

*Midwood High School
Research Program Science Fair
2015*



Cover design by Carmine See, class of 2015



2015 Midwood High School Science Fair

28 May 2015 — 3:30 to 5:30 PM

Michael McDonnell — Principal
Tovia Rosenfeld — Assistant Principal
Glenn Elert — Research Coordinator
Jennifer Sullivan — Research Teacher
Jessica Ross — Research Teacher
Stacy Goldstein — Research Teacher
Shaniece Mosley — Research Teacher

Timeline

Period 3–9

Sophomores park boards in A214 (Research Room)

Sophomores deliver snacks, drinks, plates, etc. to A300 (Physical Science Office)

1:55 PM (Period 9)

Junior and Senior judges congregate in library

Junior and Senior tasks are explained

Junior and Senior judging packets distributed (time to read abstracts)

2:45 PM (Period 10)

Scheduled classes on 3rd floor annex moved to main building

Junior and Senior judges perform assigned tasks

Guest judges arrive and pick up judging packets from Mr. Elert (3:00~3:30)

3:30 PM (Period 11)

Sophomores move to assigned rooms, boards already in position

Sophomores given time to make adjustments to boards and self

Judging begins at 3:45~4:00

5:00~5:15 PM

Judges return to A214 (Research Room) with completed packets (calculators available)

Judges given color-coded food tickets

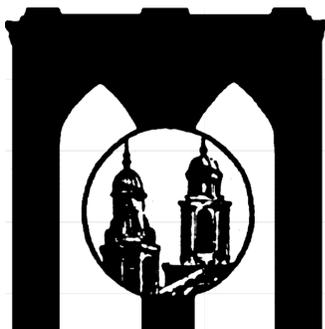
Sophomore teachers provide students with color-coded food tickets

Sophomores return boards to A214 (Research Room)

5:00~5:15 PM

Food self-service in A313 (Physics Lab) in groups of 20~30 by ticket color

Juniors and Seniors assist with clean up



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Judges

Alumni

Christopher Ayala, Shahodat Azimova, Natasha Babar, Allen Barbarovich, Roxana Bravo, Yasmine Brown-Williams, Anna Chen, Matthew Chin, Ramsha Farooq, Igor Goldvekht, Tasnim Halim, Stefanie Henry, Jasmine Lam, Aviva Laurenti, Clarice Lee, Wendy Lee, Jessica Liang, Dao Quan Lin, Tiffany Loi, Wenona Lok, Tiffany Lui, Cynthia Ly, Gabrielle Lynch, Tiffany Mai, Anastasiya Matveyenko, Emily Ng, Michael Ng, Nicole Ng, Vivian Ng, Chukwunonso Nwasike, Francisca Onyiuke, Mercy Palomeque, Akeem Pinnock, Ifrah Saleem, Zainab Saleem, Almas Shafiq, Adam Soliman, Crystal Soo, Evelyn Veliz, Vickie Wu, Emilee Yang, Andy Yee, Prianka Zaman

Teachers

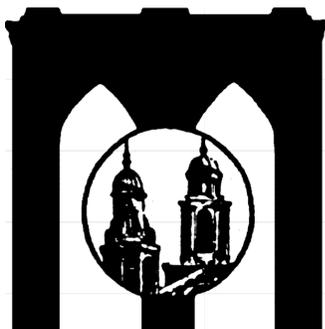
Mary Bomba (retired), Elizabeth Fenamore, W Tong Lung, Denise Aubrey (retired), Howard Spergel

Seniors

Muhammad Abdulla, Rolens Ambroise, Charlynn Trish Ben, Hussain Bokhari, Donald Ceus, Aarin Chase, Colleen Chasteau, Cindy Chee, Samantha Chee, Vivian Cheng, Ikechukwu Egbunam, Valeriya Falkovich, Jacquelyne Gilman, Mohammed Hasan, Syeda Hillary, Xiaoyan Hu, Shanna Huang, Zainab Iqbal, Taulant Kastrati, Melissa Lee, Lucy Lin, Meghan Ng, Monique Powell, Saba Sakhi, Patrice Sanderson, Carmine See, Samar Syeda, Wenli Wang, Yukie Wong, Richard Wu, Raymond Yu

Juniors

Yusra AbdurRob, Mie Abouelkheir, Laila Akallal, Urooj Ansari, Alexandra Auteri, Bilal Azhar, Kieran Bissessar, Nadia Brijmohan, Leutrim Cahani, Xiao Jun (Gloria) Cao, Mohammed Chowdhury, Roshan Chudry, Matthew Chung, Quetourah Dalencourt, Michelle Do, Doris Etienne, Hussein Fardous, Zachary Feinstein, Q.Q. (Venus) Fu, Daniel Guobadia, Jinyan Huang, Xiao Ying Huang, Emily Hui, Nikola Iberle, Sana Ilyas, Rumsha Javed, Moomitu Kashem, Jessica Lauv, Asia Le, Shang (Chris) Lee, Victor Lee, Nga Ying Lo, Christine Ly, Nikolas Magloire, Maya Miller, Max Miloslavsky, Zaw Naing, Osarhuwense Otasowie, Joseph Parziale, Josh Pilipovsky, Joselyne Pimentel, Diana Polonska, Abrar (Abe) Rais, Daniel Rebibo, Shanayah Renois, Kai Saunders, Colleen Simon, Sayahi Suthakaran, Xiu Ling Weng, William Xie, Lily Xiong, Linda Zhu



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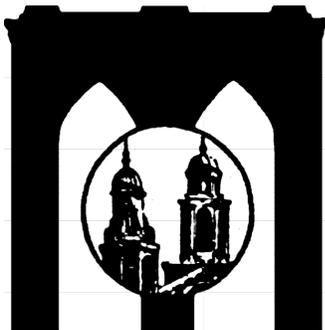
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- 318-18 Deanna Andreyev & Jazmine Remache
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- 318-09 Angel Zou & Jennifer Phu
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Abstracts

314-14 The Effect of Hydrogen Peroxide Concentrations on Hair Strength

Alia Abdelhameed & Danielle LoPresti (Ms. Sullivan – Product-testing)

Hair bleaching is done by mixing bleaching powder with an oxidizing agent known as hydrogen peroxide developer. Peroxide developers are categorized by volumes (10 volume = 3% peroxide, 20 volume = 6%, 30 volume = 9%). This experiment was done to test the effect of different peroxide concentrations on the strength of hair. Synthetic hair fibers were used to simulate the results of actual hair. It was hypothesized that the higher the concentration of peroxide used, the weaker the hair would get and the less force it would require to break. Three different hair colors were used. The hair was first bleached for one hour, remembering to leave a control group unbleached. A test was conducted using the Vernier Force Sensor to test the strength of each strand of hair. Results were recorded in three separate data tables based on color. The results concluded that the higher the concentration used, the weaker the hair got and required less force to rip each strand. The hypothesis was supported.

316-11 The Effect of Active Ingredients found in toothpaste on oral bacteria growth (Micrococcus)

Mahmoud Abouelkheir (Ms. Ross – Product-testing)

This experiment-tests the effectiveness of common active ingredients found in toothpaste on the growth of a specific oral bacterium, *Micrococcus luteus*. Results would determine which active ingredients in toothpaste inhibited growth of the oral bacteria the best, thereby assisting consumers when choosing which toothpaste to buy. Bacteria plates were prepared and disks containing three samples of toothpaste active ingredients were placed onto labeled quadrants. Zones of inhibition were measured for Sodium fluoride w/ Triclosan averaging 24.45 mm, Sodium Fluoride averaging 11.95 mm, and Sodium Monofluorophosphate with 13.6 mm. With the data recorded, ANOVA was conducted and a p-value of 1.3×10^{-20} was determined. This value shows a significant difference between means. The hypothesis was supported as Sodium Fluoride w/ Triclosan was observed to have inhibited the bacteria the best.

316-08 The Effect of a Variety of Milks on the Amount of Lactose Formed

Ilham Ahmed (Ms. Ross – Product-testing)

The purpose of this experiment is to determine which type of milk will have the most amounts of lactose crystals. Lactose is a carbohydrate in different milks and it is broken down by the enzyme lactase. A deficiency of lactase makes people lactose intolerant since their body can't digest the milk and they have to drink lactose free milks. The information obtained can help lactose intolerant people choose the milk that suits them best, which is the milk with the least amount of lactose or no lactose at all. Soy milk, Whole milk, and Almond milk were tested to determine the amount of lactose in each of ten trials. The average for soy milk was 0.67 g, for whole milk was 1.06 g, and for

almond milk was 0.3 g. An ANOVA test was performed and the p-value was 4.952E-09, thus the null hypothesis is rejected. As a result, almond milk had the least lactose amount, whereas whole milk had the most lactose amount. It is best for lactose intolerant people to drink almond milk, not soy or whole milk.

