three out of the seven methods protected cotton. All of The other methods burned for more than 14 seconds.

Summary Statement
I tested homemade fire retardants, and did two trials, by treating cotton with the retardants, to find my results.

Help Received
I came up with the project idea on my own and my father assisted me with the toxic chemicals while I performed the tests on my own. I then had my science teacher review my results.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Kael K. Mai

Project Number
J0614

Project Title
Electric Fruit

Abstract

Objectives/Goals
My objective is to find out which of these citrus fruits (oranges, lemons and grapefruits) will produce a consistent electrical current the longest when zinc nails and copper wire interact with the citric acid in the fruit.

Methods/Materials
Five fruits each of oranges, lemons and grapefruits. Zinc nails and copper wire. Voltmeters, alligator clips, and a timer. A zinc nail and a 2" copper wire piece was inserted onto opposite ends of a citrus fruit. The voltmeter was attached to the nail and wire by alligator clips (positive to copper, negative to zinc). Measurements in micro-amps were recorded in varying intervals of time, for a 12 hour period.

Results
The five lemons produced the strongest electrical current for the longest period of time. The five grapefruits produced the weakest current for the shortest amount of time. The five oranges fell in the middle between lemons and grapefruits.

Conclusions/Discussion
The citric acid in the fruits reacted with the zinc nail and copper wire, producing a current. The amount or concentration of citric acid in the fruit correlates to the strength and the length of time a current is produced, which has nothing to do with the size of the fruit. This means that lemons would produce a stronger current and for a longer amount of time due to lemons having a higher concentration of citric acid.

Summary Statement
I showed that the amount or concentration of citric acid in a fruit correlates to the strength and longevity of a current, which is produced by the reaction between citric acid, a zinc nail and copper wire.

Help Received
My parents helped with some of the recording which took over 12 hours. My science teacher helped with ideas for the science experiment.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Laurel A. Manion

Project Number
J0615

Project Title
The Cookie Experiment

Abstract

Objectives/Goals
The objective of this experiment was to determine if the baking of the chocolate chip cookie was altered when using different types of baking sheets. Did the baking sheet alter the texture of the cookie or the taste?

Methods/Materials
I made a triple batch of chocolate chip cookies that I used for all cookies in the experiment, so the cookie dough was not a variable.
Then I baked each cookie using six different types of cookie sheets; silicone Silpat, ridged Sur La Table sheet, stoneware baking sheet, Calphalon non stick baking sheet, insulated platinum baking sheet, and an aluminum baking sheet.
All batches were baked at 350 degrees for 13 minutes. I used a cookie scoop so all the cookies were the same size.
Then I let all the cookies cool on a rack for 10 minutes.
Then the cookies were placed in a labeled Ziploc baggie.
Testers had a plate labeled with all the cookies and they filled out the survey for my data.
Surveys were collected and then I tabulated the results.

Results
The results were that YES the baking sheet does affect the way the cookie tastes and the texture of the cookie. The testers chose the cookie baked on the ridged Sur La Table baking sheet as the BEST cookie. They preferred this cookie for the taste and texture.

Conclusions/Discussion
The conclusion is that baking cookies is a science! Changing the material to bake a cookie on can alter the taste and texture of a cookie. I love to bake and this experiment has proven to me that I can alter the taste of food by changing the baking sheet of an ingredient. Some people think cooking is easy, but it can be difficult when trying to bake the perfect cookie.

Summary Statement
An original chocolate chip cookie can be altered using different baking sheets made from different materials.

Help Received
I have to give credit to my Aunt Shauna who inspires me to bake. She also helped me make the cookie dough for this experiment.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Samantha I. Medina

Project Number

J0616

Project Title

The Effect of Tempertaures on Electrolytes

Abstract

Objectives/Goals

The objective of my experiment was to test if different temperatures were to effect the amount of electrolytes in sports drinks. In this case, I used the sports drink Powerade#.

Methods/Materials

Conductance sensor built with instructions from sciencebuddies.com, 5 Powerades, and thermometer. Tested electrolyte count of every Powerade, each of the five were put in different temperatures, after 45 minutes in their designated temperature using the conductance sensor in the measurement of mA (milliamps).

Results

The electrolyte count in the Powerades came out to be higher in the warmer temperatures, according to the conductance sensor. Therefore, the electrolyte count was dependent on the temperature.

Conclusions/Discussion

Several trials with different bottles of Powerades in different temperatures shows that warmer temperatures lead to a higher amount of electrolytes in those Powerades. This information can be used to benefit anyone who is physically active by them consuming a warmer sports drink rather than it being ice cold.

