CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Christian G. Amirkhanian

Project Number
J0501

Project Title
Measuring Concentration of Solutions (Liquids) using Light

Abstract

Objectives/Goals
The purpose of my experiment was to measure concentration of very small volumes of solutions (such as dye colored water or juices) using light when it flows through small glass capillary tubing. My experimental setting was based on Light Absorbance Detection.

Methods/Materials
In my experimental setting I used micro-glass capillary tubes for the collection of very small volumes (micro-liters) of different concentrations of solutions and optically measured the amount of light passing through the small tube. I used a small vacuum pump to transfer the measuring solution inside the micro-glass capillary tubing and monitored the concentrations by measuring the amount of visible light being absorbed through the test solution.

Results
I learned that my micro-capillary measuring setup performed close to what I was expecting. As I changed the waters dye color concentration the light absorbance also changed proportionally, which resulted in the light intensity changes measured by the digital voltmeter.
My data supported the hypothesis that the light absorbance increased as the solution concentration also increased. Therefore the differences in light output measurement represents the liquid concentration (colored water concentration).

Conclusions/Discussion
During my experiment I learned that as I changed the water#s dye color concentration (dependent variable) the light absorbance also changed proportionally, which resulted in the light intensity changes measured by the digital voltmeter. For example as I diluted the dye concentration by a factor of 2, the light output intensity also measured 2 times less. This is supported by my data and the findings agree with the descriptions given about the physics of light absorbance provided in science books and other micro-fluidic types of publications. I learned that it was important to center the light output from the optical fiber directly through the center of the micro-capillary tube where the concentrated liquid was flowing which helped to reduce the amount of the background or scattered light in the detector. This resulted in improvements in detection sensitivity.
This study should be repeated using other types of solutions such as soft drinks or orange juice or micro liters of blood (oxygenated) to measure their concentration, which would be useful in standardization and quality control processes in food industry and health clinics.

Summary Statement
I measured small volumes of different concentrattions of samples (dye colored water) using Light Emitting Diode.

Help Received
I recieved help on my science fair project, from my father.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Ranvir S. Bajwa

Project Number
J0502

Project Title
Analysis of Water for Mercury using Light

Abstract

Objectives/Goals
My project is to determine if it is possible to detect mercury in water using light and the electromagnetic spectrum. I hypothesize a red shift of the spectrum when light is passed through the mercury solution, with prominence of bright colors and waning of dark colors. I predict this because in experiments with mercury vapor a red shift has been seen. With the gold nanorod suspension there will be blue shift because the color of the suspension is blue.

Methods/Materials
Wood, light, convex lens, prism, metal sheet,test tubes, pipettes, beaker, distilled water, scale, camera, gold nanorods, mercury chloride and sodium borohydride.
An optical spectrometer was constructed. Solutions of Mercury Chloride and Sodium Borohydride were prepared in distilled water at 10(-5)M. A spectrum was obtained by passing light through distilled water. 10 drops of the gold nanorod suspension were poured into a test tube (A),light was passed through it and appearance of the spectrum was noted. 10 drops of the sodium borohydride solution were added to (A) and any change in spectrum was noted. 10 drops of the gold nanorod suspension and 10 drops of sodium borohydride were poured into test tube (B, control). Mercury solution was added to test tube A drop by drop and distilled water to test tube B observing the spectrum. Pictures were taken if the spectrum changed. Three trials were performed.

Results
In my first two trials, a red shift of the light spectrum was observed after 4 drops of mercury solution were added to the gold nanorod suspension and in my third trial red shift appeared after adding 3 drops of mercury. In each trial the red shift remained with further addition of mercury. There was no blue shift observed with the gold nanorod suspension.

Conclusions/Discussion
My data supports my hypothesis that if a certain amount of mercury is present in the solution, there will be red shift of the light spectrum. There was no blue shift seen with the gold nanorods suspension. I suspect I may not have seen a shift because the shift may be too subtle to observe with the naked eye but would be seen with a spectrophotometer. I would like to investigate this possibility. In this experiment I have shown that small amounts of mercury can be detected in water using light and gold nanorods. With development, I believe this testing has great potential in reclaiming contaminated water and in performing on site testing for tap water.

Summary Statement
Is there a simple method for detecting mercury in water using light and the electromagnetic spectrum?

