

# Independent Student Research Project Abstracts

2005 - 2006

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## The Effects of Commercial Antacids on the pH Level of Hydrochloric Acid

*Student Research By: William Roland, Stacey Simon, and Brittany Watling*

In this experiment three antacids were tested to determine which one lowered the pH of Hydrochloric Acid (HCl) most effectively. By lowering the pH of the HCl in the human stomach, the symptoms of heartburn and indigestion will be treated. Testing was done between October 12, 2005 and December 14, 2005 at the Macomb Academy of Arts and Sciences in the chemistry lab. The three antacids tested were Maalox Max, Tums, and Alka-Seltzer. During the testing, the antacids were mixed with 35 mL (milliliters) of .01M (Mol) HCl; the pH of the mixture was then tested. This was called the starting pH. 1M HCl would then be added, 1mL at a time, to the mixture. The pH of the mixture would be recorded after each addition. Results showed an inverse relation between the amount of 1M HCl added and the pH level. In other words, the more 1M HCl added to the mixture, the lower the pH. The trials were not completed until the pH of the mixture decreased to 2. 2 is the pH of the human stomach. While conducting this experiment results showed that Maalox took the least amount of HCl before the pH went down. This says that out of the three antacids tested, Maalox would be the least successful in reducing the symptoms of heartburn and indigestion. Maalox would start working right away but would work for the least amount of time. When testing Tums, it was found that it could hold more mLs of Hydrochloric Acid before it's' pH would decrease. Although Tums would hold around 10 more mL then Maalox, it came nowhere near Alka-Seltzer. Our experiment showed that Alka-Seltzer is the most affective antacid. It proved that Alka-Seltzer would neutralize the most mL of the Hydrochloric Acid in the human stomach. Thus, curing the unwanted symptoms of heartburn and indigestion.

## The Produced Frequency Based on the Change in Tension of a Guitar String

*Student Research By: Katie Fitzsimons, Kara Gates, R.J. Perry, and Eric Young*

The purpose of this experiment was to find the different frequencies of a sound wave using different sized masses, 500g, 1 kg, 1.5 kg and 2 kg, to create tension on a guitar string, producing frequencies. The research began on October 12<sup>th</sup>, and ran for 10 more weeks. Each week five sound waves were randomly collected from each mass. The masses were grouped as 500g, 1 kg, 1.5kg, and 2 kg. They were randomly attached to the guitar string, a person then plucked the string, and a microphone was used to pick up the sound and transferred into the computer using the program Mac Scope II. The data shows that for 500g that the data collected was not normal, which means that the data cannot be relied on by the experimenter that the change was due to the cause of the change in the experiment. For 1 kg and 1.5 kg the data was also not normal, because it seemed to be spread out randomly. Only in 2 kg was the data considered normal because the p-value for 2 kg was over .005. If the p-value is less than 0.005, then the data is considered to be abnormal. It was concluded that only after 2 kg can there begin to be enough tension to create a frequency level. This is true because below 2 kg there is not enough tension for the string to produce around the same frequency levels each time, which is why the mass needs to be above 2 kg in order to produce a somewhat constant frequency level.

## The Effects of Various Activities on Blood Pressure

*Student Research By: Kristen Patchel, Erik Theume, and Kathryn Van Ham*

The purpose of this study was to determine the change in blood pressure caused by chewing gum, push-ups, and jogging. The experiment was conducted at the Macomb Academy of Arts and Sciences from October to December 2005. A treadmill, stopwatch, chewing gum, sphygmomanometer, calculator, and forty random male and female volunteers were gathered. Every Wednesday, a random activity—chewing gum, jogging, or push-ups—was performed by some of the volunteers. Each activity was performed for two minutes, and the volunteers were only allowed to do one activity per day. The volunteer's blood pressure was taken before and after they did the activity. Throughout the ten weeks, none of the volunteers performed an activity twice. Jogging had the highest mean of change in systolic blood pressure at 17mmHg, next was push-ups at 0.5mmHg, and lastly was chewing gum at 0mmHg. Jogging had the highest mean change in diastolic blood pressure at 9.2mmHg, next was push-ups at 3.62mmHg, and lastly was chewing gum at 1.08mmHg. All standard deviations were between 7.7mmHg and 31.87mmHg for the means of systolic and diastolic blood pressure before and the change in blood pressure after the activity. It was found that if an elevated blood pressure was wanted, then jogging should be done; if a semi-raised blood pressure was wanted, then push-ups should be done. If blood pressure was not wanted to be changed, or possibly lowered, then chewing gum should be done.

## Spring Constant Consistency Compared to Certain Masses

*Student Research By: Adam Suddon and Beau Seigfreid*

The purpose of this study was to test and observe the spring constant of a trampoline. This was to see if the spring constant would remain the same for whatever force was applied. This was done by dropping three bowling balls of different masses from the same height. The height that the balls were dropped from was always one meter. The masses of the bowling balls were 7.27 kilograms, 5.44 kilograms, and 4.54 kilograms. Each ball was dropped onto a ProSport jogging trampoline (purchased at Wal-Mart at 13 mile and Gratiot Ave. about 20 years ago.) and recorded on a Sony Portable Camera (Supplied to the experiment by the instructors at the Macomb Academy of Arts and Sciences, located in Armada, Michigan on Prospect Road.) Once the experiment was done it was put into a program called Peak Motus. Peak Motus was used to analyze the velocity, the stretch of the trampoline in the y-direction, and the height of the bowling ball in each different time frame. After this the data was placed onto two separate programs for analysis. Microsoft Excel was used at first to find kinetic energy, potential gravitational energy, mechanical energy, and the spring constants. Then from there the data was put into Mini Tab. Mini Tab was able to process the data into T-tests to show if the spring constant was constant between each different weighing bowling ball. The data was then put into a series of graphs. The independent variable for this experiment is the mass while the dependant is the spring constant. It was observed that the spring constants were not the same but both of the larger massed bowling balls spring constants were very similar if outliers were excluded. The medians of the spring constants of the 7.27 and 5.44-kilogram balls were also very similar.

## ***The Effects of Color Preference On Product Label Design***

*Student Research By: Allyssia Ashman, Sean Gillis, Ellery Henley, and Melissa Wesolowski*

In this experiment, it was attempted to discover the reason behind the most preferable choice of the types of colors (warm and cool) and why one product is chosen over another when the only difference is the type of color. Therefore, seven *Aquafina* bottles were chosen, and using the computer program *asc Paint Shop Pro*, seven different labels were made in the colors of red, orange, yellow, pink, purple, green, and blue, all in three different shade groups: true, dark, and pastel. Also, two labels were made of the neutral colors black and white. The experiment was performed in a windowless hallway in the Macomb Academy of Arts and Sciences in Armada, Michigan. Because the hallway was so long, it was shortened with two walls of tarp paper. Within the two paper walls was a table with the set of bottles that were being experimented on. Thirty of the same subjects were used for all four trials. The subject would go in the room and choose the most attractive color. In the True color trial, pink was found to be the most attractive color: 34% of the people chose pink and 27% chose red. Overall, 73.3% of people chose warm colors, and 26.6% of people chose cool colors. IN darkened colors, yellow, (the most popular choice) was chosen by 27% of the people. 60% of people chose warm colors, and 40% of people chose cool colors. And in pastel colors, blue and yellow were chosen by 24% of people. Also, 60% of the people chose warmer colors, and 40% of people chose cool colors. Overall, warmer colors were chosen most often. In the neutral colors, black and white 54% of people chose black and 46% of people chose white. The difference between these is not significant enough to conclude that black is strongly preferred to white.