Summary Statement

As tested with a conductance sensor, warmer temperatures result in a larger amount of electrolytes in sports drinks.

Help Received

My father helped me understand the electrical connections when building my conductance sensor, but other than that, I completed this project on my own.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Musheh R. Ovanesian

Project Number
J0617

Project Title
Bright Enough?

Abstract

Objectives/Goals
My experiment is trying to see which temperature of water will cause the most resistance in a glow stick sample.

Methods/Materials
I first cut open the glow stick with a saw. Then, I separated the two mixtures and combined them with the water in the small container. I set up the multi meter, attach it to the photo resistor, and record data.

Results
At the end, my hypothesis was proven correct. The cold water ended up with averages of 0.17 ohms, 0.26 ohms, and 0.16 ohms. The cold water had averages of 0.11 ohms, 0.14 ohms, and 0.174 ohms. The room temperature water had averages of 0.13 ohms, 0.15 ohms, and 0.16 ohms. My hypothesis is proven correct.

Conclusions/Discussion
In this experiment, my hypothesis was proven correct. The glow stick sample at 5°C had the most amount of resistance, the glow stick at 23°C had the 2nd most amount of resistance, and the glow stick sample 34°C had the least amount of resistance. This shows that a glow stick would be brightest in hot water, and dullest in cold water.

Summary Statement
My project is about comparing the different amounts of electrical resistance from different glow stick samples at three temperatures.

Help Received
Mr. Michail, my parents, and my brother

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Rylen J. Patel

Project Number
J0618

Project Title
Ouch... Pain

Abstract

Objectives/Goals
In my experiment I tested whether aspirin, naproxen, or ibuprofen will keep the pH the same and also dissolve in the fastest time.

Methods/Materials
Hydrochloric Acid, .01 m
Spoon- 1
Googles -1
Cup- 20
Advil- 5 tablets
Aleve- 5 tablets
Ecotrin- 5 tablets
Motrin- 5 tablets
Gloves- 1 pair
pH strip- 40
Measuring cup
Stopwatch

Results
The pH was around fairly consistent between the three different pain killers.

Advil took the least time, as well as Aleve taking the longest

Conclusions/Discussion
In my experiment I tested whether aspirin, naproxen, or ibuprofen will keep the pH the same and also dissolve in the fastest time. Advil was the fastest and kept the acid at 7.3. Ecotrin came in second and also did well in neutralizing stomach acid. Motrin was very close to being second but the time for the pill to dissolve was a little too much. Finally, coming in last in a long way was Aleve who's pill dissolved last and didn't do well in neutralizing stomach acid. The reason Advil was first and Motrin was very close to being second was because they are made up of the same chemical compound. I believe that they dissolved fast because the 18 hydrogen atoms bonded with 2 oxygen atoms, causing it to become liquid. Ecotrin also may have taken less time since it was a smaller pill then the other three and it did a pretty well job in neutralizing the pH. Aleve did last because it is an uneven compound at it may have taken a longer time to

Summary Statement
Which aspirin, naxproxen, or ibeprofen neutralizes the pH in you stomach in the fastest amount of time

Help Received
Dr. Patel

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Jacqueline Prawira

Project Number

J0619

Project Title

Rice Plasticity: The Effect of Amylose and Amylopectin in the Formation and Tensile Strength of Rice-based Bioplastic

Abstract

Objectives/Goals

The objective of this experiment was to determine the effect of amylose and amylopectin in different types of rice grain/starch in the formation and tensile strength of a rice-based bioplastic. My hypothesis was if amylose molecules can easily align and associate through hydrogen bonding, while amylopectin yields a much larger molecule than amylose, then different ratios of amylose and amylopectin in the rice grains will affect the plasticity in a rice-based bioplastic, because the linearity of amylose molecules have more extensive hydrogen bonding, while the branched structure of amylopectin molecules build higher viscosity in forming a bioplastic.

Methods/Materials

The procedures to develop different rice grain/starch bioplastic formulas were performed in Stages 1 and 2. The final bioplastic formulas of long grain, medium grain, short grain, glutinous rice and rice flour were developed and compared to cornstarch bioplastic (control). Magnetic hot plate with digital thermometer was used to create the bioplastic. All rice bioplastics and control had their maximum force tested using digital force gauge and had their tensile strength calculated.

Results

Data showed that each rice grain had different amylose and amylopectin contents that affected each formula's plasticity. Amylose contributed to gel strength. Amylopectin had the reverse effect. Some rice bioplastics had a higher tensile strength than the control despite having less amylose content. Unexpected results were found and possible sources of error were discussed.