Help Received
My mentor, Professor Florencio E.Hernandez, Univ. of Central Florida provided me guidance and gold nanorods; Mr. Mark Hobbs, my teacher helped me with obtaining chemicals and equipment; my father helped me with project construction and preparation and safe use of chemicals.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Kyle P. Bloudoff-Indelicato

Project Number
J0503

Project Title
Electrolysis

Abstract

Objectives/Goals
My goal was to learn as much as possible about electrolysis and to see if sodium hydroxide could be produced from common table salt. It was also interesting to learn which electrodes performed the best.

Methods/Materials
A plastic coffee was used as the electrolytic cell and 60 grams table salt, 2 liters well water and electrodes were selected from materials found around the house. Wires with allegator clips were attached to a 12VDC transformer. Standard 110VAC-15A house current was used. A burret and stand was used with HCL acid and phenylthalene indicator to titrate the concentration of sodium hydroxide. A pH meter was used to test the original pH of the test solution. 100ml volumetric flasks, thermometer, 125-250ml Erlenmeyer flasks, hot plate, oven, 10ml pipets, camera, screw driver, matches, bolts and nuts. All of this information was entered into the lab book.

Results
Experiment #3, using the heavy brass bars as electrodes, got a reading of 1N NaOH and the other two tests recieved values of 0.14-0.16 N NaOH. The range of pH readings on the titrated solutions was 9.3 to 10.4. The concentration of each test results was done by titrating with 0.1N hydrochloric acid.

Conclusions/Discussion
In summary, sample number 3 produced the highest concentration of NaOH. The titration of the substance indicated that it is strength was approximately 1 Normal. It was concluded that the stronger, less corrosive electrodes, produced a greater amount of NaOH as they received a larger amount of electric current during the experiment. This proves the experiment hypothysis.

Summary Statement
The production of Sodium hydroxide from table salt by electrolyis through an ionic medium

Help Received
Father helped with research, gathering chemicals and lab equipment and project set up. Father calculated normality of NaOH titrations. Sister helped balance chemical equation and helped layout board.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
William R. Cabison

Project Number
J0504

Project Title
Vitamin C Determination by Iodine Titration

Abstract

Objectives/Goals
The objective of this experiment is to determine which citrus fruit contains the most ascorbic acid through iodine titration.

Methods/Materials
A vitamin C (ascorbic acid) standard solution and a starch indicator were made. The iodine solution was the titrating agent and ascorbic acid was the titrant. Seven citrus fruits were tested in this experiment. With the iodine solution, 15mL of vitamin C standard solution and the 15mL juice samples of each fruit were titrated using a burette. Iodine solution was continually added to the mixture until the titration endpoint, a distinct color change in the solution with dark purple sediment, was reached. The amount of ascorbic acid present in a 1 cup juice sample of a fruit was calculated by using ratio proportions.

Results
Of the seven tested citrus fruits, the navel orange contained the most ascorbic acid in 1 cup of juice with 143.2mg of vitamin C. The citrus fruit with the least amount of ascorbic acid in 1 cup of juice was the California mandarin orange with 74.7mg of vitamin C. The 15mL juice sample with the greatest volume of iodine solution titrated to it indicates that the most ascorbic acid is present within the solution.

Conclusions/Discussion
My conclusion is that the navel orange contains the most ascorbic acid in 1 cup of juice, followed by the Texas grapefruit, the lemon and the red pummelo, the key lime, the Minneola tangelo, and the California mandarin orange.

Summary Statement
Citrus fruits were tested in order to determine which of them contain the most ascorbic acid by iodine titration.

Help Received
Cousin helped as a mentor; Teachers helped with report; Father and cousin helped with display board.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Nathan J. Choe

Project Number
J0505

Project Title
So Easy Clams Can Do It

Abstract

Objectives/Goals
The goal of the experiment was to see how the amount of carbon dioxide captured was changed when using different amounts of calcium chloride with calcium oxide.

