



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Frank A. Barrack	Project Number J0502
Project Title Bonds Are Broken by Light: The Effect of Varying Salinities on Hydrolysis Using Constant Energy from a Solar Panel	
Abstract Objectives/Goals My objective was to determine whether a solution with a greater salinity would yield more hydrogen through hydrolysis than a solution with a lower salinity using a homemade solar panel as a constant source of electricity. Methods/Materials A homemade solar panel with a total output of 3.7 volts was placed in front of a 500-watt work light to produce the current necessary for hydrolysis. NaCl solution with salinities of .45%, .9%, 1.5%, 15%, and 31% were tested. Distilled water without any salt was used as the control. Three hundred mL of a test solution were poured into a beaker in which was placed the cathode from the solar panel under a capped, inverted 10 cc syringe full of the same test solution. The work light was turned on, and the resulting gas rose to the top of the syringe. A fan was used to cool the solar cells. The gas collected was measured in cc's after 1 hour. Each salinity was tested a total of 5 times. Twenty cc's of the gas collected was analyzed by gas chromatography at an independent lab. It was found to be nearly 100 per cent hydrogen at the time of collection. Results The solution with the highest concentration of NaCl yielded the most hydrogen in the course of an hour. The solution with the highest salinity (31%) generated more than ten times as much hydrogen as the solution with the lowest salinity(.45%). Conclusions/Discussion Hydrogen produced by hydrolysis using energy collected with a solar panel is a green, renewable alternative fuel. This experiment demonstrated that the solution with the greatest concentration of NaCl produced the most hydrogen through hydrolysis. This would be important for mass-producing hydrogen by hydrolysis using solar energy in the future.	
Summary Statement My project is about determining the best concentration of NaCl to produce hydrogen through hydrolysis using a solar panel as a constant source of electricity.	
Help Received My father supervised my use of power tools, and my mother helped by gluing my board. Mr. Elgas, an analytical chemist, ran a gas chromatography test on a sample I took to him. I would like to thank my parents and teacher for their support and encouragement.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Neil Bhambi	Project Number J0503
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Project Title
Gotta' Sweet Tooth: Does Microbial Fermentation Produce Acid in the Mouth with Aspartame and Various Sugars?

Abstract

Objectives/Goals
The objective of my project was: does microbial fermentation produce acid in the mouth with the artificial sweetener (Aspartame) and various sugars? I thought that the microbial fermentation will indeed result into acid production. My hypothesis was based on the fact that aspartame and sugar contain alcoholic group that oxidizes into organic acid.

Methods/Materials
In order to test my hypothesis, I needed to make a stock culture of Saccharomyces Cervisiae (Yeast) and acetobacter aceti bacteria. These microbes were used to inoculate 10% (v/w %) solution of the substrates: sucrose, fructose, glucose, galactose, and aspartame. Six sterile flasks, for the fermentation process, were labeled for the control and all the substrates. To prepare the control sample, 25ml of deionised water, 3 ml of peptone broth, 1ml of yeast, and 1ml of acetobacter aceti were put in flask. And for testing substrates the same total volume as a control was put in other flasks#25ml of 10% substrate solution, 1ml of yeast, 1ml of acetobacter aceti and 3ml of peptone broth as growth promoter. The flasks were then covered with aluminum foil and placed in an incubator at 37 C. After the incubation period (24 hours) biomass from the testing flasks was filtered. The pH values of each of the filtrate samples were checked for acidity. Acid-base titration method was conducted to measure organic acid production quantitatively. For the titration process, 0.1M NaOH standard solution was prepared by weighing out 2g of NaOH in 500ml of distilled water. A buret was then filled with NaOH solution. Two drops of phenolphthalein were added to the flasks containing fermented substrate solutions. The process began by slowly adding the standard solution while swirling the flasks. A pink color appeared, but soon disappeared. When the pink color began to linger, this point was known as the equivalence point (Point where acid is neutralized by the base.) Calculations were done to find out the percent mass of organic acid.

Results
Consistently, it was found that as the volume of alkali increased, the higher amount of organic acid present.

Conclusions/Discussion
My hypothesis was proved correct. Aspartame and sugars all resulted into organic acid. Aspartame oxidized into formic acid, and the various sugars oxidized into acetic acid.

Summary Statement
My project is about measuring percent of mass of organic acids produced by various sugars and artificials sweetener.

Help Received



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Brian D. Busemeyer	Project Number J0504
Project Title Where the Big Crystal Grows	
Objectives/Goals The purpose of my project was to determine what happens if you grow a crystal seed in a substance with a different crystal structure. My hypothesis was that crystal seeds that are grown in the same supersaturated solution will grow larger than seeds that are grown in a supersaturated solution with a different crystal structure.	
Abstract	
Methods/Materials Epsom Salt Alum Sea Salt Pot Water Saucers Water Bottles	
Growing the Seeds These steps were done for each substance. 1. Boil water. 2. Add enough of the substance (Alum, Epsom Salt, Sea Salt) until the water is supersaturated. 3. Let the solution cool on a saucer, so the water can evaporate leaving the seeds. 4. Select seeds that are similar in size from each saucer. 5. Measure and record the size of the seeds.	
Growing the Crystals 1. Boil water. 2. Add enough of the substanc (Alum, Epsom Salt, Sea Salt) until the water is supersaturated. 3. Cool the liquid to let the weeds form at the bottom. 4. Hang each type of seed in each type of substance (Factorial Design) in bottles. 5. Let the bottles sit in the the same temperature and humidity. 6. At the end of 2 and one half weeks, measure the growth of each crystal.	
Results The Epsom Salt Seed and the Alum Seed grew larger in the solution that matched the seed. The Sea Salt Crystal failed to grow. All of the seeds that were placed in a supersaturated solution that was different than the seed dissolved immediately.	
Conclusions/Discussion Later I realized what happened. When I put the seeds in the supersaturated solution that was different than the seed, it dissolved through a process of diffusion (particles going from a high concentration area to a low concentration area.) I learned how important the saturation process was. My next step will be to fully supersaturate with two solutions (new structure, seed structure) to see if the presence of a different substance affects the growth of the crystal.	
Summary Statement My project is about the effect of crystal structure on the growth of crystals.	
Help Received My mother helped put the board together. My brother helped me learn about the technical terms and process. I carried out the process.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Daniel G. Epperson	Project Number J0505
Project Title To Press or Espresso "O". That is Meletta Question	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective is to determine the relative amount of caffeine in the various ways my parents make coffee in my house. They make coffee by using a Krups home espresso maker, Melitta filter, and coffee press. They use the same amount of coffee beans to brew cups with each method</p> <p>Methods/Materials Coffee samples (single cups of coffee each made with a 25g sample of ground beans) made from a Krups Espresso maker, Melitta drip, and coffee press, will have caffeine removed by extraction. The caffeine will be isolated and weighed. The extraction of each coffee sample will be accomplished with three Methylene Chloride washings in a separatory funnel. The methylene chloride washings will be filtered and then evaporated, leaving caffeine residue behind. The caffeine residue will be weighed by difference.</p> <p>Results The results of this experiment showed that coffee made with the Krups home espresso maker had the most caffeine compared to the Melitta Drip and Coffee Press.</p> <p>Conclusions/Discussion In my experiment the caffeine content was the highest in the espresso. The reason could have been for the higher temperatures of water (steam) used to brew the coffee. Because I was analyzing for a very small amount of caffeine using a normal triple beam balance and glassware, my results could have had some errors. A more precise analytical balance would have been nice to have but it was not available at the time. I extracted and purified the caffeine in each sample the exact same way but I had my doubts to whether or not the caffeine was as pure as I wanted it to be. Each sample had some impurities but I think the impurities were equal. That made my results meaningful as a comparison between the coffee making methods but not as a quantitative measurement of caffeine.</p>	
Summary Statement My project is about determining the relative caffeine amounts in coffee made with an espresso maker, a Melitta drip, and a coffee Press.	
Help Received My parents helped me with the idea because they always debated on which method they make coffee had the most caffeine. A Eureka High School chemistry teacher, Mr. Benzinger, loaned me the entire chemistry lab supplies needed for this experiment. My father supervised the experiment.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Lauren E. Feuerborn	Project Number J0506
Project Title Ready... Set... Ferment!	
Objectives/Goals My hypothesis is that there is a relationship between the initial sugar level of grapes and the ultimate alcohol level of wine. I believe the ratio of sugar percentage by volume to alcohol percentage by volume is around 2:1 (.50). To test my hypothesis I will replicate the fermentation process with yeast and sugar water.	
Abstract	
Methods/Materials I. Materials 1 hydrometer 1 thermometer 1 funnel 5 325 ml bottles 1 graduate 1 refracometer 1 vinometer 1,000 ml of water Fermentation yeast Graph paper 1 fish tank water heater Sugar Water II. Procedure 1) Created volume of sugar water with 32% sugar a. poured sugar into one gallon of water b. used refracometer to get to 32% sugar 2) Washed and dried five 250 ml bottles 3) Poured 200 ml sugar water with percentages at: 32%, 30%, 28%, 26%, and 24% into bottles a. diluted sugar water by adding more water b. water brought down sugar level 4) Added ¼ tsp. yeast to each bottle of sugar water	
Summary Statement My project is about sugar and alcohol and the relationship between them.	
Help Received My mom and dad helped me type my report. I used wine equipment given to me by Royce Townsend to help me do my experiment	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Garen Gevorkian	Project Number J0507
Project Title Verification of Avogadro's Law	
Objectives/Goals The purpose of my project is to see if equal volume of gasses at the same temperature and pressure contain equal number of moles (Avogadro's Law)	
Abstract Methods/Materials I poured the liquid reactant in the plastic bottle, hold the bottle horizontal and slowly added the solid chemical, capped the bottle with a syringe inserted in the stopper and turned it upright, for chemical reaction to start. I collected 135mL of the gas produced and find the mass. I used different reactants to produce different gases. I produced oxygen, carbon dioxide, ammonia, and hydrogen. I repeated the trials 3 times for each gas, find the average mass. Knowing the mass, and using the RAM (relative atomic mass) I found the number of moles. Number of moles for different gases was very close, but not identical.	
Results The number of moles for different gasses were not identical, but I was amazed that they were very close.	
Conclusions/Discussion I think one of the reasons to not get exactly the same number of moles for different gasses, was the precision of the scale I used. The scale precision was 100ths of gram, with 1000ths of gram I could have better reading. Also maintaining exactly the same pressure, needed more complicated equipment that I didn't have access to.	
Summary Statement Finding number of moles for equal volume of gasses at the same temperature and pressure.	
Help Received Mrs. Gevorkian, taught me all the chemical equations, and everything that was needed for the project. Mr. Ira from Tri-EssScience, helped me with the chemicals.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) <p align="center">Monica J. Hernandez</p>	Project Number <p align="center">J0508</p>
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Project Title
Does the Amount of Natural Fruit Juice Affect the Amount of Vitamin C in Packaged Juice Drinks?

