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The Effects of Differing Temperatures on the Bounce of Golf Balls

Student Research by: Levi Ekanger, Sarah McCauley, Tonya Lenont, and Deno Brockert

This experiment was conducted to find the best playing conditions for golfers everywhere. The purpose of this experiment was to alter the core temperature of golf balls to achieve greater bounce heights. The conclusion was that there was a difference in height for each temperature. The colder golf balls did have lower bounces, freezer golf balls with a mean of 114.7cm and refrigerated with a mean of 122.5. The room temperature golf ball ended up with the highest mean bounce but it was thought the results would be

different. The main error of this experiment was that the 212 degree Celsius golf balls were heated in the water for ten minutes to ensure they were the designated temperature. Due to the long stay in the water, the shells of the golf balls became very soft from absorbing the water. The shells were so soft, finger indentations could be seen. It is believed that the softened shell absorbed more of the impulse of initial hit and therefore the bounce was lower. The tiles underneath the dropper were a little uneven causing the ball to change directions and not giving it the full height it could have reached. Because of the cost of golf balls, only three were used for each temperature, they were rotated so each got tested 10 times each. [\[Return to top of page\]](#)

The Study of Multivitamin Dissolution on Absorption

Student Research by: Brandon Beaupre, Chris Bruce, Chris Forehand, Jimmy Jordan, and Robert Siewert

The purpose of this experiment was to determine if the multivitamins One-A-Day, Herbalife, and Vitasmart met the U.S. Pharmaceutical standards for *dissolution*. The standard states that a vitamin should dissolve fully within forty minutes of *dissolution*, or the vitamin may not be fully effective. Each vitamin was tested in a hydrochloric acid solution with a pH level of two. This solution simulates the acid present in the human stomach. Thirty tests were conducted for each vitamin. The experiment took place over a ten-week period, and ten vitamins were tested each week. The One-A-Day vitamin was most successful in the *dissolution* testing. Herbalife was the least successful vitamin. The results also show that Herbalife and Vitasmart failed to meet the U.S. Pharmaceutical standard for *dissolution*. [\[Return to top of page\]](#)

The Effects of Bio-Clean on a Drain Clogged with Hair

Student Research by: Caitlin McCarty, Trisha Blake, and Daryl Desrosiers

The experiment was conducted to verify if the Bio-Clean (a drain cleaning product) company's claims about their product were true. To begin the experiment a mixture of hair was placed in containers, with either plain water or a Bio-Clean-Water solution and was for a week. After a week, the containers were drained, and the hair was rinsed and massed. A total of sixty containers were completed

in the experiment. After some corrections, it was observed that the containers with the Bio-Clean solution did have a decrease in mass. Also, the containers with just water increased in mass, most likely due to an inaccurate draining procedure. Neither of the two types of container's final mass had decreased a great amount. The experiment appeared to be inconclusive. The claims of the Bio-Clean company were neither proved nor disproved because of unclear results. [\[Return to top of page\]](#)

The Effect of Various Amounts of Water on Bottle Rocket Flight Time

Student Research by: Devin Kutchuk, Blake Merrifield, and Bruce Chang

The purpose in conducting the bottle rocket experiment was to find at which amount of water a bottle rocket would have the best flight time. Each of the bottle rockets that were launched had their own designated amount of water. The different amounts of water all had the same amount of PSI, which was 90 PSI. The different amounts of water that were used ranged from 200 ml to 1800 ml. The hypothesis for the experiment was that the more water that was used for a launch the better of a flight time the launch would have. The results showed that the hypothesis for this experiment was half correct. The best time period for a launch ranged from 600 ml to 1100 ml. The amounts were not too high, but not too low. The highest flight that was launched was 6.19 seconds with an amount of water of 1500 ml. The lowest flight that was launched was 2.87 seconds with the amount of water of 500ml. [\[Return to top of page\]](#)

The Effects of Whitening Toothpaste On Coffee Stained Tiles

Student Research by: Amanda Askew, Stephanie McCallumore, Courtney Rawlins, and Nina Swiacki

This experiment was conducted to find out if the more expensive brand of toothpaste really works better on stained teeth. Also the researchers wanted to see the difference in the whiteness between the tiles after being soaked, but before being brushed and after being brushed. The first week, coffee was made and poured into a two-gallon fish tank. Thirty tiles were placed into the coffee. The fish tank with everything in it was placed in a refrigerator so that

it would not mold. This stayed in there for one week. The next week the tiles were brushed with cinnamon Crest Whitening Expressions toothpaste on an Oral-B toothbrush for two minutes and then rinsed for fifteen seconds. The coffee process was repeated again for the next week. When that week was up the tiles were taken out and brushed with water on an Oral-B toothbrush for two minutes (rinsed for fifteen seconds). The coffee process was repeated again for the next week. That week Gleem toothpaste was put onto the toothbrush. Each week the tiles were massed before being brushed and after. The results show that there was a difference in the masses of the tiles before being soaked and brushed and after. There was also a difference between the masses before and after being brushed with Crest, Gleem, and water. They were the darkest after being soaked but not cleaned. After being brushed by each of the two toothpastes and water all improved on the whitening guide. [\[Return to top of page\]](#)

The Effects of Different Environments on the Growth of Various Types of Mold

Student Research by: Corey Green, Ian McDonald, Niles Czekiel, and Gregg Hulett

The experiment was conducted in order to figure out which food mold grows on best and why. The individual food samples were placed inside Petri dishes and placed in an enclosed area (cup board) and sealed off. A week later the individual food samples were taken out and a grid was placed over the individual food samples. The resulting measurements were placed into charts and tables for future use. The observations recorded proved the initial hypothesis to be wrong. The apples and oranges produced the largest amount of mold while the bread, lettuce, and control (an empty Petri dish) produced zero mold. The oranges were found to have produced the largest amount of white mold while the apples produced the largest amount of brown mold. The reason for zero mold growth on the bread, lettuce, and control was due to the lack of moisture caused by evaporation. Background research suggested that the reason for the excessive amount of mold growth on the apples and oranges was due to the fact that citric acids provides as an excellent fertilizer for mold growth. [\[Return to top of page\]](#)

Three Dimensional Games and Their Thermal Effects on

Silicon Microprocessors and Graphics Acceleration Cards

Student Research by: Mike Breiling, Byron Voelkert, Kyle Weirauch, and Eddie Zinger

A study was conducted in order to determine the best fan speed to cool a personal computer. The research took place in room 120 of the Macomb Academy of Arts and Sciences in Armada, Michigan. First, a computer was assembled. The game Star Wars: Knights of the Old Republic was played for fifteen minutes with a fan speed of either 0 RPM, 1600 RPM, 2100 RPM, or 2600 RPM. Eight trials were conducted for each fan setting. Finally, the data was recorded and analyzed. Unexpectedly, the fan speed of 2600 RPM did not cool the computer most effectively. Most fan developers calibrate their fans to that speed setting. The results showed that the fan setting of 2100 RPM cooled a computer the most, and the fan designer's setting was not the most effective. That was because at the fan speed of 2100 RPM, air was let in and out of the case at the most productive rate. While at the 2600 RPM setting, the air was trying to be pulled in too fast for the case. The 0 RPM setting cooled the computer the least because no air was circulating throughout the case. [\[Return to top of page\]](#)