Methods/Materials
Materials: 75 grams of calcium chloride(0, 5, 10, 15, 20, 25 grams per container), 84 grams of calcium oxide (14 grams per container), Six 12x12x5 cm Glad container, and an OHAUS CS 2000 scale.
Method: Fill the Glad containers with 14 grams of calcium oxide. Put 0 grams in one container, 5 grams in another, 10 grams in another, and so on for 15, 20, and 25 grams of calcium chloride. Do not cover the containers. Weigh the containers. Weigh once 8 days have passed. Subtract new weight from old weight to get new weight gain. Repeat nine more times

Results
I know most of the mass I achieved was carbon dioxide because with the little calcium chloride I had, it would stop absorbing after the seventh day. I then gave it one day for all water to evaporate. The average results for each independent variable are as follows. The container with 0 grams of calcium chloride gained an average of 2.1 grams of carbon dioxide. The container with 5 grams of calcium chloride gained an average of 10.7 grams of carbon dioxide. The container with 10 grams of calcium chloride gained an average of 19.8 grams of carbon dioxide. The container with 15 grams of calcium chloride gained an average of 23.3 of carbon dioxide. The container of 20 grams of calcium chloride gained an average of 23.6 grams of carbon dioxide. The container with 25 grams of calcium chloride gained an average of 25.8 grams of carbon dioxide.

Conclusions/Discussion
The hypothesis is if more calcium chloride is added, then more carbon dioxide will be caught. The results showed that more calcium chloride meant more carbon dioxide capture. Therefore, the hypothesis was supported by this experiment.
The capture traveled in a sort of slump and had a great difference in the beginning between averages, but the difference lowered. Therefore, 15 grams was the best choice because it gave good carbon dioxide capture for the amount of calcium chloride I used.

Summary Statement
How the amount of carbon dioxide capture changes with different amount of calcium chloride in calcium oxide.

Help Received
Science teacher lent me some calcium chloride and his scale. My Mom let me borrow the living room.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Robin Choudhury

Project Number
J0506

Project Title
How Do Cooking Techniques Affect Vitamin C?

Abstract

Objectives/Goals
The objective is to determine which cooking techniques [baking, boiling, steaming, and stir-fry] will retain the most vitamin C content. I thought steaming for a short period of time will result in the largest retention of vitamin C content.

Methods/Materials
I used broccoli, kiwi fruit, ascorbic acid, acetic acid, metaphosphoric acid, indophenol dye, vegetable oil and water. The lab wear used were aprons, latex gloves, and hat. The equipment I used were knife, weighing balance, beaker, graduated measuring cylinder, oven, wok, freezer, gas stove, temperature sensor, sieve, pestle and mortar, tubes, syringe filters, buret, pipet, volumetric flask, and a funnel. I steamed, stir-fried and boiled broccoli, and baked kiwi. To check the vitamin C content, I extracted vitamin C from food samples and titrated with indophenols dye.

Results
Stir-fry samples had the highest retention of vitamin C with an average loss of 1.2%, followed by steaming (12.3% loss of vitamin C content). The greatest loss of vitamin C was during boiling (63.1%). However, a significant loss of vitamin C was also observed during baking (40.8%).

Conclusions/Discussion
Stir-frying retained the most amount of vitamin C content, which did not support my hypothesis. The greatest loss of vitamin C (during boiling) may be due to loss of water-soluble vitamin C in boiling water. Steaming, compared to boiling, did not lose a large amount of vitamin C because the liquid water did not come in contact with the food samples. The destruction of vitamin C during baking may be due to the high heat in the oven. Stir-frying retained the most amount of vitamin C, because of minimum exposure to heat and water. Broccoli was stir-fried for a short period of time with a small amount of water, which vaporized during stir-frying. The initial frying in a small quantity of oil might have formed a small layer of oil on the outside surface of broccoli preventing leaching of vitamin C into water.

Summary Statement
This project's objective is to find the cooking technique that retains the most amount of vitamin C content in fruits and vegetables.

Help Received
Project advisor, Mom, Dad. Dr. Dennis Bacon, from California State University, Fresno, helped in preparation of chemicals.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Jennifer R. Cohen

Project Number
J0507

Project Title
Which Type of CO(2) Carbonation Keeps Its Bubbles the Longest When Added to Liquid?

Abstract

Objectives/Goals
I tested whether liquid carbonated with dry ice keeps its bubbles longer than pre-carbonated water bought in a store or liquid carbonated with carbon dioxide in the form of a tablet. I hypothesized that liquid carbonated by dry ice would keep its bubbles longer than store bought pre-carbonated liquids or liquids carbonated with carbon dioxide tablets.

Methods/Materials
To test my hypothesis, I compared the time in which water carbonated with dry ice kept is bubbles to water carbonated with carbon dioxide tablets and pre-carbonated water. I repeated the experiment seven times.