Abstract

Objectives/Goals
 To measure the amount of Vitamin C in packaged juices and to determine the relationship between the amount of natural fruit juice and Vit. C. My hypothesis is that the amount of natural fruit juice does affect the amount of Vit. C.

Methods/Materials
 Method: (1.) Prepare Starch solution from ½ tsp. cornstarch with 1 Tbsp. distilled water to form a paste. (2.) Prepare Standard Vit. C solution by crushing Vit. C tablet. Pour 125 ml. of distilled water into jar, adding crushed Vit. C. Stir until powder dissolves. (3.) Determine how many drops of iodine are needed to turn the Vit. C solution a blue-black color. Pour equal portions of Vit. C solution into four jars. Add 5 ml. starch solution to each. Fill eyedropper with iodine, add it to jar A, and count drops, stopping after each addition of 5 drops and stirring. Continue adding iodine until solution turns a blue-black color and stays that way after stirring. Record number of drops this took. Repeat using jars B, C, and D. Calculate the average number of drops of iodine needed to react with the 25 mg. of Vit. C. Use as the denominator in the right side of the equation in step 4. (4.) Determine amount of Vit. C in each of several packaged juice drinks by pouring 125 ml. of juice and 5 ml. of starch solution into a baby food jar. Add drops of iodine and stir after each addition of 5 drops until solution remains blue-black. Repeat on each juice and repeat experiment 3 times. Use this formula to calculate the number of mg. of Vit. C in each juice:

$$\frac{\text{mg. of Vit. C in juice}}{\text{# of iodine drops for this juice sample}} = \frac{25 \text{ mg. of vit. C}}{\text{# of iodine drops for standard Vit. C solution}}$$
 (5.) Analyze data to determine whether hypothesis was proved or disproved.
 Main Materials: Tincture of Iodine; Cornstarch; Distilled Water; 100 mg. Vit. C Tablet; Eyedropper; Jars Marked A, B, C, D; Variety of Juice packages

Results
 Some juices with high amounts of fruit juice had lower amounts of Vit. C than they claimed to have, and only one juice really had 100% of the Vit. C RDA even though 7/10 claimed to have 100%.

Conclusions/Discussion
 The amount of natural fruit juice does not directly affect the amount of Vit. C in packaged juice drinks. Manufacturers of some drinks with low amounts of natural fruit juice probably include artificially added ascorbic acid (a component of Vit. C) to produce high Vit. C levels.

Summary Statement
 I measured Vitamin C levels in 10 packaged juice drinks and determined that the amount of natural fruit juice does not directly affect the level of Vitamin C.

Help Received
 Parents purchased supplies and cleaned equipment; Teacher loaned scientific equipment.