## **The Effect of Different Temperatures on the Distance of a Golf Ball**

*Student Research By: Stephen Peltier, Ryan Phillips, Andrew Rusel, and Jack Calderone*

The purpose of this experiment was to find if temperature affected a golf balls flight distance. The golf balls that were used to conduct the experiment was the brand *Top Flight*. Twenty-five *Top Flight* golf balls were obtained at the K-mart in Richmond, Michigan. There were six temperatures that the golf ball had to be at to achieve the correct data. The six temperatures that were achieved were 0 degrees Celsius, 21.1 degrees Celsius (room temperature), 30 degrees Celsius, 40 degrees Celsius, 50 degrees Celsius, and 60 degrees Celsius. The experiment could only works if the golf balls were hit with the same power every trial. The machine that was used in the experiment was called the *Iron Byron*. The *Iron Byron* was manufactured by a group of students at the Macomb Academy of Arts and Sciences. A microwave was also obtained at the Macomb Academy of Arts and Sciences. A plastic microwave able Tupperware container was used to hold the golf balls safely during the transportation to the *Iron Byron*. It was also used to hold the balls in the microwave during the heating process. A large two-hundred foot tape measure to measure the distance the ball travel after being struck by a the club. The tape measure was acquired at a researchers house. A spoon was also used to retrieve the balls from the heated container. The spoon was also from a researchers house. A *Team Losi* temperature gun was also used to measure the temperature to the golf ball, which was obtained a researchers house. To perform the research without error a strict process was used. First, the golf balls were either heated or cooled down by a microwave (heated) and by snow (cooled). Then the *Iron Byron* was set outside of MA2S where all research was taken place. Afterwards the 200-foot tape measure was set up attached to the *Iron Byron*. Next the golf balls that were at the correct temperature were ran outside to a researcher at the *Iron Byron*. Once a ball was there it was set on the *Iron Byron's* tee and hit. Then a researcher would be at next to the tape measure and would record the data. This process was repeated twenty-five times.

## **The Effects of Different Contamination Levels of Oil on Nymphaea-Ceae**

*Student Research By: Niles Czekiel and Megan Rawlins*

The purpose of the experiment was to test the effects of different contaminations of oil on a plant specimen. Test subjects (water lilies) were placed into six separate containers. Different levels of oil were added to each tank. Tank one received one tablespoon, tank two received two tablespoons, tank three received three tablespoons, tank four received five tablespoons, and tank five received five tablespoons of oil. Every week the effects were observed and recorded into charts and spreadsheets. The collected data was then combined and compared. It was found that as the level of oil was increased the average health of the specimens decreased except for tank three. Tank three was given three tablespoons of oil. However, its specimens had the lowest health average of all test subjects due to mistakes in handling and their natural life cycle. Data shows that all specimens had a decrease in their health. Based on background information oil clogs pores in water plants, therefore it can be assumed that the increase in oil levels allowed for more of a chance for it to clog the specimen's pores.

## **The Effects of pH Level on Protein Digestion**

*Student Research By: Brandon Beaupre, Deno Brockert, and Gregg Hulett*

The purpose of the study was to test if the natural acid in the human stomach is the best environment for the consumed protein. Pepsin, the natural enzyme found in the stomach that digests food, was mixed in the hydrochloric acid solution. The protein powder was placed into the pepsin solution. This mixture was used in the experiment to better simulate the digestion process. The solution was then placed into an incubator for 24 hours at body temperature (98.6°F) to allow the adequate time for full digestion. The pH levels that were tested in the experiment are 1, 2, 3, 3.15, and 3.5. The pH of 1 has the highest acid level, and the pH of 3.5 with the lowest acid level. This experiment could be useful to athletes who wish to see if the protein they take in through their diet is digested properly and fully. Athletes need their protein to be fully absorbed in order to obtain the energy necessary to perform physical activities and knowing this information could benefit them greatly. The research took place from November 4<sup>th</sup> through December 15<sup>th</sup> at the Macomb Academy of Arts and Sciences.

## **The Effect of Different Liquid Laundry Detergents on Stains**

*Student Research By: Bruce Chang, Jim Fitzsimons, Blake Merrifield, and Robert Siewert*

The purpose of this study was to test and observe three different laundry detergents and how they affected stains. Three different detergents were tested on three different stains over a ten-week period. The entire experiment was conducted in the Macomb Academy of Arts and Sciences in the cafeteria testing period. The experiment was done in the cafeteria of the Macomb Academy of Arts and Sciences. The purpose of the experiment was to determine which laundry detergent would best remove different types of stains by measuring the amount of stain removed. Dynamo, Arm & Hammer, and water (control) were all tested on grass, ketchup, and oil stains. The experimenters used fifteen stains each of grass, oil, and ketchup. Each trial used five of each stain in the three different detergents. A see-through grid with 1cm x 1cm squares was used to find the area of the stain before and after washing the stain. The stain was then washed and measured again after being allowed to dry. A percentage of leftover stains were obtained from this data. After comparing the percentages, Arm & Hammer was determined to be the best at removing all three stains, followed by Dynamo, and followed by water.

## **The Effect of Glycerin on the Lifespan of a Bubble**

*Student Research By: Leila Breault, Chelsea Frazier, Kyrene Teipel, and Katie Wylin*

The purpose of this study was to determine how many milliliters of hair conditioner (glycerin), when added to a bubble solution, would increase the life of the bubbles most. Between the starting date, which was October 19, 2005, and the ending date, which was December 14, 2005, researchers performed the experiment in the cafeteria of the Macomb Academy of Arts and Sciences (MA<sup>2</sup>S). Bubbles were blown with a syringe, then the bubble's life duration was timed by using a stopwatch and the data was recorded. In the data that was collected it was recorded whether the bubbles popped in the air, or if they bounced. The bubble solution that was used was composed of Dawn dish soap and warm water. In the test the researchers used plain bubble solution as the control group and thirty trials per test with different amounts of hair conditioner every thirty trials. In this study the bubble life was expected to grow as more hair conditioner was added because of simple cross-linking due to hydrogen bonding. However, the time change appeared to be more directly related to the humidity rather than the amount of glycerin.