Results
I found that water carbonated with dry ice kept its bubbles an average of 4 hours and 27 minutes. In comparison, pre-carbonated water kept its bubbles an average of 3 hours and 32 minutes and carbon dioxide tablets kept its bubbles an average of 3 minutes and 42 seconds.

Conclusions/Discussion
I concluded that liquid carbonated with dry ice kept its bubbles the longest.

Summary Statement
Which type of CO(2) carbonation keeps its bubbles the longest when added to liquid?

Help Received
Ms. Lucera and Mr. Buenaventura for their guidance; Mom, Dad and Mike for their support.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Wesley Ho

Project Number
J0508

Project Title
Measurement of Diffusion Coefficient in Liquids using Digital Video Technique

Abstract

Objectives/Goals
The purpose of this experiment is to measure the rate of diffusion of liquids using digital video technique. The technique is applied to determine the effect of temperature and viscosity on the diffusion coefficient in corn syrup. The hypothesis is that if a liquid is thinner or if its temperature is higher, then its rate of diffusion will be faster.

Methods/Materials
In this experiment, the diffusion distance versus time (response variable) of a liquid is recorded while the temperature or viscosity (manipulated variable) is changed. The experimental data is compared against a theoretical model based on Fick's Second Law of Diffusion. The model is simulated using Excel for various relative diffusion coefficients.
By comparing the experimental curves to the theoretical values, the dependences of the diffusion coefficient on temperature and viscosity are obtained. The diffusion takes place in a clear plastic tube mounted parallel to the ground to minimize the effect of gravity. The diameter of the tube is selected to be 3/8 inch to keep the diffusion one dimensional but at the same time is large enough to avoid air bubbles that can block the flow. Food coloring is used to help distinguish the diffusing liquid against the background liquid. A ruler is placed next to the tube to help mark off the distance. A video camera is place three feet away to film the diffusion process. Finally, Sony Vegas software is used to read off the diffusion distance versus time from the video tape.

Results
The experimental data is organized into two types of graphs consisting of distance vs. time vs. temperature and distance vs. time vs. formula. A corresponding set of theoretical diffusion distance vs. time curves are made to match the experimental data by varying the diffusion coefficient in the model. The results show that by altering the viscosity of corn syrup through thinning by 90%, the diffusion coefficient increased three times. While altering temperature by 27 degrees, there is hardly any change in the diffusion coefficient.

Conclusions/Discussion
The experimental technique of using a camcorder to capture the diffusion process in liquids and subsequent analysis using digital video editing software was shown to give very accurate measurements. Using the measured data, the hypothesis that if a liquid's temperature is higher or if it is thinner, then its rate of diffusion will be faster is confirmed.

Summary Statement
A digital video technique to measure diffusion coefficient in liquids is used to show the effect of temperature and viscosity

Help Received
Dad taught how to use Microsoft Excel and helped proofread report

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Jonah S. Kaye

Project Number
J0509

Project Title
Some Like It Hot: Does Heat Help Polyethylene Glycol Dissolve?

Abstract

Objectives/Goals
Every morning I take polyethylene glycol (Miralax) mixed in cold apple juice. Since dissolving Miralax is a slow process, I researched how to speed it up. My hypothesis was that as the temperature of a solvent (water or apple juice) increases, the solute, polyethylene glycol, added to the liquid will dissolve more quickly.

Methods/Materials
I measured 100 ml of water in a graduated cylinder 5 times, and poured each 100 ml of water into plastic cups labeled either 9, 17, 25, 33, or 41 degrees Celsius. One at a time, I placed the 9 and 17 cups in my freezer, and the 25, 33 and 41 cups over a heated stove, until a digital thermometer showed the desired temperatures. I then poured 8 grams of Miralax into each cup, stirred each solution, and recorded the time elapsed for the Miralax to completely dissolve. The entire trial was repeated two more times and these three trials were repeated using apple juice as my solvent.

Results
In all six trials, with each increase in temperature, the time interval for dissolving lessened. In fact, at higher temperatures, the data demonstrated an almost linear correlation between rising temperatures and lowering dissolving time. My data also showed that as a solvent, water hastened the dissolving process as compared to apple juice.

Conclusions/Discussion
The data collected clearly proved my hypothesis that as the temperature of the solvents increased, polyethylene glycol dissolved more quickly. Of course, more trials would make the data more accurate. In addition, potential minor errors might have affected the data's reliability. Scale and thermometer precision, inconsistent solution stirring, and subjective viewing of dissolving completion may have contributed to possible inaccurate results. In any case, adding heat to my Miralax will undoubtedly speed up my morning routine.