The Effects of Spray 'N' Wash, Shout Action Gel, and Clorox OxiMagic Laundry Stain Removers on Sam's Grape Juice, Plochman's Premium Mustard, and Carter's Black Stamp Pad Ink on White 100% Cotton Pieces of Fabric

Student Research by: Reanna Golab, Mary Sucaet, Patrick Bruci, and Angelica Jones

The purpose of this research was to find a laundry stain remover that would be most effective in removing household stains from white fabric. Shout Action Gel, Clorox OxiMagic, and Spray 'N' Wash were the stain removers chosen to be tested. French's mustard (yellow), Sam's Choice Grape Juice (purple), and Carter's Stamp Pad Ink (black) were chosen as the household stains which were tested. The stains were applied on 2" x 2" pieces of white, 100% cotton pieces of fabric and then treated with the given cleaners. Color schemes were used to measure the shades of color removed from each piece of fabric, with a scale of zero to ten, with ten being the darkest and zero being completely white. Each stain ranked at a ten, before being treated. After being treated, rinsed and dried, the shade that

the stain had become was recorded. Although the average means for the individual stain removers were found to be very close in the number of shades removed, it was not sufficient enough to support the hypothesis that all of the cleaners would work at the same rate. The data for the cleaners had much too great of a range to support the hypothesis. [\[Return to top of page\]](#)

Comparison of the Effectiveness of Different Antacids on Neutralizing Hydrochloric Acid

Student Research by: Frances Dixson, Stephanie Hart, Hannah Johnson, and Cassie Yaple

The purpose of this study was to determine the effects of different antacids in neutralizing the acidic level of a stomach-like hydrochloric acid solution. All testing took place at the Macomb Academy of Arts and Sciences between October 13 and December 15 of 2004. Three brands of antacids were individually dissolved into a hydrochloric acid mixture similar to that of a stomach and heated to body temperature (37°C). The pH level of the acid mixture was measured after each antacid had dissolved and then compared to the original level. Alka-Seltzer was shown to be the most consistent and effective antacid when added to the solution, while Tums was shown to be the least effective due to sporadic, or less consistent, data.

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Belle River Water Quality Testing Upstream And Downstream of the DTE Belle River Power Plant Using Nine Water Quality Testing Procedures

Student Research by: Erin Harding, Cory Hayes, Jake Weldon, and Andrew Betka

This experiment was conducted upstream of the DTE (Detroit Edison) Belle River Power Plant at the Belle River Park in Memphis, MI (site 1), downstream of the plant at site 2 in East China, MI, and at the Macomb Academy of Arts and Sciences (MA²S). This experiment was derived from previous research studies on water quality status of the Belle River, which were mostly all done by DTE themselves. To study the water quality, 30 trials of nine water quality tests were taken from each site. TI (Texas Instruments) CBL 2's (Computer Based Laboratory),

The Datamate program, and TI-83 plus calculators were used to find results with the various probes. Results showed trends between dissolved oxygen/temperature and calcium/pH (sites 1 and 2). These results were expected due to the relation signified by the Water Quality Testing With Calculators book by Vernier. The results were analyzed using Minitab 14 statistical software. [\[Return to title index\]](#)

The Effects of Dimples on Golf Ball Air Disruption

Student Research by: John Essenmacher III, Jack Johnston, Theodore Patchel, and Alex Rusek

The purpose of this experiment was to determine the amount of airflow disturbance over common and popular golf balls and to see if there was a correlation between the amount of dimples on the golf ball and the amount of disturbance it created. Also, the amount of disruption was correlated with the distance a golf ball would travel in a real life scenario. In theory, the golf ball that creates the least amount of air disturbance will travel farther than golf balls that create more air disturbance. In the experiment, many golf balls were tested by placing them into a wind tunnel. Dry ice was then sublimated into a heavy white gas and blown into the center of the golf ball being tested. Four golf balls were tested this way: the Callaway HX-Red, the Titleist Pro-V1, the Nike Power-Feel, and a sanded golf ball used as a control. Each trial was video taped and still frames were extracted from the film. Each golf ball was then assigned a percentage based on the amount of air disturbance and compared to the other golf balls. The Callaway HX-Red had the highest percentage of dimple coverage, and it had the least amount of air resistance during testing. The Titleist Pro-V1 had the second lowest percentage. Next was the Nike and the sanded golf ball had higher air disturbance percentage respectively. [\[Return to title index\]](#)

A Biomechanical Analysis of a Basketball Shooters' Elbow Angle, Shoulder Angle, and Knee Angle Before and After Ball Release

Student Research by: Amanda Hensley

The purpose of this study was to determine the ideal initial and final angle for the shoulder, elbow, and knee of a basketball player if the

greatest probability of making a shot is to be achieved. Five young, female basketball players were observed and declared the subject group. A male basketball player with considerable experience was used as the model for the experiment. Each of the six shooters shot until they had made, as well as missed, fifteen shots, for a combined total of thirty shots. All shooters shot free throws with a two-handed style, or one hand on the side of the ball and one placed underneath. The shots were recorded using a Sony camera and transferred into the Peak Motus program. Six distinct points were placed on the wrist, elbow, shoulder, hip, knee, and ankle of the shooter. These points were used to calculate angle measures. Thirty shots were analyzed for the model trial, while three makes and three misses were randomly chosen and analyzed from each of the three girls. The model shooter was found to have smaller variance levels and consistent data trends, while the subjects were slightly more erratic due to the combination of the five female results. Shot angles for missed shots were close to those of the made shots but the frequency of made shots was more than double that of the missed for both the subject and the model group. Five of the six data sets were found to support the hypothesis of the experiment, with the exception being the final knee angle. [\[Return to title index\]](#)

The Effects of Release Pin Angles on Trebuchet Launchings

Student Research By: Chad Bleske, Bob Delmotte, Nathan Johnson, and Ian Orzel

A trebuchet is a siege device mainly used between the years 850 and 1350 AD (Wikipedia). Trebuchets demonstrated their superiority over tension catapults with their ability to assault enemy castles and structures over large distances (Vemming, 1998). The purpose of this study was to test three different release pin angles to see which is most accurate and which hurls a projectile the longest distance. To perform this, a trebuchet was constructed. The trebuchet was made by cutting pieces of wood to the appropriate length and assembling a base, supports, and the arm. A counterweight and sling were also attached to the trebuchet, while a headless nail was attached to the end of the arm to serve as the pin. A camera was set up to tape each trial. A wiffle ball was launched thirty times for each separate pin angle, the distance it went was measured and recorded, and the video was transferred onto a computer to be analyzed by the Peak Motus System (Centennial, CO). Upon completion of the experiment, the data shows that the 170° release

pin angle threw the longest distance; shown by its high mean, while the 160° release pin angle was the most accurate. The 170° release pin angle seemed to launch the farthest because of its closeness to a 45° launch angle, which is determined to cause a projectile to travel the greatest distance due to the laws of projectile motion. [\[Return to title index\]](#)