## **The Color of Light that Shines Brightest through Fog**

*Student Research By: Matt Karl, Bret Kirchner, Cody Tousignant, and Cole Waterstraat*

The purpose of this study was to find the color of light that had the greatest intensity through a tank filled with fog. The colors of light that were used during the experiment were white, yellow, red, green, and purple. The different colors of light were shown through a 10-gallon tank. The intensities were recorded using a light intensity meter that was attached to a CBL2, which was connected to a TI-83 calculator. The red light had the greatest intensity through the fog. It was concluded that the red light had the greatest intensity because red has the shortest wavelength on the visible light spectrum so it was able to pass around the water molecules easier than the other colors. The purple had the lowest intensity through the fog. It was thought that it had the lowest intensity because it has the largest wavelength on the visible light spectrum, therefore making it harder to pass around the water molecules in the fog. This experiment concluded that the red light had the greatest amount of penetration through the fog compared to white light and the other colors of light tested. The data was collected at the Macomb Academy of Arts and Sciences in Armada, MI from October 19, 2005 and ended on December 14, 2005.

## **The Amount of Bacteria Growth Dependent on the Egg Content of Noodles**

*Student Research By: Chris Haller, Matt Martin, and Kyle Spencer*

The purpose of this experiment was to find which egg content of noodles would grow the most bacteria. The three egg contents that were tested were two, three, and four egg. These egg contents were tested at 33°C. Between October 18, 2005 and December 14, 2005 research was conducted at the Macomb Academy of Arts and Sciences. It was observed that the three egg content outgrew the other noodles by far. The results prove the hypothesis to be incorrect. This is because the three egg content noodle grew the most and the hypothesis stated that the four egg would grow the most. The p values tell that the experiments data had data that did not happen by chance the noodle content did effect the growth of bacteria on the noodles. In conclusion the results show that the hypothesis was rejected because the three egg noodle grew the most instead of the four egg noodle.

## **The Effect of Fiberglass Batts, Rigid Foam Panels, and Cellulose Insulation, on the Temperature Inside a Sealed Container When Exposed to the Freezing Point**

*Student Research By: Abby Czachorowski, Crystal Knust, Shelby Motoligin, and Alec Peterson*

The purpose of this experiment was to find the most efficient insulation to contain a temperature inside of a home. Testing for this experiment was conducted at the Macomb Academy of Arts and Sciences (MA<sup>2</sup>S) starting on October 16, 2005 through December 14, 2005. The insulations that were being tested were fiberglass batts, rigid foam panels, cellulose, and no insulation (the control). Each insulation was placed inside a wooden cube and placed in the freezer at -20° C. There were seventeen trials conducted and each was one hour long. It was found that rigid foam panels were the most efficient insulator.

## **The Effects of Temperature on the Bounce of a Tennis Ball**

*Student Research By: Shana Knake, Katie Schlump, and Brittany Ryan*

The purpose of this study was to test which temperature would create the largest bounce height. Five different brands of tennis balls were tested at five different temperatures: 10° C, 15° C, 20° C, 25° C, and 30° C. It was observed that as the temperature of the tennis ball increased the height of the tennis ball bounce increased. It was concluded that the observed results were due to the temperature creating the rubber molecules to become denser and hold together tightly, resulting in a lesser bounce. As temperature increased the molecules moved around more, creating the ball to bend more, resulting in a greater bounce height. It was theorized that if the temperature of the tennis ball would increase the bounce height would slowly decrease until it lost all elasticity, and would not return to its original shape.

## **The Dependency of Mold Growth on the Amount of Water**

*Student Research By: James Schneider*

The purpose of this experiment was to see if the amount of water would affect the amount of mold found on bread. This also had one other reason, and that was to see what kinds of mold would form at different water amounts. For nine weeks, the amount of mold was written down. There was 90 pieces of bread used in this experiment, and it was divided into six groups, each depending on the water amount (0-5mL). The bread that had 0mL of water was used as a control to compare the other sets to.

## **The Effect of Temperature on a Paintball's Accuracy**

*Student Research By: Adam Kozlowski, Zach Nawrot, and Chris Tobey*

The purpose of this study was to determine if changing the temperature of a paintball would affect the accuracy of the shot from a distance of seven and one-half meters. This study was also conducted to try to find a small advantage for the players of paintball. The research was conducted in a controlled environment at the Tobey residence. A wooden stand was constructed to hold the paintball marker one meter off the ground. Between October 12, 2005 and December 14, 2005 data was collected by shooting paintballs of different temperatures at a 12" x 12" paper target. The four temperatures used were 20° C (room temperature), 39° C, 13° C, and -5° C. It was concluded that the most accurate of the four temperatures for hitting the bulls-eye of a target from seven and one-half meters was 39° C.

## **The Effect of the Recycling Process on the Structural Integrities of Polymers**

*Student Research By: Chris Forehand, Jordan Krause, and David Wolf*

The purpose of this experiment was to view the effects of six plastics after a process called the freeze-thaw process was performed on them. This process includes breaking a bar of plastic, cutting it up, and then re-melting it to form a new bar. The six plastics used were low-density polyethylene (LDPE), high-density polyethylene (HDPE), polyvinyl chloride (PVC), polystyrene (PS), polyethylene terephthalate (PETE), and polypropylene (PP). There were three trials performed, each consisting of three bars per trial. The plastics were tested using a machine after the plastics were created using the silicon mold. The strongest plastic found during testing was PETE. PP, LDPE, HDPE, and PS followed in strength respectively. PVC was the only plastic that stretched for every trial. LDPE, HDPE, PP, and PETE all gradually decreased in strength, while PVC and PS increased for the first trial and then decreased after the second trial. It was concluded that performing the freeze-thaw process on plastics has a negative effect on strength in most cases.

## **The Effect Of Mass On A Rockets Distance, Time, And Velocity**

*Student Research By: Danielle Beste, Karl Cross, Jason Deneweth, and Shukria Shawqi*

The purpose of this experiment was to determine how mass affects the distance traveled, time of flight, and initial velocity of a rocket. Four rockets with masses of 10.6, 16.6, 20.6, and 24.6 grams were launched using a pneumatic potato gun at a pressure of 15psi and a 35-degree angle. To vary the mass for each rocket, Play-doh was inserted in the nosecone. Every trial was recorded and then analyzed using the Peak Motis program. After analyzing the data, it was observed that the control rocket, which was 10.6 grams, did in fact travel the farthest distance with the fastest velocity. Also, it had the longest time of flight. The time of mass (when rounded to the hundredths place) had turned out to be the same at 1.15 seconds with the exception of the control rocket. In contrast, the 16.6 gram rocket traveled the least distance with the slowest initial velocity.