Summary Statement
Does heat help polyethylene glycol dissolve?

Help Received
My mother and father helped type and proofread the written parts of my exhibit.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Katherine J. Keller

Project Number
J0510

Project Title
Going Green

Abstract

Objectives/Goals
I took three fuels and determined which one produced the most amount of heat energy and could be considered an alternative fuel to gasoline.

Methods/Materials
The fuels were diesel fuel, vegetable oil and biodiesel fuel. I assembled a device which allowed me to record the amount of heat energy transferred to water by each fuel. I used the heat equation for calorimetry to figure out how much heat energy was released .The final amount was measured in joules.

Results
I found that there was a significant difference in the amount of joules produced by the three fuels. In fact, the most heat energy was produced was in vegetable oil. Biodiesel fuel came in second, followed by diesel fuel.

Conclusions/Discussion
Since I found that there is more heat energy produced by vegetable oil and biodiesel than diesel fuel, it supports the fact that there are viable forms of energy we can continue to research to use in our motor vehicles. There are ways to reduce our gasoline usage and Greener cars should be a goal of the future!

Summary Statement
I took three fuels and determined which one produced the most amount of heat energy .

Help Received
I would like to thank both of my parents for helping me purchase the materials I needed. I would like to thank KFC for supplying me with free vegetable oil from their French fries for my testing. I also appreciate the information given to me by the people at Pacific Biofuel, Inc, regarding the consistency of

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Sierra H. Laird

Project Number
J0511

Project Title
The Effect of Different Chemicals on the Color of Fire

Abstract

Objectives/Goals
The purpose of this project is to see how different chemical substances react with fire to produce different colored flames.

Methods/Materials
Materials: Safety goggles, latex gloves, apron, nickle chromium inoculating loops (2), propane campstove, butane lighter, 1 plastic spoon for each of the 9 chemicals, 1 3-inch aluminum foil square for each chemical, camera, 1 c hydrochloric acid, distilled water, Rainbow Moments birthday candles,dry pinecones, paraffin wax, Chemicals (1 T each): copper sulfate, copper chloride, sodium borate, sodium chloride (sea salt and table salt), potassium chloride, calcium chloride, strontium chloride, magnesium sulfate. Method: Materials were ordered and gathered. I did research on safety issues, flame tests and chemical reactions. My aunt and mother helped me with the experiments. We put on safety goggles and aprons and conducted the tests outside. We cleaned the jars, spoons and table. We put each chemical into a jar with some distilled water and let it dissolve. We put the tip of a loop into the solution and then into the flame and recorded and photographed the color. Between each test we cleaned the loop with hydrochloric acid and also cleaned the table from any contamination. We also coated pinecones with paraffin wax and different chemicals.

Results
All of my results were either the same or slightly warmer than the researched predicted results. The nickle chromium loops added a small amount of orange which explains why some results were slightly warmer. When I put the pinecones with strontium chloride onto a bonfire, they produced bright red flames.

Conclusions/Discussion
Different chemicals react with fire to produce different colored flames because the electrons moving around the nucleus have different energy levels in each element. When heated, the electrons get excited and move to a different orbit and as they cool down they move back to their normal orbit and this extra energy produces light waves. Each element has different amounts of extra energy, producing different colors.

Summary Statement
My project consists of flame testing different chemicals to determine the color of flame they produce.

Help Received
My mother and aunt helped me in finding some of the researched websites. They ordered the chemicals and loops and helped me with the experiment. They also helped me to figure out the type of graph that would show my results the best.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Erin N. Miley

Project Number
J0512

Project Title
Acids' Relationship to Mass and Height: Which Cupcake Brings Delight?

Abstract

Objectives/Goals
In baking a cake, it is important that all ingredients are configured correctly in order to produce an attractive and edible cake. Acids are significant in this configuration. Finding the acid that provides for a tall, heavy cake will help the product both taste of a higher quality and sell more proficiently in stores. The consumer will also be receiving more product for their money.