The Effects of Eye-Dominancy on Dart-Throwing Accuracy

Student Research By: Morgan Douglas

The purpose of this experiment was to test for a correlation in accuracy and eye dominance. It also tested the idea that the dominant eye is stronger than the non-dominant eye and is therefore better for aiming. From October 2004 to December 2004, this was tested using darts. A person was asked to throw ten darts with their eyes open, ten darts with only their dominant eye open, and ten darts with only their non-dominant eye open. The dominant eye was determined for each person using the common eye dominance test. It was found that, in terms of distance, the accuracy of the non-dominant eye was only slightly different from the non-dominant eye. The differences in the average distances of the non-dominant eye and the dominant eye were barely noticeable. [\[Return to title index\]](#)

The Effect of Repeated Strokes On a Golf Balls Distance

Student Research by: David Wolf, Mike Grix, Jacob Malburg, and Karl Cross

The purpose of this experiment was to hit golf balls repeatedly to see if the distance would decrease as the strokes increased. A homemade machine was built to hit the golf balls. This machine was built and transported to the Macomb Academy of Arts and Sciences, where the testing took place. A Molitor, Slazenger, Titliest, Top Flite and pinnacle golf balls were hit. The distance of each hit was recorded in succession and was compared to the hypothesis. The experiment was successful because some measures of central tendency were found such as the mean, median, and mode. The data was scattered and did not decrease, as the strokes increased, like the hypothesis stated. The highest mean for all the golf balls was Pinnacle with 40.54 ft. The lowest mean was Molitor with 36.61 ft.

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The Effect of Different Air Pressures on a Soccer Ball

Student Research by: Shannon Kline, Julie Miller, Kurt Nieman, and Meagan Thrower

The purpose of this experiment was to see which air pressure would make a soccer ball travel five meters in the lowest time. A machine was built to kick five size five soccer balls inflated to six different air pressures. When the machine kicked the ball, a stopwatch was started. When the ball completely crossed the five meter mark, the stopwatch was stopped. The same method was used sixty times for each air pressure. The manufacturer's recommended air pressure, which was eight PSI, had the fastest average time of 1.59 seconds. The air pressures below eight PSI caused the balls to slide across the floor instead of roll, causing these times to be slower. The soccer balls with an air pressure above eight PSI had backspin, causing those times to also be slower. However, the balls inflated below the recommended air pressure had quicker times than those inflated above it. [\[Return to title index\]](#)

The Effects of Different Temperatures on Sugar Levels in Various Fruits and Vegetables

Student Research by: Danielle Beste, Holly Jurzysta, and Shukria Shawqi

The purpose of this experiment was to determine the effect temperature has on the fructose level of bananas, apples, potatoes, and grapes. Different foods were cut in half and placed in two different temperatures for twenty minutes. The temperatures were 177 degrees Celsius in an oven and 21 degrees Celsius in a lab. When twenty minutes had passed, the foods were tested with a glucose meter for their fructose level (This is possible because fruits contain sucrose, which is a combination of fructose and glucose). The results for the experiment were that the cooked potatoes had the lowest fructose level and the uncooked bananas had the highest fructose level. This experiment was successful because amounts of fructose were able to be measured and the results were varied, which was suggested in the hypothesis. It was also successful because the uncooked foods had higher fructose levels than the cooked foods. The only exception to this was the grapes. [\[Return to title index\]](#)

The Effect of Friction On A Golf Ball From Different Surfaces

Student Research by: Bethany Clark, Kayla Allor, and Mallory Diehl

The purpose of this study was to find the force of friction opposing the motion of a golf ball on a ramp with varying surfaces. After setting up a uniquely constructed ramp on an angle, the ball was rolled down the ramp. A time was recorded when the golf ball would roll past two motion detectors, one at each end of the ramp, and a distance was measured between the eye of each sensor. These two things were used to calculate the force of friction acting on the ball for each surface. This resulted in finding the surface that caused the fastest average velocity and the smallest force of friction to oppose the golf ball. The vinyl window screen was found cause the lowest amount of friction and the highest velocity instead of the suspected surface of cellophane. The results also show that as the average velocity decreased for the golf ball, the higher the force of friction was that acted on it. [\[Return to title index\]](#)

The Effects of Insulation

Research By: Sarah Gutierrez, Shannon Lynch, Noelle Rastigue, and Amanda Palaski

The purpose behind this experiment was to use different insulating materials to control the heat flow of the boiling water, and to find which insulating material kept the water inside of the box at the highest temperature. A wooden box containing a beaker of boiling water was insulated with various insulators. The insulating materials that were tested included: fur, feathers, plastic bags, straw, pine shredding, paper shredding, and cloth. A trial that used no insulation was used to see if the insulators were having some effect on the temperature of the water. The box was placed into a refrigerator and the temperature of the water was recorded over a thirty minute period. The insulating material that allowed the least amount of heat loss was the feathers. This means that the feathers were the best insulator tested. The plastic bags had the largest amount of heat loss, making the plastic bags the worst insulator tested. When analyzing the data it was discovered that if the time interval of the pine shredding trial was extended it would have been the best insulator. [\[Return to title index\]](#)

The Effects of Different Air Pressures on the Distance a Volleyball Travels

Student Research by: Alissa Beeman, Jordan Krause, Jill Szydloski

The purpose of this study was to determine which air pressure produced the greatest distance traveled by a volleyball. A machine was built to hit a volleyball with the same force every time. The volleyball was inflated to two, four, six, eight, and ten psi. At each air pressure the ball was hit thirty times. The distance the volleyball traveled while in the air was recorded. The trials took place in order from the lowest air pressure to the highest, to keep from altering the elasticity of the volleyball. The ball inflated to six psi traveled the greatest distance. The air pressures closer to six produced greater distances. This was interesting because it was thought that the ten psi ball would have gone further than the eight psi ball.

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The Effect of Air Pressure on a Basketballs Bounce Height

Student Research by: Callan Banach, Katie Baert, Alex Pikunas, and Jason Deneweth

The purpose of this experiment was to compare the bounce heights of indoor and outdoor basketballs with varying air pressures within them. All of the testing took place at the Macomb Academy of Arts and Sciences in Armada, Michigan during the fall and winter of 2004-2005. Two types of basketballs were used. A Wilson, Solution indoor game ball and a Rawlings NCAA Final Four outdoor ball were compared during the experiment. To perform this experiment, a wooden rectangular frame with wooden arms mounted to the top was built to not only elevate the basketball from the ground but also to allow the basketball to be released consistently in each trial. Both the indoor and outdoor basketballs were dropped with four, eight, twelve, and sixteen psi in them. The trials were video taped with a camcorder to ensure accuracy when trying to measure the bounce heights. After taking thirty trials of a selected pressure in a certain basketball, the tape was taken from the camera and reviewed on a monitor in slow motion to make sure that no errors occurred in recording the bounce heights for that pressure and style of basketball. The results showed that for both the indoor and outdoor basketball as the air pressure increased so did the bounce heights. [\[Return to title index\]](#)

The Effect on an Electromagnet's Strength when Changing the Number of Coils

Student Research by: Daniel Kaltz, David King, and Nick Weldon

In this experiment, the strength of an electromagnet was tested using different numbers of helixes of wire and hanging a bucket or a cup at specified distances from the last coil. This was done at the Macomb Academy of Arts and Sciences (MA2S) located in Armada, Michigan. The purpose of the experiment was to determine how much the electromagnet's strength would increase with the more coils added, and by how much it changed. To conduct this experiment, wire, an iron bar, wire strippers, a one-gallon bucket, a balance, and a Low Voltage Power Supply were needed. The electromagnet was tested using 25, 50, 75, 100, 125, and 150 coils of wire. With each number of coils it was tested 45 and 90 millimeters from the coils, and then from the end of the bar. For the majority of the time as the number of coils increased, so did the strength of the electromagnet.