## **The Effect of an Electromagnet on the Acceleration of a Model Car**

*Student Research By: Katie Baert, Mike Grix, and Alex Pikunas*

The purpose of this experiment was to test the technology used in European self-levitating trains and to apply this technology to the automobiles of America. All of the testing was completed in the Macomb Academy of Arts and Sciences in Armada, Michigan during the 2005-2006 school year. A model car was fitted with an electromagnet while the ramp set at an angle of five degrees was fixated with permanent magnets on regular intervals. The car was tested at 1 volt, 2 volts, 3 volts, 4 volts, 5 volts, 6 volts, and zero volts with no magnets as the control. The testing took place on two separate days where 30 trials at each voltage were taken for each day. The results showed that at three volts the car could travel at the greatest speed, but if this process were to be applied to a real-world function, two volts would become the voltage applied due to consistency reasons.

## **The Effects of Permanent Hair Dye on the Strength of Hair**

*Student Research By: Callan Banach, Alissa Beeman, Holly Jurzysta, and Jill Szydloski*

The purpose of this experiment was to determine if repetitively dyeing hair would weaken it. The experiment was conducted at the Macomb Academy of Arts and Sciences in Armada, Michigan. Blonde hair was collected from a donor in Shelby Township, Michigan. The hair was separated into nine sets with 30 strands in each set. Two permanent hair dyes, Revlon Color Silk and Clairol Balsam, were used to dye the nine sets. Set one, the control was not dyed, set two was dyed once, set three was dyed twice, and so on. Each strand of hair in each set was tested for strength. The testing was done by clamping a single strand of hair across a ring stand and then a paper cup was hung from the center of the hair by a paper clip. The paper cup was slowly filled with sand until the strand of hair snapped. The mass of the paper cup was taken and recorded. After all 30 strands of a set were tested, a mean was found. The set with the greatest mean was set seven with a mean of 102.06g. The lowest mean was the control with a mean of 82.76g. The data from this experiment shows that the hair was neither weakened nor strengthened.

## **The Effect of Backpack Straps on the Curve of the Vertebral Column**

*Student Research By: Shannon Lynch, Sarah Gutierrez, and David King*

The purpose of this experiment was to measure the angle of the spinal column while wearing a backpack. Three tests were performed on twenty different subjects. These three tests included no backpack, a backpack with shoulder straps, and a backpack with chest and hip straps. Subjects walked on a treadmill for thirty seconds with ten percent of their body weight contained inside the backpack. While walking on the treadmill, the subjects were recorded, and the footage was then digitized in the computer program Peak Motus. It was observed that both backpack trials did increase the angle that the subjects leaned forward when compared to the subjects' normal walking position. The greatest angle was the test of the backpack with chest and hip straps with an angle of 7.523. One trend was that the male subjects had a larger angle measure than that of the female subjects. Another trend was that female subjects had relatively close angle measurements for the backpack trials as males did not. One of the main observations from this experiment was that by wearing a backpack with or without the chest and hip straps, the spinal column is affected.

## **The Effects of Various Angles Of Fan Blades for a Windmill**

*Student Research By: Corey Green and Ian McDonald*

The purpose of this experiment was to find at which angle the blades of a windmill would produce the highest number of revolutions per minute. The reason this experiment was conducted was to help the growing energy problem and to find out if the normal angles of most windmill blades are really operating as efficiently as possible. After deciding on an experiment a small model of a windmill was built for testing. The blades of the windmill were twisted to various degrees while a predetermined wind force was applied. Data was collected using a photo gate and an Explorer GLX data logger. There were many observations made in this experiment, most of which disproved the hypothesis. The first thing that stood out was the higher angles of inclination for the windmill blades had lower R.P.M.s and the lower inclination of windmill blades had higher R.P.M.s. Another trend in the data was that zero degrees and all angles seventy-five degrees and above had zero R.P.M.s. The reason for higher R.P.M.s with the lower degree of angles was believed to have had less air resistance when spinning allowing for a faster spin, creating higher amount of R.P.M.s.

## **An Analysis of the Vitamin C Content of Various Fruits and Vegetables Stored Under Different Environments**

*Student Research By: Devin Kutchuk, Tonya Lenont, Sarah McCauley, Aimee Thueme*

The purpose of conducting the experiment was to test the amount of vitamin C in varying fruits and vegetables, and to determine if aging affects the amount of vitamin C in oranges. The testing was done using a titration system. Starch water was added to the juice, from the fruit and vegetables, as the indicator. Iodine (.01 Mole) was then slowly added to the juice until the juice took on a purple-black color. The amount of iodine that was used in the juice was then used to find the amount of vitamin C. It was discovered that the oranges did not contain the most vitamin C, however grapefruit did. Oranges had 60 milligrams of vitamin C per serving and grapefruit had 123-136 milligrams of vitamin C per serving. Green peppers had the most vitamin C out of all of the vegetables, with an amount of 60-90 milligrams of vitamin C per serving. Apples had the least amount of vitamin C out of all of the fruits, with an amount of 14 milligrams of vitamin C per serving. Brussel sprouts had the least amount of vitamin C out of the vegetables, 1-9 milligrams of vitamin C per serving. The fresh refrigerated oranges contained this 76 milligrams of vitamin C per serving this was the highest amount of vitamin C in the refrigerated oranges. The lowest amount of vitamin C in the refrigerated oranges was 40 milligrams of vitamin C per serving; this was found after one week of refrigeration. Week one of the non-refrigerated oranges contained the lowest amount of vitamin C, 39.5 milligrams of vitamin C per serving. Week three non-refrigerated oranges contained the highest amount of vitamin C, 68.8 milligrams of vitamin C per serving.

## **An Analysis of Heat Contents of Varying Oil/Diesel Mixtures**

*Student Research By: Chris Bruce, Daryl Desrosiers, Levi Ekanger, and James Jordan*

For the past decade, fuel demand and prices have been rapidly rising. Along with the demand, the price continues to progressively climb. An alternative to pure diesel fuel has been found, biodiesel. The main problem is finding what oil and what ratio of the mixture with diesel would produce the most Joules per milliliter (J/mL), creating a much cleaner and more efficient fuel source for the average diesel fuel consumer. A total of nine different oil mixtures containing varied amounts of Diesel, Vegetable, and Corn oils were tested to reveal the best mixture combination that would provide the most fuel efficient, environment friendly, and cost saving fuel source that is easily accessible to the average consumer. The mixtures were tested in safety heat oilcans in a fume hood within the chemistry lab at the Macomb Academy of Arts and Sciences. The main results showing that the hypothesized 50% Vegetable and 50% Diesel mixture produced the highest Joule per milliliter mean, followed by Corn 25% and Diesel 75%, and finally pure diesel fuel. This is due to the fact that Vegetable, along with Corn oil, has a high level of viscosity, this causing their bonds to be broken less frequently from the wick, which releases less energy. When mixed with diesel percentages, the mixtures were much thinner and provided an ample solution for the bond breaking process.