320-05 A Cold Case: Changing the Freezing Point of Water

Abigail Akyeampong

(Ms. Sullivan – Chemistry)

After snowstorms trucks drive in the streets pouring salt on snow and icy roads. Why? It is done because salt lowers the freezing point of water which is known as freezing point depression. Freezing point depression means a solution will freeze at lower temperature than a pure solvent. The purpose of the experiment was to see if freezing point of water will vary if concentration levels of salt in it changed. I hypothesized that as the concentration level of salt increased, the freezing point of the water will lower. To start, 20 ml of water in a test tube was placed in an ice bath and checked often until ice crystals formed and temperature was recorded. The experiment was repeated but 1-6 g of salt was added to the 20 ml of water. The results showed that as salt concentration levels increased, the freezing point of the water lowered and took longer to freeze. In the end, the hypothesis was supported and it was concluded that the more salt you add to water the lower the freezing point is.

314-13 Determining Levels of Vitamin C in Pulp Juice vs. No Pulp

Salma Ali

(Ms. Goldstein – Chemistry)

The amount of Vitamin C in orange juice with pulp and orange juice without pulp were tested in this experiment. An iodine solution was created and used as an indicator and helped with the titration method. According to the results, the no pulp orange juice reaches endpoint faster than the pulp orange juice and therefore had more vitamin C. The t-test results show a significant difference between the variables. The t-stat result was 8.7 which is greater than 95% which is 2.10.

318-18 Music's Effect on Heart Rate

Deanna Andreyev & Jazmine Remache (Ms. Ross – Medicine & Health Science)

The purpose of this experiment was to determine how music affects a person's heart rate. The hypothesis was that the song with the fastest tempo would increase heart rate most. 30 females ages 15 to 16 were gathered. This was done to prevent any additional factors such as gender or age from influencing the results of the experiment. Heart rates with no music were recorded as control and test subjects listened to four songs for a minute each. Heart rate was recorded after each song. An ANOVA test was performed and the p-value was 1.12E-05. This meant that the data had a significant difference. Averages of the groups were compared to the control. Control had 76.2 bpm, the slowest song had 73.06 bpm, the second slowest song had 72.1bpm, the fastest song had 83 bpm, and the second fastest song had 80.1 bpm. The hypothesis was supported because the song with the fastest tempo did increase heart rate the most.

316-14 Henna Mixology

Noor Asif

(Ms. Ross – Product-testing)

The purpose of this experiment was to test which methods produce the darkest and longest-lasting henna stain. If lemon is added, then its acidic properties will help create the darkest longest-lasting palm stain and honey the richest wrist stain. Henna was applied to the subjects' palms and wrists (control = only henna applied; 3 experimental groups = honey, lemon, and lemon-sugar mixture; 5 trials/group). Stain level and stain longevity were recorded (for stain level: lower number = darker stain). General analysis

of the data was: lemon on henna = darkest palm stain (average = 3.4); either of the experimental products = darker wrist stain (average = 3.8); lemon = longest lasting palm stain (average = 5); honey = longest-lasting wrist stains (average = 5). ANOVA testing showed that stain p-value = 0.002-insignificant; days p-value = 0.386-significant-other factors affected stain longevity. The data supported my hypothesis as the lemon helped create the richest palm stains and the honey the richest wrist stains.

314-02 The Effect of Different Acne Products on the Growth of Micrococcus Luteus

Amna Aslam

(Ms. Sullivan – Microbiology)

Micrococcus luteus is a gram-positive bacterium found on human skin. Acne occurs when the sebaceous gland beneath the skin becomes inflamed when excess oil is produced by the sebaceous gland and combines with dead skin to create a pore. Three different acne treatments were used in this experiment including acne creams such as Neutrogena and Rite-Aid and a natural remedy such as lemon. Neutrogena is clinically proven to be most effective in treating acne and so it was hypothesized that Neutrogena would work best in inhibiting bacterial growth. After spreading bacteria with sterilized materials, discs coated with the acne treatments were placed onto their respective zones on the nutrient agar plates. Average zones of inhibition in mm: Rite-Aid (50.8), Lemon (25.2), and Neutrogena (15.9). Rite Aid was the most effective in inhibiting bacterial growth and the hypothesis was therefore refuted.

320-15 The Strength of Magnetism Under Varying Temperatures

Arbaz Aziz & Dmitriy Kim

(Ms. Goldstein – Physics)

Magnetism is the repulsive or attractive force present in magnetic fields and can change in different temperatures. A study to determine whether or not the changes in temperature will significantly impact the strength of magnets was conducted. Two magnets were used in this experiment, one average and one strong in magnetic strength, under controlled temperatures. A hot plate was used in order to heat up the magnet at 350 °C and a fridge was used in order to cool the magnet in -16 °C. The results indicated a significant difference between the strength of the magnet and a change in temperature, as an increase in temperature led to a decrease in magnetic strength and a decrease in temperature led to an increase in magnetic strength. The ANOVA tests showed that a significant difference (0.00000212 and 0.00000412) was present between the data.

316-12 The Amount of Bacteria in Water

Angela Baraker

(Ms. Ross – Product-testing)

Many students refuse to drink from the fountains of the main building or even filtered water claiming its “dirty”. Thus this experiment is performed to test their claim and question which water is most sterile. The water samples that were used are filtered water, tap water, bottled water (Polar Spring), Annex water and old building water. All the water samples came from the same location for each trial. In addition, distilled water was used for the control. Data for each trial was recorded after a night of incubation at 25 °C. The p-value for ANOVA was .05855776. Furthermore, the data does not support my hypothesis. The most sterile water according to my results was Annex water with an average of 58.8%, whereas filtered water had an average of 90.6%. The next most sterile water is bottled water with a average of 87.8%. Next is tap water with an average of 90.9% and finally old building water with an average of 100%.

316-04 Which caffeinated and decaffeinated teas contain the least and most caffeine?

Ruthbernack Bastien

(Ms. Ross – Product-testing)

The purpose of this experiment is to identify how much caffeine is in caffeinated and decaffeinated teas. Add drops of tannic acid to the boiled teas until precipitate is formed. Gunpowder tea is the control for caffeinated (has a lot of caffeine), and water is the control for decaffeinated (lacks caffeine). It was hypothesized green tea would be most caffeinated and lemon tea would be least decaffeinated due to the acid in lemon tea and the dark herbs in green tea. Caffeinated black tea had an average of 0.028, lemon 0.12, peppermint 0.27, and green 0.16 mL. Decaffeinated green tea had an average of 0.6, lemon 0.67, peppermint 1.01, and black 1.4 mL. ANOVA test showed the p-values were 0.001 (decaffeinated) and 0.004 (caffeinated), so there is a statistical significance. The hypothesis was not supported, black tea was the most caffeinated and the green tea was the least decaffeinated.

316-09 Does the Flavor of Gatorade Affect

Evan Burgos

(Ms. Sullivan – Product-testing)

The experiment in which I conducted was to find out if the flavors of Gatorade has an affect on the strength of the electrolytes it contains. Electrolytes are substances that, when dissolved in a solvent, are able to conduct an electrical current. Most electrolytes are soluble acids, bases and salts. We need electrolytes for our body to maintain homeostasis. Without them our body wouldn't be able to function correctly. The strength of the electrolyte is determined by the strength of the acid, base or salt. To test the different flavors I used a multimeter to find the resistance of the electrolytes from the different liquids that I used (lemon lime, orange and fruit punch flavored Gatorade and tap water). Resistance is an electrical quantity which is based on the ability of the device to reduce an electrical current. Larger the resistance the weaker the electrolyte.

318-03 The Effect of Hydrogen Peroxide on the Enzyme Reaction Rate in Root Vegetables

Montana Cambry

(Ms. Ross – Plant Science)

Research was conducted to discover if hydrogen peroxide speeds up chemical reactions in root vegetables. The experiment included a control and an experimental group of six root vegetables; onions, beets, radishes, potatoes, carrots, and turnips. They were blended to make vegetable peroxidase and refrigerated overnight. For the experimental group, hydrogen peroxide and guaiacol were added to each vegetable peroxidase the next day. The color change for the peroxidase was observed and recorded for each vegetable in intervals of one, two, three, four and five minutes. Lastly, the observations were quantified using a color chart. This procedure was done for the control group without utilizing hydrogen peroxide. A t-test was conducted to find out the value of the time it took for the root vegetables to change color. The t-test value was 1.7 and the p-value was 0.045 proving that hydrogen peroxide has a significant effect on chemical reactions in root vegetables.