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The Effects of Different Colored Light Bulbs on the Voltage Output of Solar Cells

Student Research by: Sarah Barr, Heidi Jenuwine, and Laura O'Connor

The purpose of this experiment was to determine what color light bulb produced the most voltage from photovoltaic cells. Testing took place at the Macomb Academy of Arts and Sciences (MA²S) in Armada, Michigan. A light bulb was centered in the middle of a plywood box and two solar panels were attached to the top. The solar panels were connected to a voltmeter located outside of the box. During testing, the light bulb was turned on for one minute. The initial voltage was recorded, at the beginning and end of the minute. (This was repeated thirty times for each color group, although the thirty trials were split in half evenly and testing was performed on two days. This was so for all color groups.) The results showed that the levels of voltage produced by each color group were very similar. The yellow group showed a slightly higher level of voltage, while the green group showed a slightly lower voltage than the others. The voltage decreased over time for all colors without explanation. Due to the split of the thirty trials, there was a significant increase between

data points 15 and 16, where the voltage restarted at approximately the same level as the first data point, and then continued decreasing, indicating that the solar panels may perform best with short bursts of energy followed by a period of rest. [\[Return to title index\]](#)

Bacterial Growth Potential in Armada Area School District's Bathrooms, Computers and Cafeterias

Student Research by: Casey Beeman, Andrew Blake, Joey Zebelian, and Nathan Caruss

The purpose of this study was to determine which area in the Armada School District had the highest bacterial growth level. The data results were tested at the Macomb Academy of Arts and Sciences. Data were collected from the bathrooms, cafeteria, and the computer keyboards of the Amada High School, Middle School, and the Macomb Academy of Arts and Sciences (MA²S). The samples were taken back to the lab where the bacteria was grown in agar-filled Petri dishes and placed into an incubator to enhance the growth level of the bacteria. The dishes stayed in the incubator for one week, which then were recorded by size and amount of colonies that each sample grew. After the bacteria were recorded, the content of the Petri dishes was disposed. The results showed that the MA²S keyboards grew the largest amount of bacteria. It was believed that the keyboards grew the most bacteria because the MA²S computers were used the most frequently. The Armada High School computers ended up having the least amount of bacteria growth. [\[Return to title index\]](#)

The Effect of Temperature on the Sprouting Process of Sunflower Seeds

Student Research by: Grant Bartlett, Brandon Jackson, Matt Raska, and Mark Zeigler

The purpose of this experiment was to establish exact equivalents of sprouting environments. The materials used to carry out the experiment consisted of sunflower seeds, tap water, containers, and heat. The first stage was to warm the seeds to their determined temperature for three minutes. The seeds were drained and then a soaking period of twenty-four hours commenced. After the twenty-four hour soaking period the seeds were taken out of water once more

and set to sprout for seventy-two hours (three days). The results from the experiment show that the more extreme the temperatures are away from 22.2 degrees Celsius, the less the seeds would grow. No seeds grew above the sixty-degree Celsius mark. After 22.2 degrees Celsius, the seed's average growth began to decrease. A possible reason may be that heat destroyed a certain enzyme that allowed the seed to sprout. From background information, enzymes were ruined at approximately forty-three degrees Celsius. Therefore, seeds heated beyond this temperature did not grow well. [\[Return to title index\]](#)

Filament Direction Effect on the Light Intensity of Light Bulbs

Student Research by: Lindsay Hurd, Logan Kinch, and Kylie Krause

A study was conducted at the Macomb Academy of Arts and Sciences, between October 7th and December 15th, 2004, to determine which type of filaments produced the greatest amounts of light intensity. The three different types of light bulb filaments used included vertical, horizontal, and triangle. By finding which filament produced the greatest amount of light, it could then be determined which type of light bulb filaments worked best for certain parts of a home. A structure was built to determine where the dark spots occurred. The 360-degree base of the structure was divided into three sections, with an arch overtop of the base, which was divided into four sections. A light intensity sensor was used at each point on the arch and the arch was rotated around the three sections of the base. Fifteen tests were conducted on the three different filaments and then the results were analyzed. The horizontal filament produced the greatest amount of dark spots, on average, and could be used in areas where lower amounts of light were required. A dark spot is an area where the light bulb produced a low amount of light. The triangle filament, which produced the least amount of dark spots, could be used in areas where greater amounts of light were required. The vertical filament light bulb, that produced a mean between the two, could be used anywhere else. Further experiments can be conducted to all of the different types of incandescent light bulb filaments. Also, different types of shapes and materials of light bulbs can be tested, or the many different types of light sources. [\[Return to title index\]](#)

The Effect of Brand of Orange Juice on Vitamin C

Student Research by: Christine Bingham, Merissa Seefried,

Kristina Williams, and Alicia Winans

Determining which brand of orange juice had the most Vitamin C was the purpose of the experiment. The percentage of the recommended daily value that was claimed by the brands of orange is not always accurate. The three brands of orange juice that were tested were Tropicana, Sunny Delight and frozen Minute Maid. The experiment was conducted at the Macomb Academy of Arts and Sciences in Armada, Michigan between November 17th and December 15th 2004. The titration process was used with concentrated iodine to ascertain the amount of Vitamin C (an ascorbic acid) in the three brands of orange juice. Cornstarch was combined with the orange juice in an Erlenmeyer flask to act as the indicator in the neutralization reaction. There were three tests to a set of tests and ten sets were completed for each brand. The milliliters of iodine were converted into milligrams per serving of Vitamin C using stoichiometry and dimensional analysis. The data showed that Minute Maid had the highest amount of Vitamin C. Sunny Delight had the second highest amount of Vitamin C. The lowest amount of Vitamin C belonged to the Tropicana orange juice. Future experiments that could be done include investigating trends and determining the amount of Vitamin C in other fruits and juices. [\[Return to title index\]](#)