Conclusions/Discussion

The results partially supported my hypothesis and I concluded that higher amylose rice grains produce a greater tensile strength as a bioplastic. Rice grains may be a viable alternative to bioplastic materials. Further development for application was conducted by combining rice bioplastic with paper fibers that successfully increased the tensile strength significantly.

Summary Statement

I developed my own rice bioplastic formulas from different rice grains, observed each rice bioplastic's formation and tested their respective maximum forces with the digital force gauge and calculated their tensile strengths.

Help Received

I performed this experiment by myself with adult supervision (Mrs. Aily Salikin). My parents for their assistance in creating graphs in excel and design format for the board. Mr. Lee (science teacher) for his support and feedback.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Alicia Roice; Ashlyn Roice

Project Number
J0620

Project Title
Hidden Sugar Strikes Back: Investigating Hidden Sugars (Glucose and Sucrose) in Food Using Invertase

Abstract

Objectives/Goals
The purpose of our project was to measure the concentration of glucose and sucrose(added sugars) in different food items. Our hypothesis for this project was that if we add invertase(sucrase) enzyme to food samples, then it will convert sucrose in the sample to glucose and fructose through a process called hydrolysis. The amount of glucose present can be measured using glucose test strips.

Methods/Materials
Different food samples, glucose powder, table sugar, invertase enzyme, digital scale, plastic cups, graduated cylinders, measuring spoons, droppers, distilled water, and glucose test strips.
The activity of invertase enzyme was measured by adding invertase to 10% sucrose solution and measuring the glucose concentration at intervals. The time at which the readings stabilized was taken as the duration of our tests. The value of duration we found from this step was 60 minutes.
10% solution of each food sample was prepared by mixing the sample with distilled water. The glucose concentration of the solution was measured and recorded. Then,15 drops of invertase enzyme was added to the solution and the solution was mixed well. The glucose concentration of the solution was measured after 60 minutes, and the reading recorded. Three samples of each food item was tested.

Results
The results of our experiment show that many food samples that we tested contain added sugar. Hidden or added sugar is the sugar added to food in addition to naturally occurring sugar in the ingredients. Among the samples, pancake syrup had the highest percentage of sucrose followed by Chewy Granola Bars. The highest percentage of glucose was found in the Sweet and Thick Barbecue Sauce and Tomato ketchup had the second highest percentage of glucose.

Conclusions/Discussion
Results of our experiment support our hypothesis. Sucrose present in food sample was converted into glucose in presence of invertase, which we measured using glucose test strips. Added sugar is present in sweet food and in food that you would not expect to contain sugar, like pasta sauces and condiments like ketchup and salad dressings. The presence of added sugar in food items lead to excessive sugar consumption. Studies have linked excessive sugar consumption to various health issues like obesity, diabetes, heart disease, and tooth decay. When consuming processed food, a careful look at the nutrition information of the food is necessary to control the intake of sugar.

Summary Statement
We studied the concentration of glucose and sucrose in various food samples and found that there is added sugar present in many of the food samples tested.

Help Received
Our parents assisted us in acquiring the materials for the project and in assembling the board. Our science teacher, Mr. Lee, gave us guidance during our project.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Samsara May T. Sales

Project Number
J0621

Project Title
Light It Up

Abstract

Objectives/Goals
The purpose of this project is to prove that common household materials can light up the LED string light.My Hypothesis is that the Voltage and brightness of LED light increases as the number of Zinc-Copper battery cells exposed to individual solution of table salt, baking soda, epson salt, vinegar or Sunkist soda increases. Comparing the chemical compounds of each of the household material, I think epsom salt will have the strongest reaction.

Methods/Materials
I made batteries out of Zinc and Copper plates in a medicine bottle separated with a rubber eraser. Submerges 4/5 of the metals in individual solution of table salt, baking soda, epsom salt vinegar or sunkist soda and measured Voltage and brightness of LED light. Measure the electric current with voltmeter and observe the light produced for every battery added to the circuit.

Results
We can light up LED string light with Zinc-Copper plates submerged in individual solutions of table salt,baking soda,epsom salt,vinegar and sunkist soda. The light turns on when a 3rd or 4th battery is added in the series circuit.
For every battery cell added,there is an increase of one volt to the total voltage of the circuit for most of the solutions. The brightness of LED increases as the voltage of the circuit increases.

Conclusions/Discussion
The Voltage and brightness of LED string light increases as the number of Zinc-Copper battery cells exposed to solutions of common household materials like table salt, vinegar, epsom salt, baking soda or Sunkist soda increases. I also found out that epsom salt solution is the strongest solution and the weakest solution is the table salt solution.