320-11 What's in your seaweed?: DNA Barcodes of Different Brands of Seaweed Snacks Commonly Found in Supermarkets.

Jeannine Chen & Jimmy Li

(Ms. Ross – Product-testing)

DNA from seaweed food products were extracted and analyzed to determine whether the seaweed in snack packages is made out of seaweed. It is hypothesized that the majority packages of nori seaweed are made of 100% seaweed. Eight different seaweed snack products were collected from local supermarket. A variety of lab equipment and materials were used. The microcentrifuge, PCR machine, primers and laptop were the most important. After obtaining the sample, the microcentrifuge was used for isolating

the DNA and PCR to make a precise and clear DNA sequence. Two primers were used, one called ITS (a fungi primer) and rbcL (a plant primer). Using DNA Subway, trim, BLAST, MUSCLE, and a phylogenetic tree to draw ancestral relationships. The results show that there were basil (66.75%), yeast (46.93%), fungi (53.85%), and flower (67.71%) within the samples. The percentage shows similarity of the sample to actual sequence of the seaweed. Overall, the seaweed snacks are not 100% made of seaweed.

318-05 Effectiveness of Toothpaste on Shark Teeth

Sabrina Chen

(Ms. Sullivan – Product-testing)

I investigated for the more effective whitening toothpaste, Crest or Colgate, using coffee stained shark teeth. Since Crest toothpaste claimed to fight against plaque using microgranules to allow for more effective cleaning, it was hypothesized that Crest would be more effective. After staining the shark teeth in coffee for 24 hours, daily brushing of the teeth for 30 seconds for each tooth was completed. Recording the shades of each tooth using the teeth shade chart to determine the transitions of coloring of teeth, Crest toothpaste decreased on average of 8 shades down the teeth shade chart, and Colgate with 5.6 shades decrease throughout the experiment. With a t-value of 4.08 for the t-test, 28 degrees of freedom, and over 99% level of confidence, there is a significant difference between the two toothpastes. Therefore, with Crest depicting the greater amount of average decrease of shades, Crest is the more effective whitening toothpaste, resulting in a supported hypothesis.

320-07 The Effectiveness of Mouthwash Against Escherichia coli

Chunny Chi

(Ms. Sullivan – Product-testing)

Escherichia coli is a gram-negative, rod shaped bacteria. It is mostly found in the intestines of living organisms. Mouthwash is a product that is used to improve breath by getting rid of the bacteria that produces the odor. Mouthwash is intended to prevent cavities, prevent gum disease, and soothe canker sores. In my experiment, I tested the effectiveness of mouthwash against Escherichia coli. The purpose of my experiment was to determine which mouthwash would be the most efficient against E. coli. My hypothesis was that Crest would be the best against E. coli. In order to test the mouthwashes and their effectiveness on E. coli, I used the method of product-testing. I used nutrient agar plates, spread the bacteria in them, and used plain discs and dipped them into the distilled water and mouthwashes and put them onto the respective zones on the plate. Due to the t-test value, my experiment was purely based on chance. Therefore, my results were not valid.

318-06 Candy's effect on memory

Elyse Cruz & Lia Gikashvili

(Ms. Ross – Product-testing)

The purpose of this experiment was to test whether candy such as peppermint, or gum affects memory and to what extent. The predicted outcome was that candy affects memory and peppermint candy improves memory more than gum. The method used was a one minute- 10 word memorization test taken by 30 students and have them record words they remember. The trial was repeated twice using peppermint candy and gum. The average of the words remembered without candy was 7.5, with peppermint candy was 8.4, and with gum was 7.7. ANOVA tests and t-tests were performed to find differences between the data. The p-value was 0.132 supporting that there was a statistical difference between the data. t-test results showed there was only a difference between not using candy and using peppermint candy. The major findings were that candy did in fact improve memory and peppermint candy was more effective than gum. The data supports that peppermint candy can in fact be used to improve memory.

316-02 The Effects of Cold Syrup Medicine on Bacteria

Aziza Daniel

(Ms. Ross – Product-testing)

The purpose of the experiment is to see the effects of cold syrup medicines on bacteria. All medicines had a common ingredient. The zone of inhibition was measured in each trial. This showed if the medicine allowed or did not allow the bacteria to continue to grow. Micrococcus was used as the bacteria. It is gram-positive cocci that can be found on human skin and in water and dust. The hypothesis was Delsym will have a higher zone of inhibition. The averages were Control: 6, Delsym: 9.25, Alka-Seltzer: 7.5, Tussin DM: 9.375, Tylenol: 9.5 and Wal-Tussin: 8.5 (measurements in mm). The t-test value between the Control and Delsym was -2.28. The t-test value between Tussin DM and Alka-Seltzer was -2.14. There was no difference in certain groups, but there was a difference between Wal-Tussin and Tylenol. The t-test value between them was 0.89. The p-value of ANOVA was 0.02, which means there is a significant difference. The hypothesis stated was refuted.

320-16 The Effect Different Acne Medications have on E. coli

Leonit Dedushaj

(Ms. Goldstein – Product-testing)

The purpose of this project was to determine which over-the-counter acne medication is most effective at preventing the proliferation of E. coli. To determine this, six petri dishes were made with E. coli, the petri dishes were divided into four sections; one was a negative control where distilled water was used and the other three sections had different acne medications. The results showed that the best the best over-the-counter medication was the Neutrogena Rapid Clear; this conclusion was supported by the ANOVA test done that had a p-value of .01. Since the p-value was less than .05 then the data is statistically accurate, showing that in fact Neutrogena Rapid Clear is most effective. This refuted the hypothesis because it was thought that the PanOxyl would work best.

320-04 The Effects of Gatorade on Speed, Strength and Agility

Ahmed El Sammak & Pablo Napoli Borrero

(Ms. Sullivan – Product-testing)

Gatorade is a common drink among athletes around the world and its job is to rehydrate your body quickly by promoting rapid fluid absorption, ensuring rapid rehydration, and supplying carbohydrate energy to working muscles. The purpose of this experiment was to test if drinking Gatorade before a work-out/game has any sort of effect on speed, strength or agility compared to drinking water. We hypothesized that Gatorade would have little to no effect on athletic performance if drank before starting any physical activity. After experimentation, the average for both groups for speed and agility was 5.4 seconds each and the average for pushups for both groups was 29. Our hypothesis was supported and it was determined that there was no difference between the two data sets, showing that Gatorade had no effect at all. The experiment could be improved by providing more trials for more reliable results and by having the Gatorades and water at the same temperature to prevent any discrepancies.

314-08 Highest Vitamin C Concentration in Different Types of Orange Juices

Sabrina Gorodetsky & Olga Savuk

(Ms. Sullivan – Chemistry)

Vitamin C, or ascorbic acid, is an important nutrient for humans. The acid is found in a lot of foods we consume everyday such as orange juice. Knowing which type of orange juice contains the most vitamin C may affect the choices people make when buying orange juice. It was predicted that freshly squeezed orange juice would contain more vitamin C than bottled and canned orange juice. The juices were tested using phenolphthalein as the base indicator and sodium hydroxide (NaOH) as the base. The

experiment-tested to see how basic each of the juices were. The more NaOH required to reach a color change, the less acidic the juice, thus containing less vitamin C. The average amount of NaOH required to achieve a color change in the canned juice was 3.14 mL of NaOH, the bottled juice was 2.55 mL of NaOH, and the squeezed juice was 1.46 mL of NaOH. The squeezed juice was shown to be the least basic of all the other orange juices making it the most acidic and therefore supporting the hypothesis.

316-05 The Effect of Voltages on Electrified Water and It's pH

Michael Grandel & Erica Levin

(Ms. Goldstein – Physics)

Humans have exploited the natural resources provided and caused dramatic pollution. To cut down on the amount of greenhouse gases released, new cleaner sources of fuel are being experimented with. Hydrogen gas can be used as fuel. Using a battery and salt bridge this experiment produced hydrogen and oxygen gas to mimic the extraction of hydrogen from water. If the hydrogen was collected, it could be used to power vehicles. By having a solution of water and a slow moving salt molecule ($MgSO_4$), the atoms of water react differently to the anode and cathode of the battery which creates an acidic and basic solution and graphite allows for the conduction of electricity. Increasing the voltages, the solutions reached a more acidic and basic solution quicker in the 90 minute time frame.