The Effect of Various Types of Music on Heart Rate

Student Research by: Renee Bezaire, Katie Harding, and Sheri Lewis

The purpose of this experiment was to determine the effects that varying types of music have on the average heart rates of teenagers between the ages of 14 and 17. Testing occurred at the Macomb Academy of Arts and Sciences in Armada, Michigan during the 2004-2005 school year. Rock, rap, and classical music were used in order to find a relationship between the heart rate and music. First, thirty test subjects were randomly selected for the experiment. These thirty people consisted of 15 males and 15 females. The 30 test subjects were then randomly divided into three groups of 10 people, and each listened to a different type of music. The groups were then rotated to listen to each type of music in the following weeks. Before each testing, the student's resting heart rate was taken first for two minutes followed by the heart rate with the selected type of music. The heart rate with music was then compared with the resting heart rate. After finding the total average increases in heart rate of all three genres, it was determined that both rock and rap music

increased the heart rate. However, classical music did not have an impact on the average heart rate of the subjects. [\[Return to title index\]](#)

The Effect of Temperature on the Reaction Amount of Zinc in Sulfuric Acid

Student Research by: Patrick Higgins, Lauren McHenry, and Michael Polisei

The purpose of this study was to determine the effects of temperature on the decomposition rate of zinc metal shot in sulfuric acid. One shot of zinc was placed in fifteen milliliters of 3.00 molar Sulfuric Acid for ten minutes. The zinc was massed before the testing and after the conclusion of the allotted time. These trials were repeated thirty times and were then repeated in a cooled environment. The mean for the room temperature trials of .0779g was much greater than the mean for the cooler trials of .0027g. A direct correlation was found between temperature and the reaction amount of zinc in sulfuric acid. [\[Return to title index\]](#)

Accuracy of a Football Determined by the Type of Throw

Student Research by: Maria Gillis, Steven Schafka, Heather Lulek and Jenna Lee

The purpose of this experiment was to determine what type of football throw would be the most accurate. The entire experiment was conducted at the Macomb Academy of Arts and Sciences in Armada, Michigan, from October 13 to December 15, 2004. A football was thrown at a small target using five different types of throws in sets of twenty-five. The different throws were forward lob, spiral, slow spiral, toss and bullet pass. The throws were recorded on a Panasonic camera and inputted into Peak Motus (Peak Performance Technologies Inc. Centennial, Colorado) to analyze the throws for the angle of the elbow and the shoulder, and for velocity. The results showed that slow spiral was the most accurate. [\[Return to title index\]](#)

Testing Water Sources from Different Townships In the Blue Water Area for Minerals and Chemicals to Determine the Purity of Water

Student Research By: Alex Egle, John Gardner, Jake Sweeney, and Kyle Thornton

The purpose of this experiment was to determine whether or not bottled water had overall better quality than well water. There were two well water sources tested from three different townships, Richmond Township, Lenox Township, and Casco Township. The bottled water sources included Aquafina, Deja Blue, and Dasani. The tests were performed using testing strips from the WaterWorks testing kits, and the instruction cards that came in these kits were followed to determine the method that should be performed to do each test. The substances tested for included Free Chlorine, Total Chlorine, Hardness, pH, Total Alkalinity, Nitrates, Nitrites, Copper, and Iron. When comparing the bottled water results to the well water results, mainly seen through the pH, Total Alkalinity, and Total Chlorine tests, it can be seen that bottled water has the better overall quality. [\[Return to title index\]](#)

Comparing Thermaltake SilentTower and Cooler Master Vortex Dream Heatsinks to Test the Effect of Heatpipes on a Heatsink's Ability to Dissipate Heat from an Athlon64 Processor

Student Research by: Jon Granada, Ben Moore, and Ken Greenia

This experiment was performed in order to test two heatsinks, one with heatpipes, one without, and see if the one with heatpipes would outperform the one without them. A heatsink is a device that dissipates heat from a computer's processor, and heatpipes aid in this process by facilitating faster transfer of heat away from the central processing unit (CPU). In order to obtain the highest temperatures during testing, SuperPI was used. SuperPI calculates pi, a constant with unending decimals, using a complex formula, and was used to calculate pi to the 4 millionth decimal. The two heatsinks tested were the Thermaltake SilentTower and the Cooler Master Vortex Dream. Each test was performed by first running SuperPI, and using ASUS Probe to record CPU temperatures. This procedure was used for both heatsinks. Between each test was a "cool down" period to help eliminate residual heat from previous tests. The SilentTower performed about 5K cooler than the Vortex Dream. This could be attributed to the fact that the SilentTower has heatpipes to facilitate faster heat transfer. [\[Return to title index\]](#)

Finding the Area of Optimal Performance for Three Different Types of Light Bulbs

Student Research by: Nicole Gabridge, Melissa Mueller, and Erin Stemmer

The purpose of this experiment was to determine if there is an area of optimal performance for three types of light bulbs, these light bulbs being a Sylvania 60 watt Incandescent light bulb, a Sylvania 65 watt *Doublelife* Floodlight, and a Sylvania 60 watt Compact Fluorescent Mini-Twist light bulb (Sylvania: Danvers, Massachusetts). This was done by using a Calculator Based Laboratory 2 (CBL2, Texas Instruments Incorporated: Dallas, TX) light sensor set up to measure the light intensity 360° around each bulb and a 180° arc above the bulbs. The *Doublelife* Floodlight (Sylvania: Danvers, Massachusetts) generated the highest light intensity (0.708923 kH/cm^3), followed closely by the Incandescent (0.536967 kH/cm^3). The Fluorescent Mini-Twist produced the lowest light intensity, generating only 0.035943 kH/cm^3 . The Fluorescent Mini-Twist light bulb produced an even light intensity the entire way around the bulb; this shows that it could perform optimally in any light fixture. [\[Return to title index\]](#)

The Effects and Relationships of Wave Output from an Ibanez Electric Guitar on a Pendulum String Attached to a Suspended Crate Amplifier

Student Research by: Sarah Adams

The purpose of this experiment was to determine if there was a relationship between the input guitar wavelength and the output amplifier wavelength and if so, what type of equation appropriately represented this relationship. The first string of a guitar was struck and the length of one node to the next node was measured on a pendulum string. This was recorded and the number of these segments was counted over the whole of the pendulum thread. These steps were repeated for three trials and the first fret of the first string was played for three more trials, followed by the second fret and so on until the eleventh fret had been reached. The mean value of each set of three trials for the frets was taken. The number of antinodes was then estimated by dividing each average node-to-node length into the total length of the pendulum string, 100 cm. These results were

compared to the trial results for the number of antinodes and it was found that there was a direct correlation between the expected versus actual number of antinodes. Also, as the frequency of the output guitar sound approached the natural frequency of the pendulum string, the ability to accurately measure the node-to-node length was decreased. The results of this experiment yielded a direct correlation between the input wavelengths of the guitar string into the amplifier with those of the output nylon pendulum string. [\[Return to title index\]](#)

The Effects of the Duration and the Method of Fermentation on the Caffeine Content of Camellia Sinensis Leaves

Student Research by: Amanda Desrosiers, Christina Egle, Luke Mackewich, and Jill Martindale

The purpose of this study was to determine the effects of the duration of fermentation on the caffeine content of Camellia Sinensis leaves. There is no difference between the duration and method of fermentation. In fact, the method of fermentation is just changing the duration at which the tealeaves are fermented. The testing took place at the Macomb Academy of Arts and Sciences in Armada, Michigan. Camellia Sinensis leaves were fermented using three different methods of fermentation, varying in the amount of bruising and length of fermentation. Using direct solvent extraction (Paul, 2004), the caffeine was extracted from the leaves to determine the caffeine content. It was discovered that oolong tea had the highest caffeine content, green tea had a slightly lower caffeine content, and black tea had the lowest caffeine content. It was also concluded that there was no correlation between the caffeine content and the method of fermentation. It is believed that this occurred because the caffeine was not evenly distributed throughout the leaf.