## The Effect of Temperature on Storing Hind III and EcoRI Restriction Enzymes

*Student Research By: Trisha Blake, Stephanie McCallumore, Caitilin McCarty, and Nina Swiacki*

This study was conducted to determine the ideal temperature for storing restriction enzymes. The two enzymes tested were Hind III and EcoRI. The testing of this subject could help further improve techniques used in criminal investigations and certain educational procedures. The testing began by making four agarose gels, for use during the electrophoresis process. The appropriate mixtures were created and the solution was placed in the molds. While the gels were hardening, a sample of DNA was taken from check cells and prepared to be injected into the gels. Also added to the DNA sample was one of the enzymes. The enzymes were stored at three different temperatures: 0 °C, 60 °C, and 100 °C. Each temperature was to be tested thirty times. After all DNA and gel preparation was completed, the electrophoresis process began. Afterwards, the DNA patterns were analyzed. During the study, certain factors were changed from week to week. Some of these factors included the amount of enzyme used, the voltage used during electrophoresis, and the usage of certain equipment. The data for this experiment was found to be inconclusive.

## The Effect of Temperature on Elasticity of Different Types of Rubber Bands

*Student Research By: Amanda Askew, Courtney Rawlins, and Cassie Yaple*

The purpose of this study was to test and compare the performance of rubber bands in different atmospheric temperature conditions. Three different types of 3 ½” rubber bands with ¼” widths were tested at room temperature (23° Celsius), freezer temperature (-15° Celsius), and boiling temperature (100° Celsius). Three different types of rubber bands from Alliance Rubber Company were used; Brites colored rubber bands, Sterling rubber bands, and Economy rubber bands. A mechanism was designed and constructed to stretch the rubber bands to test the durability and elasticity of the rubber bands. It was observed that the rubber bands of all types performed similarly in room temperature and heated conditions, and broke at the smallest lengths in the cold temperature trials. It was also found the Brites colored rubber bands performed better than the other two types of rubber bands. It was concluded that the rubber bands did not show a significant difference between the heated and room temperature trials because the rubber bands were already vulcanized, and therefore could not be affected by heat. Also it was concluded that the rubber did not perform as well in the cold temperature trials because the rubber molecules contracted, and did not stretch as far. It was also theorized that the Brites rubber bands performed better because of the different chemical composition, and the rubber might have been vulcanized differently due to the color chemicals added, causing it to exceed in performance.

## **The Effects of Various Saline Solutions on Masonry Nails**

*Student Research By: Jenna Lee, Heather Lulek, and Andrew Betka*

The purpose of this study was to determine which salt water concentrations would have the most effect on the rusting of nails. There were three different types of salt water concentrations used; these concentrations consisted of a distilled water solution, a 10% salt water solution, and a 30% salt water solution. The nails were then placed in Petri dishes with the different solutions and left to sit for a period of one week per trial. Five trials of each solution were done each week until thirty trials had been completed. The nails were always tested at room temperature (22 degrees C). There was no pattern in how much rust was produced from the three solutions. There was no significant difference in the starting and ending masses from the rusting of the nails either. The different solutions did not make the nails gain more or less rust than the other nails that were being tested and compared. It was concluded that the percentage of salt had no effect on the amount of rust produced. The oxygen and water that were present during the trials were what actually caused the rust to form on the nails.

## **Using Varying Audible Frequencies to Test Perceived Loudness in High School Students**

*Student Research By: Jon Granada, Ken Greenia, and Ben Moore*

This experiment was conducted to determine if humans perceive sounds of equal intensity with different frequencies as having different intensities. Beginning on October 19, 2005, and continuing every Wednesday until December 14, 2005, 30 subjects were randomly selected and tested. The testing consisted of three sounds of the same intensity but different frequencies, which were randomly selected and played to the subject. The subject would then tell which sound the subject felt to be the loudest, second loudest, and quietest. After ascertaining what the subject perceived, the data was put into a table, which was then divided into three different parts. These parts were based on the subjects' response. These results showed that the highest frequency was the frequency that the greatest number of subjects chose as being the loudest sound, the medium frequency as the second loudest, and the low frequency as the quietest sound.

## **The Scalability and Feasibility of Multi-Node Computer Cluster Grids**

*Student Research By: John Gardner, Alex Rusek, and Kyle Thornton*

The purpose of the experiment was to determine the efficiency output of adding nodes to a computer cluster, and to test the performance of the rate of information processed by the computer cluster based on the number of node computers added to the network. An experiment was conducted on October 12<sup>th</sup> of 2005 and completed on the 14<sup>th</sup> of December that same year. Each time a node was added to the computing cluster, the openMosix test application was used to run various stress tests on the processing performance of the cluster. The experiment began with a standalone terminal server and expanded to include six additional nodes. The stress test used to assess the processing power of the cluster was called distkeygen and calculated and analyzed four-thousand 1024 bit RSA key pairs. A computing cluster was determined to increase the amount of processing power, but it was also discovered that without a minimum amount of work to be completed by the cluster, or without a minimum amount of nodes, there is a Minimum Efficiency Barrier (MEB) that effectively negates the processing speed gained by adding more nodes to the cluster.

## The Effect of Caffeine on Mealworms

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

The purpose of this experiment was to test the effect of caffeine on mealworms to determine whether or not caffeine would be an effective weight loss supplement. First, mealworms were distributed evenly into four separate groups which each received different amounts of caffeine. The distribution of caffeine was 5.25 milligrams of caffeine per milliliters of water, 3.5 milligrams of caffeine per milliliter of water, 1.75 milligrams of caffeine per milliliter of water, and the control group which received 114ml of water with no caffeine. Each week the mealworms were counted and massed, and an average mass per worm was found. After counting and massing all groups, all the dead worms were disposed of and the oats, potatoes, and caffeine and water mixtures were replaced. One observation made in the ten weeks of data collection was that though all groups had a steady gain in mass. The group that received the highest amount of caffeine (5.25 mg/mL) maintained the lowest average mass and the group that received the lowest amount of caffeine (0 mg/mL) maintained the highest average mass. Overall, the group that was receiving the highest amount of caffeine had the highest rate of death and the highest rate of production of darkling beetles, while the group that received no caffeine had nearly the lowest rate of death and no darkling beetles.

## The Effect of Different Temperatures on the Degradation of McIntosh Apples

*Student Research By: Kayla Allor, Bethany Clark, Mallory Diehl, and Nick Weldon*

The purpose of this study was to determine that variance in temperature has no effect upon the condition of McIntosh apples. In four different temperatures, zero, ten, twenty-five, and thirty degrees Celsius, twenty apples were observed and placed in one of two environments. An incubator was for the two higher temperatures, and a refrigerator was for the two lower temperatures. The apples stayed in that environment for a two-week period. Individual mass was taken for each apple before it was placed in the environment and each week to follow. Also, temperature was monitored everyday for consistency and adjusted accordingly. This was to simulate the effect temperature had on apples in various storing places in the average household. The raw data was then analyzed and a percentage mass lost was calculated for comparison. The experiment resulted in a general trend that as temperature increased, the average mass lost increased. These data points defied the formed hypothesis, and showed a direct relationship between temperature and condition. This meant that the condition of apples were preserved better at lower temperatures because there was less mass being lost in the apple. However, the apples stored at ten degrees Celsius obstructed this trend considerably and was thought to be the result of error. Statistically, the data was substantial to determine that the results were adequate after performing normality and t-tests.