318-07 The Affect of Antacid on the Ability to Neutralize Acid

Valery Gromova

(Ms. Goldstein – Chemistry)

This experiment was conducted to find out how effective different types of antacids are at neutralizing acid. The experiment was done using three different antacids, 50 mL of each. Each acid was tested to see which would work best in neutralizing the acid build up that occurs during heart burn in many adults. To determine which antacid was the most effective, a laboratory procedure was set up and conducted using three different antacids and lemon juice. Lemon juice is a pH of 2 which is very close to the acidity of stomach acid. 50 mL of each antacid was titrated with lemon juice, one mL at a time until each solution reached an equivalence point. It was concluded that there was no significant difference between all the antacids. The ANOVA test showed no significant difference (0.398603) meaning all antacids neutralized the acid at reasonably close rates.

320-03 Effects of Different Acidity Levels of Vinegar on People with Acid Reflux

Keely Guallpa

(Ms. Sullivan – Biochemistry)

The purpose of this experiment was to compare the acid levels of different vinegars and depending on that which was the most beneficial to people with acid reflux. Three vinegars were used to test their acidity levels, which were apple cider vinegar, rice vinegar and distilled white vinegar. The hypothesis was that apple cider will be the least acidic therefore being the most beneficial to consume for people that have acid reflux. The experiment was conducted using titration and after doing 10 trials per vinegar an ANOVA test was done to compare the results. Since apple cider required the least amount of base to titrate, it was the least acidic therefore the hypothesis was supported.

320-10 Determining how fast the ink travels across the different kinds of paper

Amy Huang

(Ms. Goldstein – Product-testing)

Paper chromatography was used in this experiment to see if different kinds of paper would really affect how fast the ink can travel at a given time. White paper, paper towel and tissue paper were used. The results show that when doing the ANOVA, the p-value is $1.88E-09$ which is less than 0.5 which means there is significance between the tested

items. During the t-test between the paper towel and tissue paper, the value was 35.6 which are significant as it is higher than 99% value at the degree of freedom of 8. For the paper towel to tissue paper, the t-test value was 0.9 which is not significant. As a result, the paper towel does have significance with the white paper but it doesn't have significance between tissue paper. From this experiment what can be learned that paper towel can be used as an alternative as a paper chromatography paper instead of buying the expensive or professional version of it to save time and money.

314-10 How Acids Affect the Rate of Corrosion

Reanna Hyatt

(Ms. Sullivan – Chemistry)

The purpose of the experiment was to test how acids affect the rate of corrosion. Distilled water (pH of 5.6) used as the normal rain model. 1.0 M HCl (diluted to a pH of 2) and CH₃COOH (diluted to a pH of 4) used as acid rain models. Acid rain changes the rate of rusting. Corrosion is an exothermic reaction, so by measuring temperature, it was shown how fast heat was given off to see how fast the reaction occurred. The hypothesis stated HCl will perform the fastest rate of corrosion. For 10 trials, steel wool was soaked in each acid for 30 seconds, then placed in a test tube and covered with a stopper/towel to retain heat. Using an infrared gun, the temp. of the steel wool was recorded every minute for 10 minutes. HCl had the largest overall average of 28.14 °C and had the greatest temp. rise. Both the t-tests involving HCl had a 98% confidence level. The hypothesis was supported, proving the lower the pH of the acid, the faster the rate of corrosion, due to a higher temp. increase.

318-10 The Effect of Different Substances on the Freezing Point of Water

Danielle Itshaik

(Ms. Ross – Chemistry)

The purpose of this experiment was to test which substance (salt, sugar or baking powder) had the greatest effect on the freezing point of water. The hypothesis was that if salt was added to water, it would decrease the freezing point of water to the lowest temperature. To conduct this experiment 100 mL of water was poured into a cup containing 3 g of salt. The solution was mixed, placed in the freezer and its freezing point was recorded. This process was repeated using different amounts and substances. The average freezing point of 100 mL of water mixed with 9 g of salt was -10.8 °C. The average freezing point of 100 mL of water mixed with 9 g of sugar was -5.6 °C. Lastly, the average freezing point of 9 g of baking powder mixed in water was 0 °C. The p-value was 0.0032 which means that the null hypothesis is disproved and that the data is statistically significant. The hypothesis was supported because water had the lowest freezing point when salt was dissolved into solution.

318-01 The Primacy Effect

Zenab Jamil

(Ms. Ross – Behavior & Social Science)

The primacy effect is the tendency to remember items at the beginning of the sequence more than the ones towards the end. The goal is to test the validity of this theory and observe how it affects males and females. The hypothesis was that the primacy effect is prevalent in both genders and that it affects them both similarly. Thus, an equal amount of teenage boys and girls were told to memorize a list with 15 items in 2 trials and state the items they recalled. In the first trial, the list was dictated while in the second trial, they got to see it for 30 seconds. The data showed that 76% of the girls and 74.6% of the boys remembered the first 5 items on the list supporting the primacy effect. The t-test value of 0.477 for trial 1 and 0.626 for trial 2 both showed that there was no significant difference between the two genders, supporting the hypothesis. The data also showed that the primacy effect is more prevalent in both genders when they see the list as opposed to listening to it.

320-12 The Effectiveness of Raw Honey and Tetracycline on E. coli

Jasleen Kaur

(Ms. Sullivan – Microbiology)

Antibiotic resistance is a major problem in the science world due to the development of antibiotic resistant pathogens. This experiment compares the effectiveness of raw honey, a natural antibiotic and tetracycline on E. coli. It was hypothesized that raw honey will be able to inhibit more bacterial growth than tetracycline due to its natural antibiotic qualities of producing hydrogen peroxide. The average results showed that raw honey was able to inhibit 42.2 mm growth of E. coli while tetracycline was able to inhibit 22.7 mm growth. The t-test value of 2.10 showed that there was a statistical difference between the inhibitions of bacteria with a 95% confidence level. Thus, the hypothesis was supported. Raw honey was able to inhibit more bacterial growth as honey doesn't only produce hydrogen peroxide but is also hygroscopic, meaning it can dehydrate the bacteria. Raw honey provides a promising hope in future to fight against the infection of antibiotic-resistant bacteria.

320-01 Endothermic and Exothermic Reactions

Aiza Khan & Devina Li

(Ms. Sullivan – Chemistry)

This experiment shows what kind of reaction, endothermic or exothermic, would occur when everyday household products are combined. An endothermic reaction is when heat is absorbed and there is a decrease in heat in the product. An exothermic reaction is when heat is released, causing products to have more heat. In this experiment, 20 mL of each liquid and 1 gram of each dry ingredient was measured. Then the ingredients were mixed together with their respective liquid and the temperature was taken. The temperature was once again taken after 2 minutes of observing the reactions. The two temperatures were subtracted to get the result which showed either an increase in temperature signifying an exothermic reaction or a decrease signifying an endothermic reaction. The hypothesis was supported in this experiment. The temperature of the hydrogen peroxide and yeast increased by an average of 7.35 °C, while the temperature of vinegar and baking soda decreased by an average of 2.3 °C.

316-16 Outstanding Optics

Sophia Khoja

(Ms. Ross – Product-testing)

The purpose of this experiment was to compare the effectiveness of different brands of sunglasses. This can be beneficial because it will inform people which sunglass will be the most efficient in protecting their eyes. The effectiveness of six different brands of sunglasses were tested using UV beads. The sunglass that had the most amount of UV beads that didn't change color was the most effective. The hypothesis was that the Persol sunglasses would be the most efficient due to its high cost. The results showed that the average amount of UV beads that didn't change color for the Ray Ban sunglasses was 29%, 39% for Cartier, 41% for Persol, 38% for Old Navy, 33% for Guess, and 28% for Aero. Statistical testing supported that there was a significant difference between these averages. Therefore, the hypothesis was supported and the Persol sunglasses was the most effective.

314-03 The Capability of Antibacterial Soap

Terence Kong

(Ms. Goldstein – Environmental Science)

This experiment was used to determine which brand of antibacterial soap works the best in fighting against Micrococcus. The three types of soaps that were used were Palmolive, Soft-soap, and Dawn. My hypothesis was, if I used the brand Dawn, it will have the least bacteria growth on the Petri dish. All materials were obtained and sanitized to limit the source of error. After, obtaining four Petri dishes and dividing

each dish into four sections, each section had its own letter to represent a different type of soap. At the end, 9 Petri dishes were made and the results showed that the brand Palmolive was the best at fighting off bacterial growth. As seen from the ANOVA test, the p-value was 4.17663E-05 which required additional charts such as t-test. After doing all three t-test, they came out to be about 0.12, 1.27, and 1.42. With these values, they were under the 95 percent confidence level so there is no significant difference.