Methods/Materials
I tested this problem by taking a chocolate cupcake recipe and substituting the acid call for, vinegar, with buttermilk, limejuice, lemon juice, and cooking sherry. After the eleven cupcakes had baked I proceeded to find the height and mass of each individual cupcake. I controlled this by using the same cupcake recipe, the same amount of acid in each of the 5 experimental trials, weighing each cupcake to be certain that each cupcake entered the oven at 55g, putting the same amount of pressure on each cupcake while finding the height, and cleaning all materials after each trial. While analyzing my data, I found it very interesting that the mass of each cupcake was reduced from 55g after being baked. In my experiment the independent variables were the five acids and the dependent variables were the height and mass of each cupcake.

Results
After averaging my data, I was able to conclude that the limejuice when mixed with baking soda provided for the tallest cupcake with an average of 4.6 centimeters. Cooking sherry averaged the largest mass at 50.5 grams.

Conclusions/Discussion
In conclusion, part of my hypothesis was proven correct. The cupcakes containing vinegar did in fact average the largest height. The cupcakes containing cooking sherry averaged the largest mass. I believe this to be true because during the leavening process, air bubbles are formed within the batter and expand when exposed to heat. The most acidic acid will have the largest reaction with the baking soda causing the air bubbles to expand more than the other acids. Because the air bubbles are larger, more water has the ability to evaporate from the cupcake.

Summary Statement
The purpose of my project was to find an acid that produces both a tall and heavy cupcake when mixed with baking soda.

Help Received
Mrs. Marcarelli helped both with procedure and written work; Mr. Negus assisted with procedure; Parents assisted monetarily; Mr. Budzynski helped with graphs

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Varun K. Mohan

Project Number
J0513

Project Title
How Do I Conduct?

Abstract

Objectives/Goals
To determine if the conductivity of distilled water changes when it is mixed with various substances and to what extent.

Methods/Materials
A LED based conductivity meter is constructed using an LED and a 9 volt battery and the leads of the meter are dipped in various solutions # (1) tap water (2) distilled water (3) Common salt dissolved in distilled water (4) Epsom salt dissolved in distilled water (5) Calcium chloride dissolved in distilled water (6) Diluted version of Common salt solution. (7) Diluted version of Epsom salt solution (8) Diluted version of Calcium Chloride solution. The conductivity is tested using the intensity of LED.

Results
LED in the conductivity meter glowed more with tap water than distilled water. Where as, for the distilled water the LED in the conductivity meter did not even glow. When I mixed the distilled water with the salts, the LED glowed brightly. The different salts [Epsom salt, calcium chloride, sodium chloride] mixed with the distilled water glowed at the same extent. When the salt solutions were diluted by distilled water, the brightness of the LED in the conductivity meter decreased.

Conclusions/Discussion
The electrical conductivity of water changes when it is mixed with various substances. Distilled water does not conduct electricity at all. Tap water conducts electricity and so do the salt solutions. When materials like sodium, calcium and magnesium are dissolved in water, they dissociate. These dissociated atoms now carry an electric charge and are called ions. When salt, sodium chloride (NaCl), is dissolved in water,the sodium atoms which have lost one electron apiece and represented by the symbol Na+, separate or dissociate from the chlorine atoms. The chlorine atoms each gain one electron in the process and are represented by the symbol Cl-. These atoms exist in equal numbers. When solid sodium, magnesium, and calcium are dropped in water their solid structure is broken up and charged ions float all through the water molecules in the solution. When electric current is introduced to the solution via the conductivity meter the movement of the ions allows the current to flow through the solution causing the LED to light. The number of ions per liter of solution will affect the flow of current through the now closed circuit. Conductivity is dependent therefore on the presence of ions as well as the concentration of ions per quantity of water.

Summary Statement
My project is about the conductivity of distilled water when it is mixed with various substances.

Help Received
My parents bought me the materials.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Hannah N. Schuyler

Project Number
J0514

Project Title
Ice Ice Baby

Abstract

Objectives/Goals
The purpose of my experiment was to determine the melting rate of ice with different concentrations of salt and sugar solutions.

Methods/Materials
20 100 ml plastic cups
220g salt NaCl(Ralph's Iodized Salt)
220g sugar (Pure Cane Sugar)
2,050mL tap water
5 funnels
5 100 ml graduated cylinders
4 800mL plastic containers
WhirlPool Gold Freezer
US Balance Professional Mini Scale US Magnum (500gx0.1g)
100g balance calibration weight
Stopwatch
Masking tape

Results
The meting rates were:

Frozen Solutions	Melting Rate of Ice (mL/min)
Control	0.20
1% Salt	0.25
1% Sugar	0.20
10% Salt	0.47
10% Sugar	0.26

Conclusions/Discussion
My conclusion is that salt lowers the freezing point of water more than sugar does which causes it to melt faster.