Summary Statement
I made a device that lights up when exposed to solution of common household items such as table salt,baking soda,epsom salt ,vinegar or sunkist soda.

Help Received
None. I made the batteries and performed the project myself.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Pujita S. Tangirala

Project Number

J0622

Project Title

A Green, Low-Cost Adsorbent for the Removal of Dye from Aqueous Solutions

Abstract

Objectives/Goals

Dyes are used in many industries, such as textiles, plastic, printing, and cosmetics. Because current methods of wastewater treatment are expensive and create toxic sludge, there is a need for a cost-effective method. The purpose of this project was to test the efficiency of spent tea leaves (STL) as a low cost adsorbent of dye using a column adsorption filter system. In this experiment, the effect of flow rate, adsorbent dose, and initial dye concentration on the adsorption of methylene blue by STL was studied. The hypothesis was that a lower flow rate, a higher adsorbent dose, and a lower dye concentration would all lead to higher adsorption.

Methods/Materials

STL was prepared by washing, drying, grinding, and sieving the tea residue. A homemade spectrophotometer was built and calibrated using known concentrations of methylene blue. A column adsorption filter system was built and three flow rates (4.4, 2.96, and 1.46 mL/min), three adsorbent doses (0.4, 0.5, and 0.6 g), and three initial concentrations (1, 2, and 3 mg/mL) were tested. Each test was repeated three times. All the samples were analyzed using the spectrophotometer.

Results

Dye removal efficiency (E%) increased as the flow rate was decreased. At a flow rate of 4.4, 2.96, and 1.46 mL/min, E% was 77.62%, 84.13%, and 98.70%, respectively. E% increased as the adsorbent dose increased. At an STL dose of 0.4, 0.5, and 0.6 g, E% was 98.98%, 99.03%, and 99.10%, respectively. E% increased from 1 mg/mL to 2 mg/mL and decreased from 2 mg/mL to 3 mg/mL. Even though the concentration was increased from 1 mg/mL to 2 mg/mL, free adsorption sites were still available. At a concentration of 1, 2, and 3 mg/mL, E% was 99.10%, 99.19%, and 98.70%, respectively.

Conclusions/Discussion

Maximum dye removal efficiency of up to 99% was attained depending on the adsorption conditions, and maximum adsorption capacity of 95.41 mg/g was attained. STL can be used as a low-cost adsorbent for the removal of methylene blue dye from aqueous solutions. The functional groups present on the surface of STL and its cellular components are responsible for the adsorption of dye. STL is abundantly available and requires no pre-treatment except washing and drying. This column filter system is also a cost-effective method, as it does not use any agitation or electric power. This system can be adapted to an industrial scale to be permanently installed where wastewater treatment is needed.

Summary Statement

Built a column adsorption filter system using spent tea leaves as adsorbent to remove dye from aqueous solutions and concluded that this could be a potential cost-effective alternative to expensive industrial wastewater treatment methods.

Help Received

My mom supervised this experiment. My parents bought the supplies for this experiment. My science teacher, Mrs. Mackewicz, guided me through this whole process.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Anirudh Venkatraman

Project Number
J0623

Project Title
Production of Bio Plastics from Vegetable Waste

Abstract

Objectives/Goals
The goal of this experiment was to produce bioplastics from vegetable wastes like banana peels, potato peels, and avocado pits. It's been estimated that 200,000 barrels of oil are used each day to make plastic packaging for the United States alone. Also, oil based plastics cannot be rid easily and create landfills or environmental pollution. Bioplastics can replace petroleum based plastics and can be made from vegetable wastes that contain starch.

Methods/Materials
The process of creating bioplastic was to first collect the vegetable waste, then extract the starch through a process of making a homogenous solution, filtration and sedimentation. The starch extracted was then mixed with additives such as glycerol (to add flexibility) and vinegar (to break down the starch molecules), and heated over a stove so that the glucose molecules bonded and formed polymer chains. Then, the gel-like plastic formed was baked, and dried in an oven at 250 degrees F for ½ hour. A tensile test was conducted on the plastics using a spring scale and decay test was done over 10 days.

Results
My results showed that avocado pits produced the most starch at 59% of raw waste, plastic from banana peels produced the most flexible plastic at 360 degrees rotation, and plastic from potato peels produced the strongest plastic at 25 N. Plastic from avocado pits showed a layer of fungus after 7 days. Plastic from potato and banana peels did not decay at all.