316-13 Density and Nutrients of Fruits vs. Vegetables

Richard Kozak & Rimsha Azhar

(Ms. Goldstein – Plant Science)

The purpose of this project was to determine if fruits are more nutritional and denser than vegetables. The hypothesis was that vegetables are denser and have more nutrients than fruits. Eight fruits and vegetables were chosen (apple, carrot, orange, onion, potato, pear, lemon, and tomato) that could be found easily. Those items were weighed and their volume and ability to float in water was tested using the displacement method. Afterwards, all the data was put together, composed of mass, volume, density, ability to float in water, and nutritional labels. The experiment concluded that there was no significant difference between the densities of fruits and vegetables, but overall, vegetables had a significantly higher amount of nutrients than fruits. The information that was gathered can assist in eating healthier and making better diet choices, but still fruits and vegetables are equally important in a healthy diet.

316-15 The Effect of Different Liquids on Dianthus Flower Growth

Brianna Ku & Michelle Li

(Ms. Ross – Plant Science)

Sugar water, seltzer, microwaved water, tap water and bottled water were used to test the effect of different liquids on Dianthus flower growth. It was hypothesized that if tap water was watered on Dianthus flowers then it would have the greatest growth. Calcium and iron are needed for plant growth and tap water contains these minerals. Sugar prevents plants from absorbing water. The plants were watered daily with 15 mL of liquid, measured in centimeters and kept under a grow light. The plants shrunk over the 10 days. The average height for the control group (tap water) was 8.86 cm, 5.39 cm for the bottled water group, 7.42 cm for the plants watered with microwaved water, 7.43 cm for the sugar water group and 6.03 cm for the seltzer water group. Based on the ANOVA test, the p-value was 8.51×10^{-15} . The hypothesis was not supported because the sugar watered plants had the least decrease in height.

316-01 Accuracy of Sound Apps Compared to a Sound Level Meter

Pauletta Lazarevskiy & Taiseer Uddin

(Ms. Sullivan – Product-testing)

It was hypothesized that sound apps would not be as accurate as a sound level meter because all of the apps stated that they were meant to be used only for entertainment purposes. In this experiment, tuning forks were used to produce sounds that were constant and consistent since the vibration is the same every time the tuning fork is hit against a surface. Devices then recorded the sounds in decibels. The averages of the results were 75.698 dB for the sound level meter, 86.878 dB for the iPhone 4s apps UE SPL and Decibel 10th, 77.156 dB for the Galaxy s3 app Decibel 10th and 81.411 dB for the Galaxy s3 app sound meter. Four t-tests were conducted. 3 out of the 4 apps were determined to not be as accurate as the sound level meter because the p-values were far below .05. Moreover, the levels of confidence of these results were calculated to be above 99%. However, the Galaxy s3 app Decibel 10th had a p-value of .14 and a confidence level of below 90% making the results not significant.

316-10 The Effect of Heat on Seed Germination

Andrea Lee & Rachel Chen

(Ms. Sullivan – Environmental Science)

This experiment was tested to determine if heat had an effect on seed germination. This research could have been applied to crops to see if heat could help farmers increase their harvests with faster seed germination rates. It was hypothesized that the rate of seed germination will increase when more heat is added because beans grow in warm temperatures. In order to test this problem, kidney, lima, red, and black-eyed pea beans were used and microwaved in increments of 0, 10, 20, and 30 seconds. Each group was stored under identical conditions in a moist environment and with no sunlight. The difference in averages of length and weight of the beans were recorded. There was a small significance between the sets of data in both length and weight. The hypothesis was refuted, heat from the microwave did not cause increase the rate of seed germination, but in fact slowed seed germination when exposed for too long.

318-13 Electrolyte Experimentation

Christopher Lee

(Ms. Ross – Medicine & Health Science)

Electrolytes are substances that ionize when dissolved in solvents and controls our body's hydration and more. To find the amount of electrolytes in a drink divide the current (measured by a multimeter) by the voltage. The voltage is 9V due to the usage of a 9V battery. Gatorade will replenish the most electrolytes because it's a sports drink that is consumed by many people during exercise or sports. The 11 drinks that were tested and the resulting amount of electrolytes in the drinks were Gatorade with .591 electrolytes, PowerAde (.584), Sprite (.064), Coke (.155), Simply Lemonade (.129), Simply Orange Juice (.252), Minute Maid Apple Juice (.248), Poland Spring Water (.011), Monster (.402), Red Bull (.196), and Propel Fitness Water (.285). The p-value calculated was 3.7898E-80 which means that the null hypothesis is rejected and the hypothesis created is accepted. After completing 10 trials of each drink Gatorade was the drink that would replenish the most electrolytes in your body.

314-16 Different Dishwashing Liquids vs. Bacteria

Jing Li

(Ms. Ross – Product-testing)

The purpose of this experiment is to determine which dishwashing liquid, Ajax, Palmolive, or First Force (Ultra), will exterminate the most bacteria. The hypothesis stated that Palmolive is best at removing bacteria. In order to carry out the experiment, 0.4 millimeters of E. coli bacteria was evenly spread on the petri dish, and plain discs dipped in 3 dish soaps and the control were put in the plate. After incubation overnight, the zone of inhibition was measured. A larger zone of inhibition indicated a greater effectiveness of dish soap. The results of 10 trials show that Ajax had the largest zones of inhibition, with an average of 11.6 mm. The average zones of inhibition for Palmolive, Ultra, and the control were 10.3 mm, 8.8 mm, and 6.1 mm, respectively. The ANOVA test was done and the p-value was 8.25E-11 (less than 0.05), meaning that the data was statistically significant. This experiment concluded that Ajax is the most effective dish soap among the three.

316-20 The Effectiveness of Garlic Concentrations on Killing E. coli

ShuHui Li

(Ms. Ross – Plant Science)

An experiment was conducted to test the effectiveness of garlic concentrations on killing bacteria. The hypothesis was that higher garlic concentration will kill more bacteria. This experiment required bacteria and 4 different garlic concentrations: 25%, 50%, 75% and 100%. Each garlic concentration was tested for 10 trials. After each trial, the zones of inhibition of garlic concentrations were measured and were compared

among the garlic concentrations. The average of the zone of inhibition for 25% is 12.8, for 50% is 15.6, for 75% is 19.6 and for 100% is 23.1. Also, an ANOVA test was performed during this experiment. It was determined that it has a p-value of 1.22E-05 which is less than 0.05. This shows that there's a statistical difference between the garlic concentrations. Further, the hypothesis was supported because the higher the garlic concentration is, the more effective it is on killing bacteria.

314-09 The Effect of pH on Bean Germination

Elaine Liu

(Ms. Ross – Plant Science)

This experiment-tests the effect of pH on bean germination. The pH scale ranges from 0-14 with 7 being neutral. $\text{pH} < 7$ is acidic and $\text{pH} > 7$ is basic. The hypothesis is that beans will germinate the greatest in pH 7. A total of 90 green beans were tested. Of the 90 beans, 30 were placed in each cup labeled; water, sodium hydroxide, and acetic acid. The pH of each solution was measured by using pH paper. The beans were observed for 11 days and their root in centimeter was recorded. The averages are as follows; 1.672727 cm for water, 0.927273 cm for sodium hydroxide, and 0 cm for acetic acid. The data is significant through an ANOVA test; the p-value is 1.01×10^{-11} . The t-test value for water and sodium hydroxide; water and acetic acid; sodium hydroxide and acetic acid are 4.18, 10.67 and 10.86 respectively. Therefore the data has a statistical difference. The hypothesis was supported; the level of pH does affect bean germination. The results showed that beans germinate the greatest in pH 7.

318-20 How does the pH level affect E. coli and Micrococcus growth?

Lilin Liu

(Ms. Ross – Microbiology)

The purpose of the experiment was to find out how the pH levels affect E. coli and Micrococcus bacteria growth. A total of ten trials were conducted with each bacteria using hydrochloric acid (HCl) and sodium hydroxide (NaOH). The results indicated that HCl worked best with Micrococcus. The average zone of inhibition was 29.9 mm, compared to NaOH with Micrococcus, which was 8.7 mm. The degree of freedom is 19 with a confidence level of 95%. The t-values is 2.101 and critical value is 1.734. Therefore, it is concluded that the hypothesis was supported. Bacteria will grow better in a neutral or basic pH, such as the distilled water and sodium hydroxide. The hydrochloric acid impeded the growth of both E. coli and Micrococcus, but Micrococcus has a more significant zone of inhibition. Further experiments include using a wider range of pH values as well as other types of bacteria.