## **The Effects of Different Doses of Tums® on the pH Level of Hydrochloric Acid**

*Student Research By: Amanda Palaski and Noelle Rastigue*

Many people experience GERD. GERD stands for Gastro Esophageal Reflux Disease. Many people believe that heartburn and GERD are separate diseases, however, heartburn is a one symptom of GERD. To settle the uneasiness or indigestion of the stomach people take antacids such as Tums®. This makes the hydrochloric acid (stomach acid) less acidic. In this experiment, tablets of the antacid Tums® were crushed to simulate chewing. Then, they were distributed to the 700ml of HCl. 700ml is the same amount that is in the average human stomach. The pH level of the hydrochloric acid was then taken every second for fifty-five seconds to find the difference between the three different dosages used (one tablet, three tablets, and six tablets). Results showed that the double dosage (six tablets) worked the fastest, however, the recommended dosage (three tablets) worked the most steadily and it was pondered that if let go for a more extensive period of time, the double dosage would actually be harmful to the body. Also, the half dosage (one tablet), worked the slowest at neutralizing the acid. It is believed that these results occurred because the more medicine that is administered to try and neutralize at the same time, the more medicine that is working towards neutralizing. However, there are ways to overdose and it is believed that using the double dosage will cause an overdose. The biggest trends that were seen were in the means. The biggest mean was seen in the double dosage and the smallest in the half.

## **The Effects of Overcrowding on Grass Growth**

*Student Research By: Renee Bezaire, Elizabeth Fleming, Jenna Kegler, and Sheri Lewis*

The purpose of this experiment was to determine whether or not the amount of spacing between plants would affect the overall growth. The experiment was conducted using twelve terracotta pots in which seeds were planted with one-quarter centimeter spacing from each other, one-half centimeter spacing, and one centimeter spacing. These grass plants were then compared to a control, where the seeds were randomly scattered over the surface of the soil. Each pot consisted of 30 seeds, once sprouting occurred, grass length was measured weekly. Ultimately, it was observed that the closer spacing produced greater growth than did further spacing between seeds. The group of spacing that had the highest growth was the control, followed by the one-half centimeter, then the one-quarter centimeter, and finally the one centimeter spaced plants, which had the lowest growth.

## **The Effects of Wind Speed, Blade Angle and Quantity on Energy Output**

*Student Research By: Casey Beeman, Lindsay Hurd, Logan Kinch, and Alicia Winans*

The purpose of this study was to determine if blade quantity, angle of the blade, and wind speed had any effect on the output of a wind turbine. This was done by building a wind turbine with adjustable blades. Between October 12<sup>th</sup> and December 14<sup>th</sup> 2005, tests were conducted at the Macomb Academy of Arts and Sciences that consisted of three, four, five, and six blade amounts with angle measures of zero, thirty, and sixty degrees. These were tested under the conditions of high and medium wind speeds on a fan. The results show that the thirty degrees with four blades produced the highest output for the high wind speed and the five blades at thirty degrees produced the highest output for the medium speed. It was concluded that the thirty degrees had the greatest output for all blade quantities and both wind speeds. This was because it had the best ratio of surface area, but still allowed the wind to pass through, allowing the fan to spin.

## **The Effects of Various Angles and Frequencies on the Intensity of Sound**

*Student Research By: Matt Raska, Donald Yochim, and Mark Zeigler*

The purpose of this experiment was to determine the angle that would produce the most sound reduction when twelve different frequencies were reflected off of a metal panel. Testing was done at the Macomb Academy of Arts and Sciences (MA<sup>2</sup>S) in Armada, Michigan from October 19, 2005 through December 14, 2005 in an isolated room. To conduct this experiment, a soundproof box was constructed out of .5 inch plywood measuring 2 feet by 2 feet by 5 feet. Sound was directed at two metal panels of which the angle could be adjusted. The sound was then reflected towards a decibel meter and the decibel level was recorded. The twelve different frequencies that were tested were 25 Hertz (Hz), 44 Hz, 63 Hz, 156 Hz, 250 Hz, 625 Hz, 1000 Hz, 2500 Hz, 4000 Hz, 10000 Hz, and 64000 Hz. Each frequency was tested 30 times for angles 0 degrees and 20 degrees through 160 degrees in increments of five degrees. It was concluded that an angle of 25 degrees had the greatest average decibel level and an angle of 60 degrees had the least average decibel level, or the most sound reduction. It was also found that a frequency of 250 Hz produced the greatest average decibel level and a frequency of 64000 Hz produced the least average decibel level, or the most sound reduction.

## **The Velocity of a Football When Shot Out of a Passing Machine with Varying Spirals**

*Student Research By: Andrew Blake, Nathan Caruss, and Joey Zebelian*

The purpose of this study was to determine if the spiral of a football has any affect on the velocity at which it travels. This experiment was conducted between October 14, 2005 and December 15, 2005 at MA<sup>2</sup>S. Video data was analyzed of the football's flight after being shot out of the Jugs Passing Machine, with varying spirals for their horizontal (X), vertical (Y), and resultant (R) Velocity, using a Peak Motus motion analyzer. It was found that the football with the greatest spiral was the (30,-30) trials, this also caused it to have the greatest R velocity, followed by the (15,-15) which had a lower R velocity and a slower spiral. The (0,0) trials had the lowest R velocity and the slowest spiral.

## **The Effect of Washing Techniques and Time on Hair Strength**

*Student Research By: Kylie Krause, Melissa Lapp, Merissa Seefried, and Kristina Williams*

The purpose of this study was to determine what washing technique and time interval was best for the strength of hair. This experiment was conducted between October 12, 2005 and December 14, 2005 at the Macomb Academy of Arts and Sciences in Armada, Michigan. Hair was taken from three people and washed with different combinations of water, shampoo, and conditioner for time intervals of 30, 60, and 90 seconds. Some of the hair was color treated and also may have been treated with hair products such as hairspray and gel. The strength of the hair was tested by fastening a strand of hair to two ring stands, with a Dixie cup strung onto the center. Sand was gradually poured into the cup until the hair broke. The hair that was washed with water, shampoo, and conditioner for 90 seconds resulted in having the most strength. This was believed to be because the conditioner added proteins for a longer time to the hair, making it able to withstand more weight. It was determined that the hair washed for 90 seconds was the strongest compared to the other time intervals, and subject two's hair was the strongest compared to the two others. In conclusion, hair washed with shampoo and conditioner for 90 seconds witheld the most amount of weight.