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Elisha K. Hoffman	Project Number J0509
Project Title Effects of Pressure and Conductivity on Regelation	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to determine if the amount of weight on a wire, and the surface area and conductivity of the wire affects the rate at which it pressure-melts (regelation) through a block of ice. I predicted that the rate of melting would increase with more weight on the wire, and by using smaller gauge and higher conductivity wire.</p> <p>Methods/Materials I hung 1-3 plastic jugs of bottled water (weight) using 12 and 18-gauge wire (thickness=surface area) made of copper and steel (copper>conductivity>steel). Each wire weight/gauge/conductivity class was replicated five times, with controls. To control for pressure (both weight and surface area), I used each wire type and no weight and to control for conductivity, I used wire that was not conductive (nylon string). All wires were hung over standard-sized blocks (11x5x5 cm). I measured how far the wire melted into the ice after one hour.</p> <p>Results As weight increased, the distance the wire melted into the ice increased for all types of wire. Thinner wire (for both copper and steel) melted further into the ice than thick wire. I did not find a statistical difference between copper and steel wire at most thickness/weight classes. There was no pressure-melting by controls.</p> <p>Conclusions/Discussion In contrast to most other liquids, water shows some very unique characteristics during phase changes from solid to liquid. Regelation is the phenomenon in which water re-freezes to ice after it has been melted by pressure at a temperature below the freezing point of water. Pressure (weight and surface area) clearly determines its rate, but conductivity did not. Regelation might explain why ice skating is so smooth if the ice skater is actually skating on a thin layer of water caused by the pressure of the blade on the ice.</p>	
Summary Statement The rate of regelation of ice is affected by weight and surface area, but not conductivity, as demonstrated by looping a wire over a block of ice and hanging various amount of weight off wire of different gauges and conductivity.	
Help Received My dad helped me build wooden stands to hold up the ice blocks and water jugs. He also helped me lift the water jugs during experiments (they were heavy!). My mom helped me cut out the presentation board.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Elizabeth M. Huck	Project Number J0510
Project Title Catalysts	
Abstract Objectives/Goals The objective is to determine which chemical and biological substances can function as catalysts in the decomposition reaction of hydrogen peroxide to yield oxygen gas and water, and also which substances are sensitive to temperature changes. I believe liver, yeast and rusty nail will act as catalysts and liver and yeast will be sensitive to temperature changes. Methods/Materials Two different methods were used to measure the amount of reaction, therefore the reaction speed. One measured the amount of oxygen gas produced and the other measured the temperature increase in reaction since it is an exothermic reaction. A gas collection device was set up with a funnel fitted into a large test tube allowing the gas produced to be collected through a rubber tubing into a test tube filled with water. Temperature is taken before and after the reaction. The reaction was timed for two minutes. Five trials were done for each of the 16 samples plus the control. For each run 0.50 grams of sample and 15 ml of 3% hydrogen peroxide was used. The samples were manganese dioxide, calcium carbonate, potassium permanganate, liver, activated charcoal, potassium iodide, yeast, rusty nail, potato and sugar. Other materials needed were: wooden splints and candle for glowing splint test for oxygen, water trough, spoons, electronic balance, weighing paper, test tubes, brush and a thermometer. Results From the results, I see in both the oxygen and temperature testing, manganese dioxide is the best catalyst, followed by raw liver, yeast and rusty nail. Many other substances also show catalytic activity. Boiled liver and baked yeast show no reaction. Frozen liver and baked yeast showed decreased oxygen gas and temperature rise. The oxygen method is more accurate, because the temperature range in the reaction is not as large as the volume of gas collected. Conclusions/Discussion My conclusion is that my hypothesis was correct. Liver, yeast and rusty nail did work as catalysts, and so did many others I tested. The other catalysts were manganese dioxide, potassium iodide, potato and potassium permanganate. My experiment helped determine which samples are catalysts and which is the best catalyst. I learned that enzymes in potato, yeast and liver are sensitive to temperature changes. Enzymes are more sensitive to boiling or baking than freezing. I also learned that sugar and chalk (calcium carbonate) cannot be catalyst in this reaction.	
Summary Statement My project is to determine which chemical and biological substances can function as catalysts in the decomposition reaction of hydrogen peroxide to yield oxygen and water and which substances are sensitive to temperature changes.	
Help Received Mom helped buy samples and help borrow equipment from college. Teacher helped prove read draft.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) John A. Kaufman	Project Number J0511
Project Title Heatin' It Up! A Study of the Greenhouse Effect	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my experiment was to determine how different amounts of carbon dioxide in air affect the temperature of the air when exposed to light. My hypothesis was that more carbon dioxide would result in higher air temperatures.</p> <p>Methods/Materials To run my experiments I designed a test chamber. I used vinegar and baking soda to make the carbon dioxide in a coffee can. I stuck three thermometers through the side of the coffee can to read the temperatures at different heights of the can. I positioned a lamp above the can to simulate the sun by providing heat and light. I read the thermometers at different time intervals with the light on until the temperatures stopped rising, then turned the light off and read the temperatures until they reached room temperature. I compared the readings of these thermometers at different time intervals with those of a fourth thermometer that measured the room temperature at the same time intervals. I ran six experiments: no vinegar or baking soda, 35 ml. vinegar with no baking soda, 35 ml. vinegar with .4g baking soda, 35 ml. vinegar with .8g baking soda, 35 ml. vinegar with 1.6g baking soda, and 35 ml. vinegar with 4g baking soda.</p> <p>Results The maximum temperatures ranged from 8.1°C to 9.2°C above room temperature, however, there was no clear relationship between the amounts of baking soda (CO₂) and the maximum temperatures. The time it took for the air in the can to cool down ranged from 60 minutes to 110 minutes and increased in relation to the amount of baking soda (CO₂).</p> <p>Conclusions/Discussion My hypothesis was not correct. This is surprising, since it is known that carbon dioxide in the atmosphere causes the greenhouse effect. My conclusion is that more carbon dioxide in the air caused the air to retain more heat and take longer to cool down. When this is applied to the Earth's atmosphere, my hypothesis is true because as the amount of carbon dioxide in Earth's atmosphere increases, the atmosphere will hold more heat, causing the temperature to rise eventually.</p>	
Summary Statement I investigated the relationship between the amount of carbon dioxide in air and the temperature of that air when it was exposed to light.	
Help Received My father gave me some advice on the design of the test chamber and both of my parents gave me advice on organizing the poster.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Travis J. Killmer	Project Number J0512
Project Title Ironic: Iron Content in Fruits and Vegetables	
Objectives/Goals My goal was to find out if vegetarians can get the recommended amount of iron.	
Abstract Methods/Materials Eight different fruits and vegetables were tested five times each to find their iron content. I cut up one cup of the fruits and vegetables and blended them until they were pureed. I then strained the solutions to remove the pulp and collect the liquid. Once this was done I added tea to the juice solutions, which chemically reacted causing iron to precipitate at the bottom of the cup. After three hours of letting the solutions sit undisturbed I strained the juice solutions once again to collect the iron particles. Then I weighed the collected iron on a gram scale and recorded the weights.	
Results I found that the grape averaged the most iron per cup at 3.96 grams per cup, pineapple averaged 3.67 grams per cup, cranberry averaged 3.07 grams per cup, broccoli averaged 3.01 grams per cup, apricot averaged 1.52 grams per cup, asparagus averaged 1.24 grams per cup, spinach averaged 1.13 grams per cup, and apple averaged 0.68 grams per cup and had the least iron. Cranberry had the highest average iron per calorie at 0.067 grams per calorie, pineapple averaged 0.049 grams per cup, broccoli averaged 0.046 grams per calorie, grape averaged 0.035 grams per calorie, asparagus averaged 0.025 grams per calorie, spinach averaged 0.023 grams per calorie, apricot averaged 0.02 grams per calorie, and apple averaged 0.014 grams per calorie.	
Conclusions/Discussion My hypothesis was partly correct because I thought vegetarians wouldn't be able to get enough iron, but I found that only women from ages 11 to 50 would not be able to get enough iron if they ate five servings of spinach and four servings of apple each day which are the fruits and vegetables with the least iron. I also found that if they ate five servings of broccoli and four servings of grape each day which are the fruits and vegetables with the highest iron content, then all the age groups, male and female would get enough iron per day.	
Summary Statement My project is about the iron content in fruits and vegetables.	
Help Received My science teachers, Colin Matheson and Sunny LeMoine advised me on my project, my father took pictures while I was conducting my experiment, and my mother helped edit my work.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Jonathan D. Kroger	Project Number J0513
Project Title Which Juice Has the Most Vitamin C?	