314-06 The Efficiency of Fermentation with Polysaccharides, Disaccharides, and Monosaccharides

Yasmine Lo

(Ms. Goldstein – Biochemistry)

Fermentation is the process of breaking down microorganisms such as yeast. As sugar ferments without oxygen, carbon dioxide is created. The purpose of this experiment is to determine which -saccharide, a sugar, ferments most efficiently with yeast. Another factor was used to see if higher temperature ferments yeast more efficiently than a lower temperature. 3 -saccharides were used, honey, table sugar, and cornstarch. Yeast and hot/cold water was mixed with each -saccharide and a balloon was placed over the flask that it was in. After 24 hours, the widest part of the balloons were measured. Using hot water with the -saccharides created more carbon dioxide. However, disaccharides with hot water had an average of 20.45 cm, monosaccharides with hot water had 18.75 cm, and polysaccharides had 0 cm. This shows that higher temperatures speeds up the reaction rate of yeast with disaccharides.

318-14 Determining the Amount of Citric Acid of Soft Drinks using Titration

Vivian Luu & Stephanie Tam

(Ms. Goldstein – Chemistry)

The purpose of this experiment was to determine the amount of citric acid within different types of soda using acid-base titration. In addition, the purpose of this experiment was to see if there is a statistical correlation between the amount of acidity within each soft drink. The citric acid within the three types of soft drinks, Sprite, 7 Up, and Sprite Zero was titrated with NaOH. Using the indicator, phenolphthalein to distinguish whether the titration has occurred, color changes of pink to colorless were shown every time more NaOH was added until the acid was fully neutralized creating a light pink color that did not turn colorless when mixed. The hypothesis was refuted because according to the data, the soft drink with the highest concentration in acidity was Sprite as well as there was no statistical correlation between the acidity content in each soft drink.

320-02 The Effect of the Size of Pencil Resistors on the Current in a Circuit

Patrick Matarrese

(Ms. Goldstein – Physics)

The purpose is to determine whether the size of the pencil resistor allows the circuit to give off a larger or smaller current. 5 different sized pencil resistors (double-sided pencils) were used creating a circuit in which the current was recorded. The results of the experiment were the longer the pencil resistor, the larger the current flowing through the circuit. This didn't support the hypothesis that the larger the pencil resistor, the smaller the current in the circuit and vice versa.

316-06 The Electrolyte Challenge: Orange Juice vs. Sports Drink

Joanna Midura

(Ms. Goldstein – Product-testing)

Sports drinks are often known to contain high levels of electrolytes, which we need, to replenish ones that we lose. However, in this experiment, I compared the amount of electrolytes in a Fruit Punch Gatorade sports drink to the amount of electrolytes in Tropicana orange juice. In order to do so, I built a conductance measuring circuit to measure the current of tap water, dH₂O, sports drink, and orange juice. The conductance of each liquid is directly proportional to its electrolyte concentration, so the higher the current of the liquid, the more electrolytes it contains. I calculated the conductance using the formula $G = I/V$. After conducting the experiment, I performed a t-test with the orange juice and the sports drink data, which lead me to reject the null hypothesis, proving that there is a relationship between the two sets of data; that the results aren't random. Then I concluded that orange juice has a significantly higher concentration of electrolytes than the sports drink.

314-20 The Affect of Aerated Water on Yeast Metabolism

Daniel Mirkin

(Ms. Goldstein – Cellular & Molecular Biology)

The project is on the effect of aerated water on yeast metabolism. The aerated water is oxygenated water and has multiple uses in today's world, such as aerator pumps working inside aquariums giving fish more oxygen. This project will be verifying the usefulness of aerated water through yeast and its ability to create CO₂. In the project yeast is put inside sugar water that is aerated and sugar water that is not aerated. Then the Carbon Dioxide that the yeast produces is stored in an inverted graduated cylinder and after 48 hours the volume is found. After three trials for aerated and non-aerated water it was found that the yeast produced more CO₂ with aerated water. The t-test of the data is 1.38. The usefulness of aerated water has been verified

318-12 The Effects of Microwave Radiation on Escherichia coli

HuiYi Ng He

(Ms. Ross – Microbiology)

Many studies were conducted on the effects of electromagnetic radiation on bacteria and other organisms. People do not know if microwaving their foods could have an effect on the bacterium in their food. In this study, it specifically tests the effects of microwave radiation on Escherichia coli (E. Coli). The experiment was conducted by exposing the bacterium to microwave radiation at 18 seconds and 20 seconds. After the five trials of microwaving E. coli for 18 seconds, the average was more than 2,000 colonies. When E. coli was microwaved for 20 seconds, the average was .20 colonies. The t-test was used to determine the data significance, and it resulted with a p-value of .000143, since the p-value is less than .05, the data is significant. Therefore, the data is not due to chance. This experiment supports that there is an effect on E. coli when it is exposed to microwave radiation and it takes at least 20 seconds to kill it.

314-04 The Best Type of Cleaning Agent Against Bacterial Growth

Maricarmen Ng Wu

(Ms. Ross – Product-testing)

This study was to test which of these four cleaners which are distilled water, Windex, Fabuloso, and Mistolin would work best to stop bacterial growth over the course of the day. The hypothesis was that Windex would work best since it contains the most chemicals in it. In the procedure, a handrail was divided into 4 equal parts, and each part was wiped with a specific cleaner. Each section was wiped in the afternoon, and bacteria were collected the next morning at the same time for 10 days. The average colonies of bacteria grown was 5.7 for distilled water, 8.3 for Fabuloso, 8.0 for Windex, and 17.8 for Mistolin. Then ANOVA was used to see if there was a statistical difference. Since $p\text{-value} = 0.001906$ which is less than 0.05, it shows there's a significant difference in the data, meaning the results obtained were not due to coincidence. The hypothesis was rejected because the distilled water had the least number of colonies growing, meaning it worked the best to stop bacterial growth.

320-09 Using Weather Instruments and Folklore to Predict Weather

Allan Nosov

(Ms. Ross – Environmental Science)

Is predicting the weather the old fashioned way close to the accuracy of computer models? The purpose of this experiment is to see whether or not someone can accurately predict the weather for the next day using only weather instruments, knowledge of the clouds (observations), and folklore sayings. The hypothesis was that using instruments and folklore only, this would not accurately predict the weather. Several instruments were built including a barometer, wind vane, and rain gauge, along with a thermometer built in the wall outside the window. Measurements three times a day for a 15-day interval were taken. At the end, the hypothesis proved to be true as for 10 of 15 days, the next-day predictions were not right. For 3 days, the opposite of my prediction occurred. One of the forecasts called for rain and 65 but it turned out to be sunny and 78. The p-value of 0.0451 meant that the numbers were statistically significant. The t-value was 2.09.

318-16 The Accuracy of the Claims Made by Paper Towel Companies

Steven Palacio

(Ms. Ross – Product-testing)

The purpose for this experiment was to test the accuracy of the claims that American paper towel companies make about how their products are the best. The major materials used by paper towel companies is virgin wood pulp which is more absorbent than virgin fiber. The hypothesis for this experiment is that if the companies tell the truth about their products then Bounty Choose a Size will be the most successful in

their claim that they are the best. The procedure for this experiment was to put a single paper into a pan of water and wait 30 seconds to record the amount of water, in milliliters, that it soaked up. The average for Vantage Viva was 26.2 ml, 44.9 ml for Vantage Choose A Size, 37.7 ml for Bounty Basic, and 57.6 ml for Bounty Choose A Size. The ANOVA test taken showed a p-value of $10^{-42} \times 4.00$ which is less than .05. The conclusion was that the data has significant difference which allows the data to support my hypothesis that Bounty Choose a Size was most successful.

316-03 Denaturing Proteins under Heat

Samuel Pun & Anthony Dinh

(Ms. Goldstein – Biochemistry)

The purpose of this experiment is to determine if all proteins denature at the same temperature. Eggs have the protein albumen and powdered milk has the protein casein. To denature their proteins, they were gently heated at a constant temperature. When the texture changes from liquid to solid whites, it has been denatured for eggs and when a skim foam appears on top it has been denatured for powdered milk. From this experiment, the proteins albumen and casein do denature at the same temperature based on our ANOVA test. The value from ANOVA is less than 0.05 and so it's significant. The t-test revealed that there was a correlation between albumen and casein.

314-05 Sunscreen on UV Beads

Marco Ramirez & Mark Dela Pena

(Ms. Sullivan – Product-testing)

Ultraviolet radiation is known to cause negative effects like skin cancer, and damage to the eyes. We are continuously exposed to ultraviolet radiation in the form of sunlight. Choosing the right sunscreen is very important. Every sunscreen has an SPF, but some brands of sunscreen exaggerate their products' effectiveness. This experiment sought to determine which sunscreen sun protection factor (SPF) provides greater ultraviolet radiation blockage for UV beads. Some medical doctors recommend SPF of 30. Thus we hypothesized that sunscreen with an SPF 30 will block greater ultraviolet radiation. The results showed that SPF 30 did have the best protection by having the quickest time at which the UV-Beads returned to their original color. Up and up Sport Sunscreen Lotion with an SPF of 30 was the most effective sunscreen on average and water the least effective. Up and up Sport sunscreen Lotion was 43.39 seconds faster on average than water.