## **The Effect of Different Temperatures on Hockey Pucks and their Resultant Velocities and Rate of Deceleration**

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

The purpose of this experiment was to determine the optimum temperature of a hockey puck for it to travel with the least amount of deceleration across a surface of ice. This theory was tested by launching hockey pucks at different temperatures across a pre-constructed tray filled with ice. After the pucks were launched they traveled through two photo gates. The data from this was later used to calculate the deceleration for each puck launched. Experimentation was conducted in the fall of 2005 at the Macomb Academy of Arts and Sciences (MA<sup>2</sup>S), located in Armada, Michigan. After data analysis, it was found that the temperature of 20°C is the optimal temperature for a hockey puck to cause the least amount of deceleration therefore ensuring the puck to travel faster and further. The 0°C (used by the National Hockey League, or NHL) and 40°C pucks were found to have traveled the slowest. The other temperatures tested, 10°C and 30°C, had deceleration values between the optimum and least favorable groups. These data values were produced due to the amount of water that formed between the hockey puck and the ice at different temperatures. The varying temperatures of the pucks allowed differing amounts of water to form and therefore caused the puck to travel at different velocities and decelerate at differing rates. In conclusion, it was found that the temperature of 20°C is the ideal temperature for a hockey puck.

## **The Effect of Changing Drawback Weight on Arrow Velocity**

*Student Research By: Daniel Kaltz*

The purpose of this experiment was to determine whether or not an increase in the drawback weight on a compound bow would have a significant affect on the velocity of an arrow. From November 14<sup>th</sup>, 2005, through December 6<sup>th</sup>, 2005, an arrow was shot with a compound bow, with six different drawback weights, through a chronograph. A chronograph is a machine with two sensors spaced one foot apart. It records the amount of time lapsed from when the first sensors is tripped till the second sensor is tripped. It then converts to feet per second (fps). It was concluded that an increase in drawback weight did indeed have a significant affect on the velocity of an arrow.

## **The Effect of Auditory Stimuli on Reaction Time**

*Student Research By: Grant Bartlett and Brandon Jackson*

The purpose of this experiment was to find if there was a correlation between introducing auditory stimuli and the reaction time of a single stimulus. A Flash MX program was created to test the reaction time of each person. Accuracy was measured as a secondary trend. Twenty volunteers were randomly selected to participate in the experiment, which was held in a quiet room in the Macomb Academy of Arts and Sciences. The volunteers would complete 15 trials in the Flash MX program and then a second set of 15 trials. The five volunteers in the independent group would play the piano in between the two sets of trials. The results of the experiment showed that there was an impact on the reaction time of an individual when a musical stimulus was applied. The average reaction times of the individual volunteers decreased when music was introduced. Every week the average reaction time for the volunteers decreased, which illustrates a familiarity with the patterns used in the program and on the keyboard.

## The Effects of Garlic and Oregano Oil on the Inhibition of *Candida Albican* Growth

*Student Research By: Rachel Beaupre and Christine Bingham*

*Candida albican* is dimorphic yeast responsible for the disease Candidiasis. The overuse of antibiotics has made them almost useless as a treatment. Thus, a more plausible way of preventing growth might be to use natural methods. This study was conducted to determine which natural oil is the most effective inhibitor of *Candida albican*. *Candida albican* was immersed in solutions of different concentration levels of oregano oil and garlic oil obtained from soft gel capsules. Petri dishes with TSA agar held 0.1 mL of each solution. The samples were incubated at 30degrees Celsius. Growth of the yeast was checked each week for two weeks using graphical transparencies. The resulting data showed that oregano oil outperformed garlic oil as a *Candida albican* inhibitor.

## Increasing Thermal Energy and Its Impact on the Performance of Silicon Microprocessors and Graphics Acceleration Cards

*Student Research By: Mike Breiling, Kyle Weirauch, and Eddie Zinger*

A study was conducted at the Macomb Academy of Arts and Sciences to determine at what point a computer would perform the best and most efficiently. Initially, a computer was properly assembled. Then, the benchmarking program, 3DMark05, was run on the computer. When this program was finished, it displayed a number for how well the computer performed while the program was running. The trials were run in sets of four. The performance ratings, the case temperature, and the CPU temperature were recorded for further analysis. As expected, the performance ratings for the computer were the highest after all four of the trials had been completed. The average performance ratings increased for each set of trials. This happened because there was an increase in energy in the case as time progressed. This increase in heat and electricity had a positive impact on the computer's performance. The system temperatures increased after each of the trials were run. This is because there was still an electrical current running through the capacitors of the computer. This increased the temperature, and it was not possible for the computer to completely remove all of this excess heat. This was because when the computer was turned off, the system fans were unable to continue removing heat.

## The Effects of Air Purification on Ozone Levels in an Indoor Environment

*Student research By: Frances Dixson, Stephanie Hartsig, and Hannah Johnson*

The purpose of this study was to determine whether an air purifier designed to remove common odors from various materials produces unhealthy levels of ozone. Research began on October 26, 2005 and continued through December 20, 2005. Three ozone badges were placed in the center of an empty room at the Macomb Academy of Arts and Sciences located in Armada, Michigan, and were exposed to four different types of environmental variances. The variances included the low, medium, and high settings of an air purifier, along with the natural environment of the room. The badges were placed in the empty room for a duration of two hours until a total of fifteen trials had been conducted. Badges were again placed in the room with an OMZ-5000-HF air purifier set to low for a duration of two hours. The process was repeated until fifteen trials were tested for each of the medium and high settings of the purifier. The ozone badges were then airmailed to Tokyo, Japan for analysis since that is where the badges were first invented. The results had shown that the ozone badges exposed in the room with the air purifier shut off detected a relatively small amount of ozone at a level of 10 ppb (parts per billion). With the purifier set to low, the ozone level was the second lowest level. The ozone concentration levels of the badges exposed to the medium setting were relatively similar to the low setting, with a slightly higher difference. The high setting showed a significant change in ozone level, therefore it can be concluded that as the air purifier setting increased, the ozone concentration level increased as well.

## The Effects of Temperature on the Growth Amount of *Micrococcus Luteus*

*Student Research By: Patrick Higgins, Michael Polisei, Steven Schafka, and Byron Voelkert*

For nine weeks, a study was conducted in the biology lab of the Macomb Academy of Arts and Sciences in Armada, Michigan. The purpose of this experiment was to determine temperature's affect on the growth amount of *Micrococcus luteus* in an electrophoresis chamber. *Micrococcus luteus* is a bacterium commonly found in the outer skin of humans. This bacterium was placed into sterilized Petri dishes filled with Tryptic Soy agar. These dishes were then placed into an electrophoresis chamber at six different temperatures, each for the duration of one week. The six different temperatures used for testing were 25°C, 30°C, 35°C, 40°C, 45°C and 65°C, where 25°C was the recommended temperature for optimal growth and 65°C was the maximum temperature at which the incubator would heat up to. The recommended temperature of 25°C had more growth than all of the other temperatures; however, 35°C had more growth than what the trend showed that the bacteria should have. This is believed to occurred because 98.6°F (average body temperature) is equivalent to 37°C; therefore it is believed that 35°C provided a much more ideal circumstances for growth than that of 30 and 40°C. At the end of the testing period, each Petri dish was removed, the bacteria were counted, and the growth amount was recorded. It was concluded that as temperature increased, the amount of bacteria growth decreased.