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Fractal Dimensionality as a Result of Chaotic Pendulum Motion

Student Research by: Justine Pinsky

Fractal patterns result from chaotic motion, such as the motion of a pendulum with an electromagnet underneath it. The purpose of this experiment was to determine whether fractal patterns became more complex as the string on such a pendulum increased in

length, decreasing the distance from the end of the pendulum to the source of the chaotic motion. To do this, a pendulum structure was constructed to drip paint on a canvas. Selected trials were allowed to swing naturally, and selected trials were altered in motion with use of an electromagnet. A digital photograph was taken of each one of the trials, and the Benoit Fractal Analysis software was used to analyze each photograph. The Benoit program calculated the fractal dimensionality of each picture. The results showed all of the fractal dimensionalities to be around the same value of 1.92. [\[Return to title index\]](#)

The Effects of the Attributes of a Runner on Running Performance

Student Research by: Hatham Shawqi, Brad Wagner, and Norm Rawls

The purpose of the experiment was to examine the attributes of a group of high school runners to determine if they could offer an explanation as to why a person ran the speed they did. Previous research by professor Joseph Lieberman suggests that humans are built the way they are in order to make it easy to run long distances, which may have been a key part of our survival as a species. To accomplish this, 20 randomly selected students from the Macomb Academy of Arts and Sciences (MA²S) in Armada, MI ran a 40-yard dash. This experiment was done on the rear side driveway of the MA²S. The students were asked questions about their height, weight, gender, and shoe size, and were then asked to sprint the entire length of the driveway (40 yards). The students were recorded with a digital camera, and their times were recorded. Each runner was digitized and compared using the Peak Motus software on a personal computer. It was found that turnover, the number of steps per minute, was the most important factor of a person's 40-yard dash time. The other factors, such as knee drive and arm usage, did not appear to have a great effect on their times. This supported research background information that suggested that a runner's body would automatically take its most comfortable, therefore most efficient, form for that particular person. [\[Return to title index\]](#)

The Effect of Illegal Substances on Baseball Bat Performance

Student Research by: Ryan Kiernicki, Nicholas Knust, Brandon Pinskey,

and Thomas Ward

From October 2004 to December 2004 an experiment was conducted to determine which type of substance would produce the greatest velocity of a struck ball when used to alter wooden baseball bats. The experiment was a continuation of an experiment previously conducted that looked at the effects of altering a baseball bat with cork. A machine was constructed to swing the bats with a reproducible force. Two types of bats were used throughout the research. The first type, Louisville Slugger Genuine M110, was purchased. The Detroit Tigers, a Major League Baseball team, donated the remaining three bats, Louisville Slugger Genuine M356. The first type contained three modified bats and one control. They were altered with cork, Styrofoam, and super balls. The second type contained two altered bats (cork and super balls) and one control. Each bat was swung with the machine and hit a baseball off a tee. The experiment was filmed and analyzed using Peak Motus software. Using the software, data was collected and it was found that any modification to the bat actually decreases the velocity of the ball hit. Out of the materials used the super balls produced the greatest ball velocity, although the performance still did not exceed that of the control. [\[Return to title index\]](#)

The Effects of Surface Scuffing on the Trajectory of a Pitched Curveball

Student Research by: Kyle Kilpatrick, Keith Miller, Scott Suarez, and Steven Zeigler

A research experiment took place at the Macomb Academy of Arts and Science related to the issue of cheating in the sport of baseball. The purpose of the experiment was to test the effects of modifications to a baseball on the amount of the baseball dropped and accelerated in the y-direction when thrown as a curveball. This was done to simulate pitchers scuffing the baseball in order to cause the ball to have a greater curve when thrown in attempts to make the batter miss. The experimentation consisted of scuffing baseballs two different ways, by sandpapering the outer skin and also by cutting the outer skin of the baseball. There was also a control ball with no scuffing. The curveballs were then simulated using a pitching machine. The pitches then were recorded on a digital video camera. After testing with the pitching machine, the pitches that had been simulated were then analyzed using Peak Motus software. The pitches that had a higher acceleration in the y-direction were classified as

having a greater curve or drop during the pitch. After analyzing the replicated pitches with the different baseballs, it was believed that the modifications caused more air resistance, allowing the balls to use the air to curve more. This conclusion was consistent with the data because the baseball with the cut scuff had the most curve, while the sandpaper scuffed ball had the second greatest amount of curve, and the control ball had the least amount of curve. [\[Return to title index\]](#)

The Effects of Moisture on the Tensile Strength Of Major Brands of Fishing Lines

Student Research by: Jon Miller, Daryn Schluentz, Sean Matusko, and Brice Matthews

The purpose of this experiment was to determine whether a moistened fishing line affects the strength and durability of weight that can be held. The lines were tested in order to determine if water makes the line stronger. The hypothesis in which was stated was that the lines would hold more weight while they were being moistened. An eyehook was inserted into the board and a five-gallon bucket was then tied using a Trilene knot. The Trilene knot was also used to tie the bucket to the eyehook. Sand was then added into the bucket by slowly pouring it in, and as the sand was added, a spray bottle was used to moisten the fishing line. From the data received, it showed that the water only affected two out of the four different types of fishing line tested. The two lines that were affected were regular monofilament lines and the two fishing lines that weren't affected were the braided and hybrid lines. The two monofilament lines were the Stren Original and Berkley Trilene XL, as the braided, which was the Fireline and the hybrid, which was the Yo-Zuri Hybrid. Therefore, the monofilament fishing lines were stronger due to the addition of water. [\[\[Return to title index\]](#)

Water Quality Parameters as an Indicator of Environmental Pollution

Student Research by: Lindsay Chmielewski, Stephanie Drob, and Robert Gonschorek

The purpose of this study was to determine if water quality may be an indicator of environmental pollution. To implement the

study, snow samples were obtained from two sites; a high-traffic area near Card and Hall Road in Shelby Township, Michigan, and a low-traffic area near a home in rural Armada, Michigan. Beginning mid-December of 2004 and lasting through January of 2005, each of the samples were melted and tested for water quality parameters including hardness, alkalinity, iron content, pH level, and chlorine level using a Culligan water testing kit provided by the Culligan office of Romeo, Michigan. Neither of the water samples displayed significant chlorine content and the hardness level of each sample remained constant, thus, both parameters were not used in the judgment of purity in this case. The water sample from the low-traffic area snow displayed a higher alkalinity, more neutral pH level, and lower iron content than that of the high-traffic sample, and thus was determined to be more pure. This purity is thought to be resultant of the fact the low-traffic area was a less contaminated environment. Thus, by examination of water quality as an indicator of environmental pollution, the low-traffic area's water sample was more pure and therefore indicative of a less polluted environment.