Conclusions/Discussion
My conclusion is that vegetable wastes that contain starch can be used for making bioplastics, although the properties of the bioplastics will be different in terms of strength and flexibility and durability. The ratio of the amylose to amylopectin (both starch molecules) is what gives each plastic its unique property. Plastic from potato wastes can be used for making plastic containers or prosthetics because of its strength and durability. Plastic from banana peels can be used for making plastic bags and tubes due its flexibility and durability. The avocado pits plastic can be used for making short-term packaging materials that can be discarded.

Summary Statement
My project is about producing Bio Plastics from different types of vegetable wastes that contain starch and evaluating their properties.

Help Received
Mrs Shalini D'Souza (Science Teacher), Challenger Sunnyvale. Madhumita Mallik (my mother) for getting supplies and use the kitchen as a lab.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Noah R. Wahamaki

Project Number
J0624

Project Title
Substance pH vs. Melting Rate

Abstract

Objectives/Goals
The objective of this study was to determine if certain pH levels affects the rate at which ice melts.

Methods/Materials
The experiments materials consisted of: apple juice, apricot juice, strawberry juice, milk, coffee, windex, bleach, water, pH paper, freezer, timer, thermometer, plates and a sunny spot. the procedure consisted of 8 liquids frozen into ice cubes, and exposing them to the sun at the same time =, after recording the temperature of the air. Then the time it took for each ice cube to melt was recorded along with the air temperature.

Results
At the end of the experiment, it was clear that water would have the longest melting time, and bleach would have the quickest. The results did not support my hypothesis, and showed that any liquid that was not an average 7 on the pH table, would melt faster than water. There is no relationship between the pH of a substance and it's melting rate.

Conclusions/Discussion
After my results were found, I did further research and found that the melting rate is mostly determined by the other chemicals in the solution, like salts, sugars, alcohols, etc.

Summary Statement
As measured by the 37 tests performed, there is no correlation between the pH of a substance and it's melting rate.

Help Received
I designed and tested the project myself, but received help in getting pH paper strips.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Cara E. Wilson

Project Number
J0625

Project Title
Comparing the Heat Energy of Bio-Fuel to Conventional Fossil Fuels

Abstract

Objectives/Goals
The objective of this study is to determine the heat energy of different fuels in relation to motor oil, a fossil fuel.

Methods/Materials
3 ring stand, Styrofoam cup, cotton cord, 3 different fuels (motor oil, vegetable oil, bio-fuel). Cultured algae and used it as fuel because algae has a high lipid content. Timed the length of each fuels burn time, and measured the change in temperature.

Results
Several fuels were burned and heat energy was calculated. Repeated trials were run to determine the average. The motor oil had the highest heat energy, meaning it was the most efficient.

Conclusions/Discussion
Repeated trials with multiple fuel revealed a difference in heat energy of 3 fuels. It is concluded that Bio-Fuel is not a viable fuel because of its lack of heat energy.

Summary Statement
As measured by the heat energy, I found that bio-fuel is not as efficient as motor oil or vegetable oil.

Help Received
I designed the preliminary experiment myself, but due to safety concerns my science teacher helped me re-design it. I did all the rest myself, including building the apparatus.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Alicia Zhang

Project Number
J0626

Project Title
Piano of Blues

Abstract

Objectives/Goals
In this experiment, a piano of blues is made to find how changing the concentration of copper sulfate in a solution affects the sound frequency produced from an electrical circuit. Since higher concentrations of ionic compounds in a solution will result in higher conductivity and a more powerful current, it is expected that a higher concentration would result in a higher frequency.

Methods/Materials
Solutions with various concentrations of copper sulfate in distilled water were used, with a modified 555 timer circuit. Attached to it was a speaker and two wires, which would be dipped into the solutions to form a resistor and produce sound. The frequency was measured with the #Spectrum# audio analyzer app.

Results
The frequency increased with the concentration, however the growth was logarithmic, rather than linear. Concentrations of 0.08, 0.1, 0.15, 0.18, 0.2, and 1 grams of copper sulfate in 100 milliliters of distilled water produced frequencies ranging from approximately 427 to 709 hertz, representing the concert notes G#, A#, C, D, D#, and F.

Conclusions/Discussion
As expected, higher concentrations of ionic compounds in a solution will result in higher frequencies. With the correct concentrations, one can create a piano of blues!

Summary Statement
A piano of blues, made with copper sulphate solutions and a circuit, showed that the sound frequency produced increased as the concentration of copper sulphate increased; with the right concentrations, music notes can be created.

Help Received
My father taught me how to build the modified 555 timer circuit, and how it worked.