314-18 Rusting Resistance of Nails

Tahir Ramzan & Gary Shum

(Ms. Sullivan – Product-testing)

The purpose of this experiment was to test which variation of nails resists corrosion by measuring its mass change. Corrosion is the process of deteriorating a metal by changing its physical properties through a chemical reaction. Rusting is one type of corrosion that is common in nails and increases the nails mass due to the oxidation that is formed on the nail. This experiment-tested four different types of nails; common iron nails, galvanized nails, vinyl coated nails, and stainless steel nails. Based on research and it's use in construction we believed the galvanized nail would resist corrosion the most. This experiment was done by measuring the initials and final weights after 9 days of submersion in a salt water solution. The original hypothesis was supported, the galvanized nails had the lowest corrosion rate with 0.00022 grams per day. As a result of this experiment we can determine which type of nail would be best for wet environments.

314-12 The Effect of Caffeine on Heart Rate of Daphnia

Ting Ren

(Ms. Ross – Animal Science)

In the United States, more than 90% of adults consume caffeine on a daily basis. The effects that caffeine brings to people vary due to the amount of caffeine consumed and the person's body. In this experiment, Daphnia will be used to test out one of the effects of caffeine, the heart rate. Daphnia are small organisms whose bodies are transparent, allowing Daphnia to be great test subjects because their hearts can be easily seen through a microscope. Beverages such as mountain dew, red bull, and 5-hour energy will serve to determine whether caffeine affects the heart rate of Daphnia. Results showed that the average bpm for mountain dew (54mg) = 90, red bull (80mg) = 288 and 5-hour energy (208mg) = 187.2. From the ANOVA, the hypothesis was supported because high concentrations of caffeine in beverages did increase the heart rate of Daphnia with a p-value of $7.25E-12$, therefore showing that there was a significant difference between the test groups.

320-14 Measuring the Speed of Light in Salt and Sugar Solution

Michael Richards

(Ms. Goldstein – Physics)

The purpose of this project was to determine whether light moves faster through salt or sugar solution. Through measuring and taking the ratios of the sine of the angles of incidence (the angle between a light ray on a boundary and the line perpendicular to the boundary at the point of incidence, called the normal) and refraction (the amount of bending that a light ray experiences measured from the normal to the bent light ray) one can determine the speed of light when taking that in proportion to the accepted value of the speed of light which is 3×10^8 m/s. As the experiment was carried out, it was determined that the speed of light is faster in sugar water.

320-20 The Effect of 5 Spices with Antibiotics on E. coli growth

Joelle Saadeh

(Ms. Ross – Microbiology)

This experiment tested the effect of 5 spices (turmeric, cumin, black pepper, paprika, and garlic powder) with antibiotics on the growth of e-coli. The purpose of this experiment is to see which of the five spices is most effective against the growth of bacteria and has the highest average for the zone of inhibition. The hypothesis was the garlic powder would have the greatest average for the zone of inhibition because research showed garlic powder helps strengthen the immune system. The data showed that turmeric has the highest zone of inhibition compared to the other spices. Turmeric had an average of 7.8mm, black pepper 6.8mm, paprika 6.3mm, garlic powder 6.3mm, and cumin 6.2mm. The ANOVA test was greater than 0.05 so the null hypothesis was accepted and further testing was done. The t-test showed that the data was valid with 90% confidence level with a degree of freedom of 10. The conclusion is that Turmeric was best against e-coli growth so the hypothesis was not supported.

314-11 Levels of Vitamin C in Fresh Orange Juice vs. Cooked Orange Juice

Zainab Salahudin & Marwa Saad

(Ms. Goldstein – Chemistry)

In this experiment, a titration was performed to figure out whether cooking orange juice will decrease the concentration of vitamin C. An iodine tincture is used as the indicator to find the exact concentration of vitamin C. After the experiment is completed, t-tests are conducted to see if there is any significance between the data. According to the results, cooked orange juice contains less vitamin C in comparison to fresh orange juice. The degrees of freedom is 18 and 95% confidence level shows that the t stat value (13.03977) is higher than the value for 18 degrees of freedom. This shows that fresh orange juice has a greater concentration of vitamin C than cooked orange juice.

318-15 Does Orange Juice have more Electrolytes than Gatorade?

Elizabeth Skapley

(Ms. Goldstein – Product-testing)

The purpose of this experiment was to find out whether or not orange juice has more electrolytes than Gatorade. An electrolyte is a substance that dissolves into ions when put into water, and is a conductor of electricity. To carry out this experiment, the current of distilled water, tap water, orange juice, and Gatorade was measured using a multi meter, with a 9V battery attached to it. A conductance sensor was attached to the multi meter, and submerged into these solutions to find the current of each liquid. Three trials were conducted to give more accurate results. These values were plugged into the formula, $G = I/V$, where G is the conductance, I is the current, and V is the voltage, to find the conductance of each liquid. After the results were averaged, it was concluded that orange juice does in fact have more electrolytes than Gatorade.

318-04 The Most Effective Antacid

Sabrina Slutsky & Michelle Fogel

(Ms. Sullivan – Biochemistry)

The purpose of this project was to test the strongest antacid by titration with hydrochloric acid. The three antacids tested were milk of magnesia, Gaviscon, and Equate. The hypothesis was that the milk of magnesia would be the strongest antacid due to the high alkalinity and so it would be the hardest to neutralize. The experiment took 10 trials and the equivalence point was known due to a pH meter. The information was transferred to a bar graph. Two t-tests were conducted and the first was milk of magnesia versus the Gaviscon with a value of 9.1394. The second was milk of magnesia versus Equate and the value was 13.9402. The numbers were compared to a degree of confidence level and both passed with over 99%. This indicated that the milk of magnesia was a better antacid than the other two and that the information gathered was not purely based on chance. This meant that the hypothesis was supported. There were also no outliers or discrepancies in the values that were gathered.

320-18 Effect of pH on the Hatching Rate of Brine Shrimp

Megan Tartakovsky & Eylul Duramaz

(Ms. Sullivan – Animal Science)

In this experiment, brine shrimp, also considered aquatic crustaceans, were used. The purpose was to test whether a basic or acidic solution would lead to a higher hatching rate of the brine shrimp eggs. It was hypothesized that hatching rate would be greater in a basic solution due to the fact that brine shrimp usually live in environments where the pH is above 7. The brine shrimp were hatched in 3 different solutions including an environment solely made of distilled water, one with a pH that was raised with baking soda, and one with a pH that was lowered with distilled white vinegar. The results showed that the most shrimp eggs hatched in the basic solution of distilled water and baking soda and the least number of shrimp eggs hatched in the acidic solution of distilled water and vinegar. The hypothesis was supported because the most shrimp eggs hatched in the basic solution was had a pH of 10.8.

314-15 The Effect of Acne Medication on Escherichia coli

Hufsa Tasnim

(Ms. Goldstein – Product-testing)

Acne is caused by bacteria blocking the pores of one's skin and is a problem most common in teenagers. The purpose of this project was to see how effective acne medication is against E. coli. 8 trials were done by using 3 acne medications; Zapzyt, which contains an active ingredient: benzoyl peroxide, Clearasil Ultra Rapid Action Face Scrub which contains the active ingredient: salicylic acid, and Tazorac (generic name: tazarotene). Distilled Water was used as the control. The results indicated that the acne medications were all effective against E. coli because zones of inhibitions were

created, but Zapzyt was the most on average. Furthermore, it was learned through doing an ANOVA test and 12 t-tests, Zapzyt, which contained Benzyl Peroxide, was most effective against E. coli having a confidence level of 95%.

316-07 Efficacy of Sports Drinks vs. Water

Brandon Tingle

(Ms. Sullivan – Product-testing)

Electrolytes can be found in your body in the form minerals. They carry an electric charge in the form of ions. Electrolytes have a significant role in regulating the water levels in your body, the acidity of your blood, how your muscles operate, and many other important body functions. My hypothesis was that Gatorade will contain the most electrolytes. In order to measure electrolytes, you need to use a multimeter. Conductance is measured in units called siemens. In this experiment, the conductance of four liquids (distilled water, spring bottled water, PowerAde and Gatorade at different temperatures) will be tested using the multimeter. The conductor part will be submerged into the liquid and the current will be shown on the multimeter. For each liquid, the conductor will be cleaned with distilled water. This is to avoid any contact between liquids. In conclusion, my hypothesis was supported. Gatorade had the highest conductance with .00267 siemens.