Abstract Objectives/Goals The purpose of my project was to determine which fruit juice contains the highest vitamin C content. It was my belief that fresh squeezed orange juice would have a higher vitamin C content than any other juice. Methods/Materials An indicator was created by combining .1 grams of dichloroindophenol with 100 ml. of distilled water. Eight test tubes were filled halfway with the indicator solution and placed in a rack. To the first test tube, a vitamin C solution (ascorbic acid and water) was added with a dropper, changing the color of the indicator from blue to the color of the vitamin C solution (clear). In the remaining seven test tubes, one of seven fruit juices was added, also changing the indicator color from blue to the juices' natural color. The number of drops needed to alter the color of the indicator was noted, the lower number of drops reflecting a higher vitamin C level. The juices used were: store bought orange, grapefruit, and tomato juices; fresh squeezed orange, lemon, and lime juices; and frozen orange juice from concentrate. Results The results supported my hypothesis that fresh squeezed orange juice contains the highest level of vitamin C. However, the store bought tomato juice had nearly as much. The remaining juices ranking in order from greatest to least were: store bought orange juice, fresh lemon juice, frozen orange juice from concentrate, store bought grapefruit juice, and fresh lime juice. Conclusions/Discussion My conclusion is that of the juices I tested, fresh squeezed orange juice contained the highest levels of vitamin C. Since the store bought tomato juice had almost as much vitamin C as the fresh squeezed orange juice, I can assume that fresh tomatoes may be the best source of vitamin C. It is crucial to maintain an adequate vitamin C level for optimal health. Failure to do so will result in scurvy, as well as other health problems.	
Summary Statement My project is about testing the vitamin C levels in various fruit juices.	
Help Received My mother helped with typing and proofreading and my father assisted in gathering supplies.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Beyang Y. Liu	Project Number J0514
Project Title Viscosity: A Sticky Situation	
Objectives/Goals My investigative question was "Does xanthan affect water viscosity?" The goal of this experiment was to find if and how xanthan gum affects water viscosity and how this information can be applied to food applications such as soup, ice cream, and salad dressing.	
Abstract	
Methods/Materials Methods: a.6 cups were labeled 0%, 0.2%, 0.4%, 0.6%, 0.8%, and 1% b.Fill cups with water equal to the following mass: 100g minus percentage shown on cup c.Cups were one-at-a-time microwaved for 20 seconds and then placed on the magnetic stirrer platform. xanthan gum was dispensed into the cup according to the label on the cup (i.e. 0.6% cup gets 0.6 grams of xanthan gum dispensed in it), dissolving the xanthan gum. This step was repeated for all cups. d.Cups were allowed to cool to room temperature overnight. e.The solutions were tested using the viscometer and results were recorded. Then, the data recorded was multiplied by the correct conversion factor on the conversion table. Materials 1 Viscometer 1 Viscometer spindle 1 Metric scale 3 Plastic spoons 9g xanthan gum 1 Microwave 1,950g Distilled water 1 Viscometer conversion table 1 Magnetic stirrer 20 Plastic cups	
Results Xanthan gum increased water viscosity. The graph of viscosity plotted against amount of xanthan gum was a cubic function, curving upward at first and then flattening out.	
Conclusions/Discussion Xanthan gum is a very good viscosity-increasing agent. At just 1% concentration, it produced a solution similar to glue or silly putty. The graph, however, was not curving upward; it was a cubic function. This means that after 0.8% concentration, xanthan gum does not increase viscosity as much for every extra particle added. This is most likely attributed to 2 things: xanthan gum's maximum concentration at that temperature was between 0.8% and 1% or that my stirring methods were slightly flawed and not all of the xanthan gum was dissolved.	
Summary Statement This project was designed to determine xanthan gum's effect on water viscosity.	
Help Received Dr. Liu trained me in the use of lab equipment at ConAgra Foods, Inc.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Jenna W. Long	Project Number J0515
Project Title Burn Baby Burn	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to find out which of the seven foods i used released the most heat and food energy/food calories. Also how much of it burned and how long it burned. My hypothesis was that the walnut would come out on top because it had the highest calories per gram on the FDA label. Also that meant it had fuel and for such a small nut it would have to be mostly fuel meaning most of it would burn. And those factors contribute to the final equation to food calories per gram.</p> <p>Methods/Materials First you would need to make your calorimeter with the cardboard, tinfoil, rubberband, paperclip, clay, beaker, thermometer, and the water. Then you would place the food(previously weighed)on the paperclip. Then light the food, take the tome of it's burning, then immediately after take the water and stir it using the thermometer, and record its temperature. The find the temperature change. Also you would need to take the weight of the residue and find how many grams burnt. You would then insert that into the following equation: gram calories= mass of water X specific heat X temperature change and to find food calories divide gram calories by a thousand. Then for food calories per gram divide food calories by grams burnt.</p> <p>Results It came out that the almond was at the top overall. Yet, the walnut was at the top or near the top in the rest of the elements. This must be because thought the walnut was high in others. The almond was still near the top but it must have had a better ratio between the elements that contributed into the final eqautions.</p> <p>Conclusions/Discussion My hypothesis was both correct and incorrect. Correct because the walnut was on the top or near the top during most of the elements. But incorrect because in the overall and most important the almond came out on top with most food calories per gram. So my conclusion would be that of my seven nuts over all the almond released the most food calories per gram. Yet, the walnut was near the top in rest of the elements.</p>	
Summary Statement My project is about the calories in the foods that we eat , and a new hands on way to measure them.	
Help Received Father supervised my flame and helped with timing, mother helped correct my spellinng, Mrs. Marvin lent me her scale for use.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Nicole Marjes; Nicole Sumait	Project Number J0516
Project Title Trash to Glucose for Ethanol Production	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine which cellulosic waste material contains the most glucose which could be converted into ethanol.</p> <p>Methods/Materials Samples of rice straw, cardboard, newspaper and yard clippings were mixed with sulfuric acid and incubated in a hot water bath. After 5, 15 and 30 minutes of incubation, samples were tested for glucose content using a Chemstrip PbG strip(quantitative strip used by diabetics to detect blood glucose levels). The color change on the strip was compared to the color chart. Corresponding glucose levels were read and recorded. Test trials for all waste materials were done a total of five times to show repeated results.</p> <p>Results Repeated experiments showed all materials tested contained glucose with rice straw samples containing the most glucose at an average of 180 mg/dL. It was also observed that rates of conversion of the cellulose to glucose differed amongst the various waste materials with rice straw conversion occurring sooner than the other materials.</p> <p>Conclusions/Discussion The experiment showed that through acid hydrolysis, cellulose in waste materials can be converted to glucose that could then be used to produce ethanol, a renewable fuel alternative to gasoline. Rice straw samples produced the most glucose. If more time was available, future research could study the optimum conditions under which peak glucose values for the other waste materials could be achieved at a faster rate. Also follow-on research could take the glucose produced and convert it to ethanol. While ethanol is now produced from food products like corn, the ability to use waste materials typically disposed of in landfills or burned to produce renewable fuels would have significant benefits to our environment and society.</p>	
Summary Statement Using acid to break down cellulose to produce glucose, the project determined which waste material contain the most glucose that could be used to produce ethanol.	
Help Received Susan Rizk, Science Teacher, for support and direction. Nicole Sumait's mom for guidance and purchase of materials required. Arkenol, Inc. for use of various literatures for research on acid hydrolysis and ethanol production.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Smita Mascharak	Project Number J0517
Project Title Chemically Probing the Legitimacy of Ancient Herbs as Alternative Medicine	
Abstract Objectives/Goals Cascara Sagrada and Senna are herbs that have been used as laxatives by ancient cultures. The purpose of this project was to establish the legitimacy of these two ancient herbs as alternative laxatives by detecting certain anthraquinones in them. Furthermore, the natural remedies were compared with allopathic over-the-counter cathartics. Methods/Materials The contents of the herb capsules as well as PeriColace and Exlax pills were extracted individually with methanol/water mixtures. The yellow extracts were then individually subjected to HPLC separation on a SpectraPhysics HPLC setup connected to an Alltima "rocket" column. The relative amounts of the two active ingredients, emodin and rhein, were determined by their peak intensity (at 435 nm) and retention times. Both acidic and basic conditions were employed to check modulation of concentrations of these ingredients in the extracts. Results My results showed that the two herbs did have substantial amounts of the active anthraquinones. In fact, after comparing their amounts with those of the over-the-counter pills, it became apparent that the herbs contained higher amounts of emodin and rhein. Alkaline conditions in general improved the extent of extraction of the active ingredients. Conclusions/Discussion Since the natural herbs contain comparable or even greater amounts of the active ingredients emodin and rhein, they are legitimate alternatives as laxatives. Similar experiments can be performed to establish the legitimacy of other natural remedies. However, excessive use of laxatives should be avoided in general due to the carcinogenic properties of the anthraquinones.	
Summary Statement The purpose of my project is to establish the legitimacy of two ancient herbs as laxatives by detecting certain anthraquinones in them by HPLC.	
Help Received I used equipment at UCSC under the supervision of Pilgrim Jackson, a graduate student. He also taught me how to run the HPLC setup. My father, Pradip Mascharak, helped in procuring all the necessary materials (like emodin, rhein and the column).	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Allison N. Matulich	Project Number J0518
Project Title From Here to Maine: Is Tap Water All the Same?	
Abstract Objectives/Goals I wanted to determine if the quality of tap water across the United States varied. My hypothesis was that there will not be any difference in the tap water quality throughout the United States because of the Clean Water Act. Methods/Materials I collected tap water samples from 39 different locations across the United States. I recorded the exact location by latitude and longitude coordinates using a Magellan GPS unit. At each location I collected 2 samples of tap water and tested each sample for total bromine (ppm), chlorine (ppm), pH, and total alkalinity (ppm) using "PoolTime" brand test strips. Results 78 water samples were collected. No bromine was found in 46.15% of the samples. Total bromine samples varied from 0 - 3 ppm. No chlorine was found in 91.03% of the samples. Chlorine samples varied from 0 - 1 ppm. A pH of 6.8 was recorded most frequently (23.68%) in the samples with all samples having a pH range of 6.8 - 8.0. Total alkalinity showed the most variability. A total alkalinity of 0 - 40 ppm was most frequently observed (14.47%). The total alkalinity varied from 0 ppm to greater than 240 ppm. Conclusions/Discussion I found that tap water quality does vary throughout the United States even though the EPA tries to regulate it. My hypothesis was found to be incorrect. Water quality reports from 6 different locations support my findings that tap water quality does differ throughout the United States.	