Summary Statement
My project is about determining the melting rates of ice with different substances and concentrations.

Help Received
My mom double checked my work and made sure my measurements were correct. Mrs. Wentz answered all of my questions. Also, Mrs. Wentz and Mrs. Oggiano let me borrow their laboratory equipment.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Sharon Tang

Project Number
J0515

Project Title
Ions Lend a Hand to Conductivity

Abstract

Objectives/Goals
Question - How do the concentrations of different solutes affect the conductivity of water?
Hypothesis - I believe that the higher the concentration of solute in an ionic solution, the higher the concentration of ions will be present. When the concentration of ions is higher, the conductivity of the solution should rise.
Manipulative variables - Concentrations of solutes in their solutions and the different solutes. Dependent variable - Conductivity of the solutions.

Methods/Materials
Method - In this experiment, various amounts of three different solutes were added to water and the changes in conductivity were observed. Other variables that affect solution conductivity such as temperature, contact areas between solution and electrodes were kept constant. Copper electrodes were taped to a container to measure resistance of a solution as the amount of solute was varied. Gentle stirring of the solution was required to reduce "polarization" (the clouding of ions around electrodes).
Materials - NaCl, KCl, Sugar, Distilled Water, Digital Volt Meter, Scale & Copper electrodes.

Results
1. In general, adding salt to the solution led to greater conductivity.
2. I discovered that the resistance of the solution increased over time, if I let it sit alone. I found that this was due to #polarization# and gentle stirring can reduce it.
3. Sugar does not boost the conductivity as much as salt does.
4. Possible inaccuracies: a. Tap water was used to rinse the containers adding contaminants. b. Instruments# inaccuracies. c. Impurities in solutes. d. Resistance measurements fluctuated depending on how hard I stirred. e. Salts may not have fully dissolved due to saturation.

Conclusions/Discussion
1. In general, the higher the number of moles of salt in a solution, the higher the conductivity will be.
2. Only by adding certain solutes will the conductivity of the solvent increases significantly. Solutes like sugar (that forms molecular solution) do not increase the conductivity of water by much compared with salts (that forms ionic solution.
3. Distilled water is not a very good conductor but tap water is probably due to all of the impurities it has.
4. Polarization can distort the conductivity measurement of a solution. Gentle stirring can reduce this phenomenon.
5. Solution conductance may help to check quality of chemical products quickly.

Summary Statement
To study the effect of the concentration of some solutes in water on the conductivity of the solutions.

Help Received
I nearly gave up on this topic when I first encountered the polarization effect which was unknown to me but my parents encouraged me to keep looking for a solution. Mr. Evans, my science teacher, taught me how to do a science fair project.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Thomas O. Yaeger, Jr.

Project Number
J0516

Project Title
Electrolyte Madness

Abstract

Objectives/Goals
Does naturally occurring orange juice have more electrolytes than Vitamin Water or Gatorade? My hypothesis is that naturally occurring orange juice will have more electrolytes than commercial sports drinks. An electrolyte is a particle that splits into either a negative or a positively charged ion. Electrolytes perform several important functions in your body. They are also used in all batteries.

Methods/Materials
I built an electrolyte battery using galvanized screws and carbon rods as electrodes. I wired these to form a circuit and positioned them over a plastic ice tray containing my electrolyte test solutions. I tested two different commercial sports drinks and orange juice to determine which produces the most electricity. I used distilled water and salt water as my controls. I measured my results in volts with a voltmeter and a homemade ammeter. I performed three controlled tests on each solution.

Results
On average salt water produced 0.48 volts, orange juice produced 0.43 volts, Gatorade 2 produced 0.33 volts, and Vitamin Water Charge produced 0.26 volts and distilled water produced 0.00 volts.

Conclusions/Discussion
My hypothesis was correct, orange juice registered the most electrolytes using voltage as the measure; however, it may not be a great sports drink and it does not taste as good as my other selections. I recommend adding water and a pinch of salt to orange juice to make the ultimate sports drink.

Summary Statement
I compared which electrolyte solution produces the most voltage, Orange Juice or sports drinks and the price per serving.

Help Received
Dad helped saw my base. Mom helped obtain the materials and equipment.