316-18 The Effect of UV light on E. coli in Opaque Bottles

Anne Wang & Yvonne Tan

(Ms. Goldstein – Microbiology)

The purpose of this experiment is to determine whether the opacity of a bottle will affect the growth of E. coli in UV light. The hypothesis is that most opaque bottle will have the most bacteria. The experiment was done by sanding transparent bottles. Six bottles were used in this experiment. The first bottle is left as control. The second bottle is sanded slightly and the third slightly more and so on. 0.5 mL of are put into each bottle and then exposed to UV light. The bacteria is then swabbed onto agar plates so they can be incubated. An ANOVA test was conducted. Since the p-value is 4.51277E-09 which is less than 0.05, t-tests needed to be conducted as well. The t-test showed that there was a significant difference between the most opaque bottles and all the others. This means that the in the most opaque bottle had significantly more growth than the other bottles.

320-06 Is Passiflora incarnata Present in Anti-Anxiety Medications?

Whitney Wong & Nomon Mohammad (Ms. Goldstein – Cellular & Molecular Biology)

Many anti-anxiety supplements contain an ingredient called Passiflora incarnata. The flower accounts for the relief of anxiety by limiting the imbalance of neurotransmitters in the brain. In this project, two brands of medication were tested to see if they contained the flower as indicated by their labels. We then used materials needed for barcoding DNA. After two samples and a sample of the flower were collected, DNA was extracted from each substance, it was then amplified. Furthermore, PCR was used to replicate the DNA. After DNA sequencing, two samples showed no sequence, another sample contained Homo sapiens DNA, and the third sample contained Passiflora incarnata and another of Papaver rhoeas. None of the samples contained the flower and only one sample resulted in its sequence having the flower DNA. In the end, it was concluded that the label of the medications were false. Only one of the anxiety relief supplements contained Passiflora incarnata.

318-02 Bacteria Found on the Railings in the Main Building and the Annex Building of Midwood

Wensi Wu & Michelle Zhou

(Ms. Goldstein – Microbiology)

Bacteria can be found everywhere on any surface, but the best temperature for bacteria to grow is 25 °C to 37 °C. This experiment is to determine whether the main building railings or the annex building railings are dirtier. The hypothesis is the main building will be dirtier and have a significant difference. Bacteria had 1-5 days to grow on petri dishes based on the rate of their growth after swapping from the railings. The results concluded the annex building is dirtier with the average of 0.38 and 0.34 for the main building, but there is no significant difference between the two buildings. This experiment should be done again with gloves, less pedestrians when swapping the bacteria, and finding the temperature of both buildings.

320-13 The Effectiveness of Different Spices

Amanda Xiao & Roza Chervinsky

(Ms. Sullivan – Microbiology)

The purpose of our experiment was to see which spice would kill the most bacteria. We predicted curry would kill the most bacteria. In our experiment, we used three different spices and one type of bacteria. The bacteria we used was Micrococcus and the three spices were curry, cinnamon, and garlic. Cinnamon and garlic are both said to have killed human pathogens primarily found in the gastric areas. Curry can be used to relieve pain, reduce fevers, assist digestion, treat intestinal infections and skin problems. Micrococcus is a gram-positive and it's known to contaminate skin and cause diseases. After gathering all of our results, we deduced that curry killed the most bacteria since it had the greatest average zone of inhibition, proving that our hypothesis to be supported. The average zones of inhibition for: curry-1.375 cm, cinnamon-0.775 cm, and garlic-1.175 cm. For further experimentation, we can use more spices, do more trials, and use cleaner equipment.

314-07 Bacteria Around the School

Joseph Yang

(Ms. Ross – Microbiology)

As you walk around Midwood High School, you may not notice this but, there are various locations that are heavily inhabited by bacteria. The data was collected from 12 different locations with 10 trials for each location. To carry out the experiment, each of the chosen location was swabbed every morning and the bacteria collected were incubated overnight. The result portrayed that the room with the least bacteria is room A217, the average of this room is 18.3. The room with the most bacteria is 2N with an average of 131.2. The result was similar to what was anticipated. My hypothesis which predicted that the old building would have more growth because it is older was proven correct. It seems that the old building provide a better place for bacterial growth because more bacteria grew there.

320-08 The Effectiveness of Household Cleaning Detergents

Karen Yin & Olivia Lin

(Ms. Sullivan – Product-testing)

The experiment was conducted to determine the most effective household cleaning detergent. The purpose of the project was to compare three types of different detergents to see which one would be the most effective against one gram-positive and one gram-negative bacteria. It was predicted that Clorox would be the most effective in comparison to Lysol and Rife Aid because the product has a review of almost 5 stars. Four liquids were tested on microwaved discs and the zone of inhibition (area with no bacteria) was measured. Bacillus megaterium and Serratia marcescens were the two bacteria used and incubated at 25 °C. The results showed that the hypothesis was not supported, therefore it is rejected. No conclusion could be reached on which was the

most effective because the t-tests showed that it was not significantly different. This indicates that the data collected was a coincidence meaning the experiment was a failure.

314-01 Change of Resistance With the Change of Temperature

Minna Zeldin

(Ms. Goldstein – Physics)

For this project, the effect of temperature on the resistance of a copper wire was measured. The purpose of this project was to get a sense of whether copper wire is reliable under extreme temperatures. The copper wire was wrapped around a PVC pipe and the ends of the wire were attached to jumper wires which were connected to the ohm meter. A circuit was created with batteries as the source and as the wire heated up the voltage and current were measured. With the measurements, the resistance was derived using the formula: $R = V/I$. It was determined that as the temperature increases, so does the resistance.

318-08 The Effect of Gum and Music on Memory

Carmen Zheng

(Ms. Ross – Behavioral & Social Science)

The project was used to show whether gum and music improves a student's memory since memorization is essential when it comes to studying. The project needs a control group of 10 girls and 10 boys and also 3 other groups: gum, music and gum & music together. Each group is given 20 words to memorize. Upon completing the project, the hypothesis (chewing gum and listening to music improves memory) was supported for girls with a p-value of .03. This means there is a significant difference between data. The hypothesis was rejected for boys with a p-value of .25 meaning there was no significant difference between the data. The difference in averages for girls and boys in control was 1.8 words remembered; gum was 3.2 words remembered; music was 2.9 words remembered and gum & music was 2.8 words remembered which meant girls memorized more words than boys. Next time when girls are studying, it is good to listen to music and chew gum. This way they can remember more of what they studied.

318-11 Calorimetry: The amount of chemical energy stored in different type of nuts

Liana Zhu & Shuli Zhu

(Ms. Goldstein – Mathematical Science)

An experiment was conducted to determine how much chemical energy is stored in three nuts: almonds, nuts, and cashews to find which contains the most energy. The heat energy is calculated by measuring the change in temperature of 50 mL of water. The increase in the temperature times the mass of the water gives us the amount of energy captured by the water in calories. Four trials were conducted and from these trials, the cashew had the highest sum (73) and the highest average (18.25). The cashews contained the most amount of energy. While conducting the experiment, the cashews created the biggest flame. With further research, it is shown that cashews are high in calories which played a role in the rise in temperature. Based on the ANOVA test, the variance between the three groups were greater than .05 which showed that there was no significance between the groups.

318-09 What's in your seaweed? DNA Barcodes of Different Brands of Seaweed Snacks Commonly Found in Supermarkets

Angel Zou & Jennifer Phu

(Ms. Ross – Product-testing)

DNA from seaweed food products were extracted and analyzed to determine whether the seaweed in snack packages is made out of seaweed. It is hypothesized that the majority packages of nori seaweed are made of 100% seaweed. Eight different seaweed snack products were collected from local supermarket. A variety of lab equipment and

materials were used. The microcentrifuge, PCR machine, primers and laptop were the most important. After obtaining the sample, the microcentrifuge was used for isolating the DNA and PCR to make a precise and clear DNA sequence. Two primers were used, one called ITS (a fungi primer) and rbcL (a plant primer). Using DNA Subway, trim, BLAST, MUSCLE, and a phylogenetic tree to draw ancestral relationships. The results show that there were basil (66.75%), yeast (46.93%), fungi (53.85%), and flower (67.71%) within the samples. The percentage shows similarity of the sample to actual sequence of the seaweed. Overall, the seaweed snacks are not 100% made of seaweed.

Room Arrangements

A314, A316, A318, A320