Summary Statement My project shows that tap water quality for chlorine, bromine, pH and alkalinity varies across the United States.	
Help Received My parents drove me across the U.S. from California to Maine. They purchased the test strips and supplied the GPS unit.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Patrick R. McKeown	Project Number J0519
Project Title Electrolyte Electrolysis	
Abstract Objectives/Goals The objective is to determine whether Sulfuric acid or Sodium Sulfate is a stronger electrolyte in electrolysis (which one causes Hydrogen gas to be produced more). Methods/Materials Equipment needed includes a power source with voltage and current gages, 2 carbon electrodes, 2 test tubes, test tube holders, a large bowl, plenty of distilled water, Sodium sulfate and sulfuric acid as electrolytes. Fill the bowl high enough so that the electrodes are under water with room to spare. Make sure that you fill it the same amount every time. Place electrodes that are connected to power source into water. Put funnels above electrodes to assure all the gas produced goes into test tubes. Add a half gram of one electrolyte and stir to dissolve it for approximately one minute. Fill the test tubes with solution. Place them in the test tube holders and insert them upside down over the electrodes and the funnels into the bowl full of water. Turn on the power and adjust the voltage so that the voltage stays at 25 volts. Measure the amount of time it takes for the tube containing hydrogen to produce 1 and 2 ml of gas from the top of the test tube as noted by a line on test tube. Repeat several times to produce an average time. Continue adding half grams and repeating steps 3 through 5 until you have a total of 6 grams in the water. Repeat steps 2 though 6 with a fresh bowl of water. Repeat all steps with the other electrolyte. Results Results showed that Sulfuric acid was consistently faster than Sodium Sulfate at all amounts of electrolyte added. Conclusions/Discussion In conclusion I discovered that Sulfuric acid was a stronger electrolyte than Sodium sulfate. When measured in inverse time form it was approximately 2.25 times faster than Sodium Sulfate. This might be related to the fact that Sulfuric acid is highly reactant to many substances while Sodium Sulfate is not.	
Summary Statement Adding 2 different chemicals to distilled water and seeing which causes electrolysis to be faster.	
Help Received Mom helped with ideas and suggested improvements, Dad with building the experimental setup. Both helped pour dangerous chemical.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Paul D. McKinney, II	Project Number J0520
Project Title Chillin' Out With Milk: The Effects Fat Has on Freezing Milk	
Abstract Objectives/Goals The objective of my project is to determine if the percent of fat in milk effects the rate at which it reaches zero degrees Celsius. My hypothesis was that the percent of fat in milk does effect the rate at which it reaches zero degrees Celsius. The higher the percent of fat the slower the rate of cooling. Methods/Materials Four common dairy milks were used: Skim Milk(0.02% fat), Homogenized Milk(3.6%), Half and Half(12.25%), Light Cream(20%). A thermometer, a timer, rock salt, ice and 2 containers were also used. A half of a cup of milk was taken and it would sit until it reached ten degrees Celsius. Two and a half cups of rock salt and 12 ice cubes were layered together in one of the containers. Then the cup of milk, with the thermometer in it, was placed into the ice and rock salt. The timer was turned on. When the milk reached zero degrees Celsius, the time was recorded. Three trials were done and the average was taken. Then recorded. This method was done to all four milks. Results My results showed that the least amount of fat in the milk, the least amount of time it took. The Skim Milk(0.2% fat) reached zero degrees Celsius in an average time of 473.3 seconds. The Homogenized Milk(3.6%) took an average time of 583.6 seconds. Half and Half(12.25%) took an average time of 687 seconds and Light Cream took 760.6 seconds on average. Conclusions/Discussion In conclusion, the higher the percent of fat that the milk contained, the more time it took to reach zero degrees Celsius. Therefore, my hypothesis was supported, the percent of fat in milk does effect the rate at which it reaches zero degrees Celsius. The higher the percent of fat, the slower the rate of cooling.	
Summary Statement My project is to find out if the percent of fat in milk effects the rate at which it reaches zero degrees Celsius.	
Help Received Mother helped type Abstract and cut paper. My science teacher, Mrs. McKeown, helped me get my information.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Camille T. Miake	Project Number J0521
Project Title Got Vitamin C? Determining the Relative Amount of Vitamin C in Preserved Fruits using Titration	
Objectives/Goals My objective is to find which method of food preservation retains the most vitamin C content in kiwis and oranges using the titration method.	
Abstract Methods/Materials Nine of the same type of oranges and 16 of the same type of kiwis were preserved 4 different ways, with a sample left fresh. The fruits were frozen, dried, canned, and boiled. A cornstarch-iodine solution was then made, as an indicator solution, by mixing cornstarch, iodine, and water. To perform the titration method the juice of the preserved fruits had to be obtained. To obtain the juice, preserved fruit pieces and water were blended together, then filtered which left the juice of the preserved fruits. The juice was then added to 10 mL of the cornstarch-iodine solution, a drop at a time. After each drop was added, the mixture was stirred, to see if there was a color change. The number of drops required to change the color of the cornstarch-iodine solution was recorded. The results of the tests were normalized to account for the differences in the amount of vitamin C in the kiwis and oranges, and were then compared.	
Results The fresh sample contained the most vitamin C, and the best preserved sample was the frozen fruit. The second best was the dried fruit sample. The third was the canned fruit sample. And finally, the boiled sample contained the least amount of vitamin C.	
Conclusions/Discussion My conclusion is that the different methods of food preservation have a large effect on the vitamin C in fruits. And also that the freezing method was the best at retaining vitamin C, which was my original hypothesis.	
Summary Statement Determining the relative amounts of vitamin C in preserved fruits using the titration method.	
Help Received Mr. Kaleikau helped me to understand the parts of the Scientific Method; Mother helped print papers, research, and assemble board; Father helped cut the board and identify the parts of the Scientific Method; Mariani, Dole, Ocean Spray, and Del Monte for providing information	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Kristina A. Mooradian	Project Number J0522
Project Title Natural "C" Sources	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to determine the relative levels of Vitamin C in 15 fresh fruits and 15 fresh vegetables.</p> <p>Methods/Materials 15 fresh fruits and 15 fresh vegetables were tested using the titration method. The Vitamin C Indicator Solution consisted of distilled water, 5 drops of 2% iodine and cornstarch solution until a dark purple-blue solution was attained. In order to test if the Indicator Solution worked, a 500mg Vitamin C tablet was crushed and mixed into distilled water and added drops of this mixture to the Indicator Solution until it became clear. Prepare each fresh fruit and vegetable liquid mixtures by peeling, measuring each fruit and vegetable (1.5oz), adding equal measure of distilled water to each, blending and straining the juice. Add 5ml of Vitamin C Indicator Solution in each labeled test tube. Then, add one drop at a time of the prepared fruit liquid mixture in each test tube and count the number of drops needed for the purple-blue color of the Vitamin C Indicator Solution to disappear-record # of drops. Repeat 5 times for reliability. The color of the Indicator Solution disappears because Vitamin C breaks down the iodine/starch combination, acting as a reducing agent and oxidizing easily.</p> <p>Results From the 15 fresh fruits tested, strawberries ranked the highest in their concentration of Vitamin C. From the 15 fresh vegetables tested, Romaine lettuce ranked highest in Vitamin C concentration. Strawberries, blueberries, kiwis, grapes and pineapple contained the highest concentrations of Vitamin C among the fruits. Fruits containing moderate amount of Vitamin C included tangelos, oranges, bananas, grapefruits and lemons. Fruits containing the lowest amount of Vitamin C included tomatoes, green apples, peaches, pears and cantaloupes. The vegetables that had the highest levels of Vitamin C were Romaine lettuce, mushrooms, asparagus, broccoli and green peppers. The 5 vegetables with moderate amount of Vitamin C included spinach, onions, green beans, cauliflower and carrots. The 5 vegetables with least amount of Vitamin C included potatoes, Italian zucchini, celery, eggplant and cucumbers.</p> <p>Conclusions/Discussion The fruit with the highest level of Vitamin C is Strawberries. The vegetable with the highest concentration of Vitamin C is Romaine lettuce. Findings from this experiment could be beneficial for those individuals who want to increase or decrease their intake of Vitamin C.</p>	
Summary Statement To determine relative levels of Vitamin C in 15 fresh fruits and 15 fresh vegetables.	
Help Received Mother helped with data analysis; brother helped with computer use.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Janna E. Nikkel	Project Number J0523
Project Title Can Chelating Calcium Improve Circulation?	
Abstract Objectives/Goals The reason I became interested in chelation is because I have an uncle who has diabetes that has caused him to have poor circulation in his legs. Chelation was a treatment mentioned to him that could improve his circulation. Objective: My objective was to find out if EDTA could chelate calcium. I hypothesized that calcium could be chelated. Methods/Materials I chose to chelate eggshells because of their calcium content. For my control trials I placed one eggshell in each of the three jars that contained 100ml of sterile water. Then I took another three eggshells and placed each of them in a jar of 100ml sterile water with 3 grams of EDTA. I noted the changes in the eggshells over a period of fourteen days. Results 1. For my three control trials I observed no changes in the three eggshells that were just in sterile water. 2. For my three trials with the eggshells in EDTA I observed great changes. I observed the edges of the three eggshells had dissolved, leaving only the membrane. Also, the three eggshells thinned and had a soft, slimy feeling. However they did not dissolve completely. Conclusions/Discussion 1. The eggshells dissolved because the molecule of EDTA freed its two hydrogen atoms that then allowed the calcium atom to latch on to where the hydrogen had been. 2. After chelating the eggshell for fourteen days the changes were getting to be minimal. This was because there was only a certain amount of EDTA so there could only be a certain number of hydrogen atoms to chelate the calcium. Therefore the chelation process could not go on indefinitely. 3. If calcium deposits cause atherosclerosis disease then I think it is a possibility that it could be treated successfully with chelation treatments since I have observed that calcium can be chelated.	