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The Thermal Energy Exchange in Different Containers

Student Research by: Chris Pagano and David Svenson

The purpose of this experiment was to determine which type of container would be the most effective in storing liquids at the desired temperature. First the room temperature was obtained using the temperature probe with the Texas Instruments computer based laboratory, and the Datamate application on the TI-83+ graphing calculator. Then, water placed in a beaker was either heated by using a Bunsen burner and a ring-stand set-up, or cooled in a freezer until it reached one of the five desired temperatures, which was measured and monitored at several time intervals, once placed in the container, using the same equipment. The five temperatures used were all relative to room temperature. The container that was the most effective was the thermos mug metal-coated plastic hot cold container. The similar, but less expensive container was the next most effective. The similar container yet with lower cost faired 2nd in testing. The similar container made of plastic had the third best results. The sports bottle type of container had the third best results. The water bottle from Coca-Cola Bottling Company had the 4th best results. The control was an open plastic cup. [\[Return to title index\]](#)

The Effects of Different Colored Greenhouses on Grass Growth and Temperature

Student Research By: Elizabeth Fleming, Jenna Kegler, Donald Yochim, and Melissa Lapp

The purpose of the experiment was to determine the effects of diverse greenhouse colors (red, yellow, green, blue, and clear) on the growth rates of the grass plants inside the greenhouses. The study took place at the Macomb Academy of Arts and Sciences (MA²S) between the dates of October 14, 2004 and December 13, 2004. Five greenhouses were built and covered in various colors of cellophane. One grass plant was placed in each greenhouse and two were left outside of the greenhouses as controls. Five days every week, the grass plants' heights were measured along with the internal temperatures. It was found that during the first fifteen days the plant in the red greenhouse had the overall best growth rate. Meanwhile, control two, which was the only plant that was aerated, had the worst growth rates. During the final fifteen days, the plant with the best growth rate was the control two, and the plant with the worst overall growth was the plant in the green greenhouse. The plant in the clear greenhouse and the two controls had the best-combined growth rates. [\[Return to title index\]](#)

Microbial Growth on Paper Money: a Comparison of Four Denominations and Three Print Years

Student Research: By Rachael Nieman and Ryan Spencer

The purpose of this study was to determine which denomination and print year of United States currency carries the highest amount of microorganisms. This experiment was conducted between the dates of October 13, 2004 and December 13, 2004 at the Macomb Academy of Arts and Sciences in Armada, Michigan. Samples of one, five, ten, and twenty-dollar bills printed in 1999, 2001, and 2003 (2004 twenty dollar bills were substituted for 2003 because none were printed in 2003) were taken. These samples were cultured in Petri dishes so that the presence of microorganisms on the bills could be seen. One bill from each denomination and from each print year was sterilized using Isopropyl Alcohol and served as a control bill for the respective data set. The dishes were incubated for a period of two

weeks at a temperature of 26 °C. Data was taken at both the one and two week marks. The results of the data, which was analyzed based on the number of squares on a grid covered by microbial growth, showed that the five dollar bills had the highest amount of microbial growth among the different denominations and the 2001 print year series had the highest amount of growth among the print years. By using a Z-score test, it was found that the data was within an acceptable normal range. [\[Return to title index\]](#)

The Effects of Different Wavelengths of the Visible Light Spectrum on the Electrical Output of a Solar Cell

Student Research by: DeAnna Beste, Mark Dehring, Theresa Krawczyk, and Brian Reid

The purpose of this experiment was to determine the effects of varying the wavelengths that compose the visible light spectrum on the voltage produced by a small solar cell. By attempting to filter out all wavelengths, or colors, of visible light except one, the effects of that light wavelength could be measured in the form of the solar cell's produced voltage. This was done by filtering each wavelength from white light with transparent, colored cellophane and reading the voltage produced from the solar cell with a multimeter. It was found that different wavelengths of visible light had an effect on the voltage of the solar cell. Also, the results found show that there was no direct correlation between visible light wavelengths and the voltage produced by the solar cell. [\[Return to title index\]](#)

The Effect of Basketball Size on High School Females Shooting Success

Student Research by: Emily Cross, Emily Cowhy, and Viktoria Weiner

The purpose of the study was to determine whether the size of a basketball affected the percent of success when shooting. The experiment took place at the Macomb Academy of Arts and Sciences in Armada, Michigan. Thirty female test subjects were randomly selected and divided into two equally sized groups for the experiment. In the gymnasium, the area under the free throw line was split into twenty-four equal rectangles, which were used for shot positions. Ten spots were then randomly picked chosen from the

twenty-four. Two different-sized basketballs were used during the experiment, the smaller basketball was the women's ball sized 28.5 inches and the largest was the men's basketball sized 30.0 inches. Each female took five shots with each basketball from one of the ten positions, which were randomly assigned each test. The data analysis showed that the difference between each ball is insignificant. It was found that the size and weight of a basketball does not significantly affect the percent of success when shooting.

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The Effects of Salt on Different Types of Metals

Student Research by: Lindsay Knake, Christine Kiehler, and Tabetha Williams

The purpose of this study was to determine the effect of rock salt on galvanized steel, iron, and aluminum. Testing took place at the Macomb Academy of Arts and Sciences in Armada, Michigan during the fall of 2004. Pieces of galvanized steel, iron, and aluminum were soaked in three different solutions composed of rock salt, rock salt and water, and water. The metal pieces were scratched with a razor, chilled in a refrigerator and set under a heat lamp to encourage rusting. Using a clear grid, the amount of rust on each piece of metal was measured and a percentage was calculated. The solution of wetted rock salt had the greatest effect on the steel and iron pieces. The mixture composed of rock salt and water and another solution of water had similar results on the steel and iron whereas none of the solutions had any effect on the aluminum. [\[Return to title index\]](#)

The Effects of Varying Forms of Electromagnetic Radiation on the Growth of *Bacillus Subtilis*

Student Research by: Kenny Deneweth, Breanna Rawlins, Alex Russell, & Alex Schlump

The purpose of this experiment was to determine the effects of three types of electromagnetic radiation - infrared radiation, visible light, and ultraviolet radiation - on the bacterial species *Bacillus subtilis*. In order to fulfill this purpose, samples of bacteria were inoculated into a sterilized environment composed of nutrient agar held within petri dishes. From November 17, 2004, until December 22, 2004, samples of bacteria were subjected to one of four

testing conditions - exposure to infrared radiation, visible light, ultraviolet radiation, or an absence of all electromagnetic radiation. After being incubated for a period of two to eight days, a total of 246 samples of bacterial growth were analyzed. The area of the agar's surface covered in bacterial growth was recorded for each sample. This experiment resulted in the ultraviolet radiation condition having an average percentage of coverage of 31.25, the visible light condition having 39.47, infrared radiation having 41.98, and the control having an average of 41.04. A one-way between-subjects analysis of variance was performed to determine the significance of the data. The results of the ANOVA test show that the data was not significant enough to use in disproving or supporting any hypotheses. This lack of significance may be attributed to the weakness of the sources of radiation, the absorption of radiation by glass, and inaccuracies in data collection due to visual approximation. [\[Return to title index\]](#)