Summary Statement My project shows that EDTA chelates calcium and how that could possibly be related and beneficial for treating atherosclerosis.	
Help Received My mother helped me understand chelation and atherosclerotic disease; Dr.J. advised me about my procedure.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Kelly L. Painter	Project Number J0524
Project Title The Effects of Leavening on Baked Goods	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this project was to find out the effects baking soda and baking powder have on the taste and texture of baked goods.</p> <p>Methods/Materials First, I found a cake recipe and a biscuit recipe. Then I doubled, left out, or kept the leavening agent the same as in the original recipe. The experiment involved measuring the height and the texture of the cakes and biscuits. This was done by recording the height of the item after baking and performing taste tests to determine texture differences.</p> <p>Results The double cake recipe did rise the most, but fell on cooling, while the original recipe maintained its height. Both the double and the original tasted similar, the only difference was the texture. The double biscuit recipe rose slightly higher than the original, but the taste tests favored the original recipe. Both the recipes where the leavening was left out did not rise and were very doughy.</p> <p>Conclusions/Discussion The data both proved and disproved my hypothesis: I think the original recipes will rise and taste the best. I learned that leavening agents are very important to make baked goods rise and give them the preferred texture.</p>	
Summary Statement The effects of leavening agents on the taste and texture of baked goods.	
Help Received Mother assisted me in baking, taste testing, and taking pictures; Father helped taste test	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Daniela Z. Parker	Project Number J0525
Project Title Are All Reds Red?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project was to determine if all reds contained the same pigments and had the same physical characteristics.</p> <p>Methods/Materials I ran a simple paper chromatography test using BAW (butanol, acetic acid, and water) and water on isopropanol extracts of red ribbon, rose, tulip, carnation, ginger, and ripe jalapeno pod. I used a spectrophotometer to look at the solutions and determine if they had the same absorption patterns.</p> <p>Results The first observation that I made was that the isopropanol extracts varied. The next observation that I was able to make was that the different solvents that I used for my paper chromatography produced different chromatograms. I found from my paper chromatography tests that each of the red extracts were made up of different colored pigments. When I looked at my chromatograms under UV (ultraviolet) light I was able to see differences from when I looked at the same chromatograms under visible light. I looked at my extracts using a spectrophotometer, and found that the extracts all had unique absorption patterns. Some of my extracts did have peaks in similar places, but the height of those peaks differed. I used R(f) (ratio of fronts) to show that the extracts contained similar patterns of pigmentation.</p> <p>Conclusions/Discussion From this research I was able to conclude that all reds are not made up of the same pigments. I was able to prove this through paper chromatography, R(f)s, and spectrophotometric analysis.</p>	
Summary Statement The purpose of this project was to determine whether all reds contained the same pigments	
Help Received I used the lab space and equipment of Dr. Zavala from California State University Northridge.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Scott R. Reynolds	Project Number J0526
Project Title Need Energy? Got Calories?	
Objectives/Goals To see how many calories are in the foods I eat.	
Abstract	
Methods/Materials A can and a test tube to make a calorimeter, 8 grams of water, cork and needle stand to burn the food, stopwatch, thermometer to measure the water temperature, gas lighter, variety of foods, camera, and a scale to measure the mass of the food.	
Results I found there was a temperature change in the water due to calories being burned in the different foods. I used the following formula to determine my results: Change in temperature of the water x specific heat constant of water x mass of water = calories of heat. 1000 heat calories = 1 food calorie. I showed my results on a graph.	
Conclusions/Discussion I was able to determine how many calories were in various foods by burning them. I was able to compare the calories per gram of different foods.	
Summary Statement My project is about burning foods to see which food has the most calories per gram.	
Help Received Used beaker, test tube, calimeter can, scale, thermometer from Big Bear High School.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Nina E. Rosen	Project Number J0527
Project Title Are Your Fillings Leaking? Comparing Leakage of Three Dental Filling Materials Exposed to an Acidic Diet Soft Drink	
Abstract Objectives/Goals The goal of this experiment was to compare three commonly used dental filling materials to see if they would leak after prolonged exposure to an acidic sugarless soft drink, in this case Diet 7-Up. Methods/Materials Silver amalgam, light-cured composite resin and self-cured glass ionomer fillings were placed in preparations made in extracted wisdom teeth. They were kept in Diet 7-Up which was changed daily for fourteen days. At the end of fourteen days the teeth were stained and then sectioned to see the penetration of the stain into the cavity preparation. Results Results were: Neither composite filling leaked. One of the two silver fillings showed slight leakage. Both glass ionomer fillings leaked extensively. Conclusions/Discussion This project showed that the newer composite resin fillings resist acid at least as well as silver amalgam. However, this answer brings up more questions. For example, what would happen if sugar and bacteria were added in a future experiment? Also, even though it was not part of the experiment, it was interesting to see how the Diet 7-Up dissolved the enamel of the teeth.	
Summary Statement I wanted to find out if fillings would leak if they were exposed to a sugar-free soft drink.	
Help Received Father supplied materials, office equipment and instruction. Mother helped with display background.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Tiffany B. Russell	Project Number J0528
Project Title Growing Crystals: Nature's Gems	
Abstract Objectives/Goals The purpose of my project was to determine if temperature has an effect on crystal growth. I predicted that crystals grown in colder temperatures would grow faster but less regularly than those grown in warmer temperatures. Methods/Materials I used two methods to grow crystals: closed jar and evaporation. For the closed jar method, I put two jars each of aluminum potassium sulfate (alum) and magnesium sulfate (Epsom salt) supersaturated solutions in three temperature environments: 78 F, 58 F, and 38 F. Before sealing the jars, I suspended paper clips to provide a surface for crystal attachment. In the evaporation method, I placed two jars of alum in each temperature environment. For this method, I suspended seed crystals in open jars. Results The colder the temperature was, the larger, heavier, and less regular the crystals were. The crystals grown in the different temperature zones varied considerably, but these differences could be most clearly see in the Epsom salt crystals. Conclusions/Discussion These experimental results supported my hypothesis. Therefore, when growing crystals, it is preferable to grow them in warmer environments, even though the rate of crystal growth will slow, because the crystals will be more regular. This finding is important because of the widespread use of synthetic crystals in electronic and optical devices.	
Summary Statement My project explores the effect that temperature has on the growth rate and regularity of aluminum potassium sulfate and magnesium sulfate crystals.	
Help Received My father supervised the preparation of the supersaturated solutions. My parents purchased the solutes.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Danielle Salt	Project Number J0529
Project Title Cigarette Filters: Do They Really Work?	
Abstract Objectives/Goals My objective was to see how much of a difference there was in tar and smoke particulates inhaled from the smoke of ultra-light, filtered, and non-filtered cigarettes. In addition, I wanted to determine the quantity of smoke inhaled by a nonsmoker from second-hand smoke. Methods/Materials I assembled a filtering apparatus with a vacuum pump that pulled the smoke from a lit cigarette through a paper filter, which I weighed to determine the amount of tar and smoke particulates in each type of cigarette. I also calculated the percentage of a cigarette theoretically smoked by a nonsmoker in an eight hour day in a room with a smoker. Results There was a significant difference between the milligrams of tar and smoke particulates in the ultra-light, filtered, and non-filtered cigarettes, with Marlboro Ultra-lights at an average of 64.7 mg, Marlboro Filtered at 96.6 mg, and Camel Non-filtered at 157.9 mg. The calculated results for milligrams of tar and smoke particulates inhaled from second-hand smoke from an ultra-light cigarette was 7.6 mg, a filtered cigarette was 8.32 mg, and a non-filtered cigarette was 13.39 mg over an eight hour period of time. Conclusions/Discussion In conclusion, ultra-light cigarettes contain the least amount of tar and smoke particulates when inhaled and are the safest of the three types of cigarettes that I tested. They also put the least amount of risk on smokers and nonsmokers that are inhaling second-hand smoke. Filtered cigarettes are also safer than non-filtered cigarettes for the same reasons. Also, secondhand smoke is not as dangerous as many are led to believe, based on my research and calculations.	
Summary Statement I measured the milligrams of tar and smoke particulates in ultra-light, filtered, and non-iltered cigarettes, as well as quantifying the milligrams of tar and smoke particulates inhaled from second-hand smoke by a nonsmoker in eight hours.	
Help Received Father assisted with experiments and calculations.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Patrick L. Selsted	Project Number J0530
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Project Title
Vinegar pH and CO(2) Production in the Reaction with Baking Soda

Abstract

Objectives/Goals
My question was "how does the pH of different types of vinegar affect the amount of CO(2) produced when mixed with a fixed amount of baking soda." My hypothesis was that the amount of CO(2) produced would be directly related to the pH of the vinegar.

Methods/Materials
Materials:

1. baking soda	3. pH meter	9. plastic tube	15. pipettes
2. vinegar white	4. electronic balance	10. 1-hole stopper	16. pipettor
apple	5. weighing boats	11. rubber sleeve	
balsamic	6. side arm flask	12. long balloons	
rice	7. Petri dish	13. 400 ml beaker	
	8. rubber bulb	14. 500 ml cylinder	

Methods:

1. Measure and record the pH of each type of vinegar.
2. Mix 2 grams of baking soda in the sidearm flask with 8 ml of each type of vinegar.
3. The CO(2) that was produced was collected in a balloon.
4. The chemical reaction was allowed to continue for 3 minutes and the balloon was tied.
5. The balloon was submerged in a water-filled beaker, and the amount of water displaced was measured with a graduated cylinder.
6. This procedure was repeated three times for each of the four vinegars.

Results
The pH's of the four vinegars franged from 2.55 to 3.18: white (2.55), rice (2.72), balsamic (3.05), apple (3.18), but there was no correlation between the pH of the vinegar and the amount of CO(2) produced.

Conclusions/Discussion
The acidity as measured by pH was not related to the amount of CO(2) produced. Therefore, my hypothesis, that the amount of carbon dioxide released would be directly related to the pH, proved to be wrong.

Summary Statement
I tried to show that the pH of different vinegars would predict how much carbon dioxide would be generated when reacted with baking soda.

Help Received
My father helped me set up the side arm flask and he showed me how to use the pH meter and the balance. This was done in my father's microbiology lab at UC Irvine.



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Chelsia Unland; Malakai Unland	Project Number J0531
Project Title How Do the Enzymes in Laundry Detergent Affect the Protein in an Egg?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of the project was to observe how the enzymes in laundry detergent affect the protein in egg whites.</p> <p>Methods/Materials The experiment consisted of placing prepared eggs in containers filled with 525 ml. of water. Next, we put 15 ml. of Tide laundry detergent in one container and labeled it "Enzymes". Then, we put 15 ml. of Woolite laundry detergent and label it "No Enzymes." In the third container there is just water in it, we label it "Control." For seven days we observed them and record data.</p> <p>Results The egg with the enzyme detergent, slowly broke down into a sludge like mixture. The egg white expanded but remained smooth. Average size of all eggs started at 43 mm. Enzymes detergent ending size- 39.545 mm. No enzymes detergent ending size- 44.091 mm. Control water only ending size- 45 mm.</p> <p>Conclusions/Discussion Our hypothesis was correct. The Enzyme detergent did in fact breakdown the egg white, which contains the protein. The egg with "No Enzymes" detergent was not harmed at all, but it did expand. We believe the egg expanded due to osmosis; we also believe, the "Control" egg expanded as well due to the same reason. We found that the deterioration, in the eggs continued over time. Variables: laundry detergent with enzymes and without, egg holder verses no egg holder, egg rotation. We tested these variables and all variables proved to make a difference to the degree of deterioration.</p>	
Summary Statement This project proves that the enzyme named Carazyme found in laundry detergent does breakdown proteins.	
Help Received Mother edited grammar, Father suggested display construction method, Audry and Logan Creighten explained how to do a science fair project.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Gautam S. Vaidyanathan	Project Number J0532
Project Title Which Commercial Ibuprofen Tablet Has the Greatest Dose Variation?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to assay Ibuprofen in commercial Ibuprofen tablets by High Performance Liquid Chromatography in order to determine which brand of commercial Ibuprofen tablet has the greatest dose variation.</p> <p>Methods/Materials Four brands of Ibuprofen caplets (200 mg), namely, Motrin, Advil, Sav-On, and Kirkland were chosen. Ten caplets from each brand were tested for Ibuprofen content using High Performance Liquid Chromatography. The assay procedure as described under the monograph for Ibuprofen Tablets in the United States Pharmacopeia was followed with minor modifications. The percent assay, standard deviation and relative standard deviation were calculated for each brand. The RSD values were compared.</p> <p>Results The percent assay value, for each of the ten caplets tested, for all brands of Ibuprofen, was within the specification required by the USP monograph. The Advil brand of Ibuprofen caplets had the highest relative standard deviation for percent assay values at 1.64. Motrin had the lowest RSD at 1.07. Thus, the brand of Ibuprofen that had the greatest dose variation was Advil.</p> <p>Conclusions/Discussion I thought that large pharmaceutical companies, which manufacture Motrin and Advil, most probably spend more money on optimizing their manufacturing process. Through this optimization they will be able to achieve more accurate amounts of Ibuprofen and hence have a small dose variation. Of the other two generic brands, I hypothesized that the Kirkland brand would have a greater dose variation than the Sav-On brand because Sav-On is a pharmacy while Kirkland/Costco sells many different products. However, my data did not support my hypothesis. Advil brand of Ibuprofen had the greatest dose variation.</p>	
Summary Statement To determine which commercial Ibuprofen tablet has the greatest dose variation.	
Help Received used laboratory facilities, equipment, and instruments at GRAM Laboratories, Inc. under the supervision of my father, Rajaram Vaidyanathan. My father helped me type the report.	



CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s) Corey J. Willis	Project Number J0533
Project Title The Isolation and Characterization of Lavender Essential Oils	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals NMR (H-1; C-13) spectroscopy was used to characterize the essential oils isolated by steam distillation from lavender Grosso, Provence, Angustifolia, and a blend, to determine if there are any chemical markers in the pure oils so that blends can be made into consistent bulk material .</p> <p>Methods/Materials Unique chemical markers can be identified in essential oils by analytical techniques and used to characterize blends of oils. The essential oils from Lavendula grosso, provence, and angustifolia were isolated by steam distillation. NMR spectroscopy (H-1 and C-13 NMR) were used to analyze the essential oils and the commercial oil blend of the oils. NMR chemical a shift differences and peak heights were compared between each sample.</p> <p>Results The C-13 and H-1 NMR spectra of the pure essential oils from L. angustipholia, provence, and grosso were very similar. There were a few differences however. The H-1 NMR spectrum of L. angustipholia and grosso had a unique peak centered at .85 ppm that was present in only trace amounts in the spectrum of L. provence. The H-1 NMR spectrum of L. provence had a unique peak at 1.64 ppm that was present in only trace amounts in the spectrum of L. angustipholia and grosso. There were more pronounced differences in the ratio seen in each of certain peaks that were present in each of the samples. There were several peaks observed in the C-13 NMR spectra of L. grosso. There were a number of peaks that were not present in the spectra of L. angustipholia and provence.</p> <p>Conclusions/Discussion The NMR results provide that the blend contains all three essential oils. It is more difficult to determine the relative amounts of each essential oil in the mixture. The data of peak height ratios suggest that L. angustifolia is a major component of the mixture.</p>	
Summary Statement NMR (H-1; C-13) spectroscopy was used to characterize the essential oils isolated by steam distillation from Lavendula grosso, provence, angustifolia, and a blend, to determine if there are any chemical markers in the pure oils.	
Help Received Fred Brittle, Rancho Alegre Lavender Farm, Pescadero, California for supplying the lavender stocks; UC Santa Cruz, Chemistry Dept. Teaching Labs for supplying distilation glassware; Mr. Jim Loo, NMR Facility Manager, UC Santa Cruz Chemistry, for obtaining the NMR spectra and explaining NMR; Mr.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) ChristyAnna F. Zimmerman	Project Number J0534
Project Title Oxygen Levels and Burn Time	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Question: How fast will different objects burn in different levels of oxygen? Will the objects burn faster with more oxygen? What is the effect of oxygen levels on burn time? Hypothesis: If the oxygen levels are increased, then the objects will burn faster and less will be left of them. When there is more oxygen, the fire will burn more. I also think that less of the material will be left after burning in higher levels of oxygen.</p> <p>Methods/Materials Materials: ~1)15 2x2 inch squares of 100% cotton, 100% acetate, 100% non-flammable polyester and paper ~2)15 1/2 x 1 1/4 inch pieces of wood ~3)glass jar with metal lid that has 2 holes drilled into it ~4)6 foot long piece of plastic tubing ~5)low pressure inflator adapter ~6)pressure reducing valve ~7)plastic tubing adapter ~8)3 scuba tanks, one with 21% oxygen, one with 28% oxygen and one with 35% oxygen ~9)set of scuba regulators ~10)lighter ~11)stopwatch Procedure: Begin pumping oxygen into jar. Place material in bottom of jar. Ignite the material and time how long it burns until it extinguishes itself. Perform 5 trials with each material in each level of oxygen.</p> <p>Results I found that paper burned fastest in all air levels. Some burn times increased but more of the material was being burned. The materials were able to burn faster and/or more due to the increased oxygen levels. Non-flammable polyester, which would not ignite in 21% oxygen, would ignite when the oxygen level was raised to unnaturally high levels. At 35% oxygen, everything was reduced to ashes. At 28%, some things were still recognizable. At 21% oxygen some materials barely burned and most of the object was left.</p> <p>Conclusions/Discussion When the oxygen level increased, for the most part, burning times decreased. The lowest average times for all the materials were in 35% oxygen. As I raised the oxygen level, things were able to burn more and burn faster. In 21%, the polyester only melted but once it got to 28% it burned and in 35%, it was barely recognizable. In part my hypothesis was correct but in 28% oxygen, most times were higher than in 21%. Overall, the higher the oxygen level is, the faster and more objects will burn.</p>	
Summary Statement The higher the oxygen level is, the faster and more objects will burn.	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Michele K. Jenkins	Project Number J0599
Project Title Do pH and Ingredient Ratio Levels Affect Fruit Peel Mixtures Used to Preserve Plants in Freezing Conditions?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my project was to see if the pH and the peel-to-water ingredient ratios in my mixture would affect its performance level on plants in freezing conditions.</p> <p>Methods/Materials I used 3 different types of peels, lemon, lime, and orange, and 9 different ratio levels. I made the mixture by combining a water level and a peel level in a blender on "Liquefy" setting for 8 seconds. After this was done, I froze 100 drops of the mixture on a foil board for 3 minutes. I then found the top freeze resistant mixture from each peel type against the control of water. When the data had been recorded, I used the 3 mixtures for another experiment. For the second section of my project, I used 2 different types of Viola plants (Sorbet Blueberry Cream and Sorbet Coconut), the 3 mixtures, and water as a control. I sprayed 2 of the Viola plants with each mixture, 1 with plain water, and one with nothing. I then froze the plants for 3 hours, and let them thaw for 1 hour. When this was done, I recorded the data to see the progress.</p> <p>Results The best performing mixture from the first section of my experiment was the lemon mixture. It also performed the best in the second section of the experiment. The least effective mixture in the first and second section was the orange mixture</p> <p>Conclusions/Discussion The results of the first section of my experiment mostly supported my hypotheses. The first part of my hypothesis stated that pH levels would not have an effect on freezing rates. I was correct. The second part of my hypothesis stated that ingredient ratio levels would have an effect on freezing rates. This also proved to be true. In the third part of my hypothesis, I believed that the most freeze-resistant fruit peel mixture overall would be the lemon peel plus water dilution with the greatest peel-to-water ratio. This was again true. The final segment of my hypothesis said that the least effective dilution would be the lime mixture with a high ratio of water to peel because the water level would be too high, causing it to freeze more quickly. This part of my hypothesis was incorrect. The fastest freezing mixture was actually the orange peel dilution with 1/2 cup of peel to 3/4 cup of water.</p>	
Summary Statement My project is about the effects of pH and concentration levels in fruit peel mixtures used to prevent freezing in plants.	
Help Received Mother helped type reports; Grandma cleaned supplies and helped glue board	