The Effects of Processor Speed on Computational Performance

Student Research by: Harry Awdey

The purpose of the study was to determine if there was a direct correlation between processor speed and computational performance. Between the dates of October 12, 2004 and December 17, 2004, an experiment testing eight different CPUs (Central Processing Unit) was performed at the Macomb Academy of Arts and Sciences to determine performance in four program categories, which included CPUZ, Maple 9.5, Adobe After Effects 6.5 and Cinebench The 2003. Nineteen hundred and twenty total data points were collected which were then analyzed within MINITAB 14, finding several trends. After analyzing the data several trends were found. One trend was that Macintosh(Mac) based computers seemed to outperform the computers running Microsoft Windows in mathematics tests. Another trend was that many of the Windows machines performed 10 to 20 percent better than the control, which was a 450 MHz Pentium 2. However, they were 2.8GHz a full five times faster. The most probable reason for this was many of the programs used were not optimized for any specific operating system and this may have caused the sluggish response. This along with other minor trends indicates that the hypothesis of a direct correlation between performance and processor speed is false. [\[Return to title index\]](#)

The Effects of Herbal Supplements On Bacteria Species

Student Research by: Caitlin Jeanguenat, Amy Martin, and Ashley Walling

The purpose of the experiment was to determine the effects of herbal supplements on bacteria species. Between the dates of October 20, 2004 and January 4, 2005, an experiment was conducted at the Macomb Academy of Arts and Sciences in Armada, Michigan. The experiment tested the effectiveness of garlic, ginger and ginkgo herbal supplements at treating species of *Bacillus megaterium*, *Escherichia coli*, and *Staphylococcus* bacteria. After the bacteria were inoculated into Petri dishes, each of the species was treated with samples of every supplement, excluding the control sample. The effectiveness of each supplement was determined by the change in color or texture of the bacteria after the supplement had been applied. The results of the experiment showed the herbal supplements to be effective at treating bacteria, thereby disproving the original null hypothesis. Furthermore, statistics performed on the data proved the results to be accurate. [\[Return to title index\]](#)

The Effect of Temperature on Vitamin C Content in Oranges

Student Research by: Nicole Kuzminski and Becky Nieman

The purpose of the study was to determine how temperature affected the Vitamin C content in oranges. The experiment took place at the Macomb Academy of Arts and Sciences in Armada, Michigan, from November 13, 2004 to December 15, 2004. For a period of seven days, five Sunkist oranges were placed in three different environments. The three environments were: a refrigerator with a temperature held at 8° Celsius, room temperature held at 23° Celsius, and an incubator with a temperature of 30° Celsius. After one week, the oranges were removed from their environments and the juice within each orange was collected. The orange juice was titrated using an iodine and cornstarch solution, and the amount of Vitamin C present was determined. The findings concluded that the incubated oranges contained the greatest amount of Vitamin C, followed by the room temperature oranges, and finally, the refrigerator oranges. [\[Return to title index\]](#)

The Effects of the Rate of Fire on the Precision of a Paintball Marker

Student Research by: Amanda Malburg and Anne Schoenherr

The purpose of the experiment was to analyze the effects of rate of fire on the precision of a paintball marker. In order to conduct the experiment, a paintball marker was placed within a pre-constructed paintball marker stand. The target was located eight meters from the stand and marker, in which a designated amount of paintballs were emitted for each trial. The three, four, and six round burst trials discharged three, four, and six paintballs respectively. For each individual trial, the distances between the points where the paintballs struck the target were measured, and reconstructed in Geometer Sketchpad 4.0 where the area of precision was calculated. The results showed the area of precision for the six round burst to be greater than that of the four round burst, which was greater than the three round burst. From this data, it was determined that as the rate of fire increased consecutively, the area of precision doubled, halving the precision of paintball marker. [\[Return to title index\]](#)

The Effects of Digestive Enzymes on the Digestion of Starch

Student Research by: Rachel Beaupre

This experiment was conducted to determine which types of supplemental enzymes are most effective in aiding digestion and helping to replace lost enzymes in the human body. The environments of the stomach and the small intestine were created in a lab to simulate digestion. The stomach's environment was simulated through the use of hydrochloric acid. A cornstarch solution was added to the acid solution along with the digestive enzymes being tested. Glucose levels were recorded and the solution was neutralized with baking soda to simulate the small intestine. After a period of one and a half hours, glucose levels were once again recorded. This process was repeated until thirty samples of each enzyme and the control sample had been taken. The resulting data showed that Source Daily Essential Enzymes outperformed Absorbaid Enzymes in both simulated environments and broke down a higher percentage of the total starch present. [\[Return to title index\]](#)

The Effect of Different Golf Ball Brands on Golf Ball Velocity When Hit by an 8-Iron Golf Club

Student Research by: Paul Gianferrara, Kyle Goodmen, Gina Riebel, and Steven Riebel

The purpose of the study was to determine which golf ball brand could generate the fastest velocity. The utilization of an 8-iron golf club by hitting three different brands of golf balls determined which golf ball traveled the fastest and also determined what the ideal amount of dimples on a golf ball were. The brands of golf balls used in the experiment were Intech Beta TI, Pinnacle Gold Velocity, and Top Flite XL 2000. The study was performed between the dates of October 13, 2004 through December 15, 2004, at the Macomb Academy of Arts and Sciences in Armada, Michigan. Each brand of golf ball was hit 30 times by an Iron Byron, which was constructed to hit all of the golf balls with the same amount of force in every swing. The club used to hit the golf balls was a Spalding 8-iron. The trials were recorded using a Panasonic Camcorder and analyzed with the use of the Peak Motus 8.0 System. The Peak Motus 8.0 System was used to analyze the velocity of the golf ball from the point when the 8-iron first came into contact with the golf ball and throughout a four-foot path after being hit. The golf balls were analyzed based upon the mean velocity compared to the number of dimples the different brands of golf balls had. After analysis, it was found that the Intech Beta TI generated the fastest velocity, followed by Top Flite XL 2000, then Pinnacle Gold Velocity. [\[Return to title index\]](#)

The Importance of Performance Grade on the Structural Properties of Asphalt

Student Research by: Noel Bezaire, Kristen Clark, Trista Pabisz, Jake Hanley

The purpose of this study was to test and observe the elongation properties of bituminous asphalt. The properties of three different grades of asphalt, 58/28, 64/22, and 85/100 were tested under two different conditions, room temperature (72° F) and refrigerator temperature (40°F). Vertical stretch tests were completed for each of the three grades being tested in both environments. It was observed that performance grade 64/22 stretched most under both conditions and stretched the longest amount of time before breaking. Grade 58/28 stretched the second farthest in the refrigerator and third

longest in room temperature. In both environments, it stretched second longest before breaking. Grade 85/100 broke first in both environments. In the refrigerator, it was the shortest and in room temperature it was the median. It was concluded that the observed results were due to the physical makeup of the organic compounds of asphalt. The grade with the longest carbon chains, 85/100, had the most resistance to elongation due to asphalt's natural tendency to coil, as compared to 64/22 and 58/28, which had shorter carbon chains.

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