## **The Effect of Fluoridation on Thirty Pre-Molar Teeth Exposed to Phosphoric Acid**

*Student Research By: Erin Harding, Katie Harding, and Cory Hayes*

The purpose of this study was to determine the effects of fluoridation on pre-molar, virgin teeth. The research was conducted at the Macomb Academy of Arts and Sciences in Armada, Michigan. Between October 14, 2005, and December 13, 2005, thirty pre-molar teeth were separated into three groups: group 1 (distilled water), group 2 (sodium fluoride), and the control, group 3 (empty). The teeth in groups 1 and 2 were exposed to Coca-Cola for sixty minutes every week and the new mass, volume and density of each were found. The total mass lost in each group after seven weeks was compared and it was determined that fluoridation does prevent tooth decay. The teeth exposed to sodium fluoride (NaFl) were observed to have been able to resist the acidity of the Coca-Cola. The tap water soaked teeth (group 1) lost far more mass comparatively. A trend occurred mainly between the types of liquid the teeth were soaked in versus the amount of mass they loss over time. This trend had a direct correlation between time and mass loss, which meant the amount of mass loss increased as time increased. It was found that teeth soaked in NaFl were able to resist degradation over time compared to the teeth soaked in tap water.

## **The Effects of Differend Sized Meteors with Equal Masses on the Amplitude and Wave Length of the Resultant Tidal Wave**

*Student Research By: Alex Egle, Jack Johnston, Theodore Patchel, and Jake Sweeney*

The purpose of this study was to determine which type of meteor would produce the largest tidal wave in the event of striking one of the Earth's oceans. Three different balls containing small, medium, and large volumes were used to replicate three different types of meteors: stony, stony-iron, and iron. The amount of displacement would be determined by the height and width of the resultant wave. To begin this experiment, the middles of three similar balls were hollowed out and tiny masses were added to create the effect that all of the balls would have the same mass. In this way, the volume, and in turn density would be the only variables that differed in each ball. The results showed that the medium ball consistently had the largest displacement created from each drop. Also, the large ball and small ball had similar displacements for each of the drops. Due to these results, it was concluded that a stony-iron type meteor would create the most devastating wave if this meteor were to be propelled from space into one of the Earth's oceans.

## **The Effect of Soundproofing on a computer Generated Musical Note**

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

The purpose of this study was to determine the effectiveness of different materials at dampening the intensity of sound, as indicated by the amplitude of a sound wave. Between October 12 and December 14, 2005, tests were conducted to determine what kind of material would dampen sound the most effectively. The materials tested were pegboard, foam insulation, packing foam, and air as the control. Using a speaker connected to a laptop, a "C" note was played into a service window with a microphone connected to an oscilloscope on the other side with the material being tested between the microphone and speaker. The wave amplitude of the sound after passing through the material was recorded for each trial. The foam insulation dampened the intensity of the sound the greatest, based on it yielding the smallest wave amplitudes, followed by the pegboard, packing foam, and air. The holes in the pegboard disrupted the sound, while the packing foam was made from a less dense material, which allowed the sound toe easily pass through.

## **The Effect of Increased Ultraviolet Radiation on the Genomic DNA of Cyclamen Plants**

*Student Research By: Melissa Mueller and Erin Stemmer*

The purpose of this experiment was to analyze the effects of ultraviolet radiation on the genomic DNA of three Cyclamen plants, each exposed to varying levels of ultraviolet radiation. Between November 2, 2005 and December 14, 2005 a protocol for isolating genomic DNA was carried out, and electrophoresis was run on the resulting samples. Errors resulted in a loss of DNA before the electrophoresis step. The procedure was repeated and again yielded no results. It was concluded that the required centrifugation forces, a lack of EDTA, and incomplete solubilization were the main causes of error in the research.

## **The Effects of Anti-Wrinkle Creams on Simulated Human Skin**

*Student Research By: Morgan Douglas and Nicole Gabridge*

The purpose of this study was to determine if anti-wrinkle creams have any real effect on skin. Pig skin was used to simulate human skin because pig skin and human skin share many similar physical and chemical attributes. The skin was trimmed for fat, shaved to remove some of the hair, washed with soap and water, and then set in to three groups for the testing of Neutrogena cream, L'Oreal Paris cream, and the control group of no cream. The skin was measured in centimeters, stretched with force sensors, and measured again to determine its elasticity, firmness, and resistance to changes in pressure. While it was concluded that using both moisturizing and anti-wrinkle creams do help enhance skin and improve its elasticity, it could not be determined if the price and greatness of complexity of the creams have any effect on the creams' performance.

## **The Effects of Ultra-violet and Fluorescent Light on the Fermentation of Apple Cider**

*Student Research By: Christine Kiehler, Lindsay Knake, and Ashley Walling*

The purpose of this experiment was to determine the effects of ultra-violet and fluorescent light on the fermentation of apple cider. Between October 12, 2005 and December 14, 2005, samples of apple cider were fermented under ultra-violet and fluorescent lights at the Macomb Academy of Arts and Sciences in Armada, Michigan. Containers of apple cider and yeast were placed in three environments: ultra-violet light, fluorescent light, and no light. The specific gravity and observations of the cider were recorded daily. The ultra-violet light caused the lowest change in specific gravity and the fluorescent caused the highest. It was concluded that the lights had a negative effect on the apple cider and that a dark environment is the best setting for fermentation. From observations taken during testing, it was also determined that the temperature of the apple cider had the most significant effect on the outcome of the experiment.

## **The Effects of Electromagnetic Radiation on *Raphanus Sativus***

*Student Research By: Harry Awdey*

The purpose of this experiment was to determine the effects of various amounts of electromagnetic Radiation on the growth of Radishes. From the dates of November 1, 2005 and December 14, 2005 sample groups of 30 radishes were divided into three groups. Group 1 was the control, which received no radiation, group 2 received 0.5 watts of radiation for 1 hour per day and group 3 received 2 watts for one hour per day. The findings supported the null hypothesis that electromagnetic radiation would not have an effect on growth or germination rates. It was found that the 0.5w sample group has the largest overall growth and best germination rate overall when compared to the 2w and control. Therefore it was concluded that small amounts of electromagnetic radiation can prove beneficial for plant growth.

## **The Effect of Varying Petroleum Diesel to Biodiesel Ratios on Cloud Point**

*Student Research By: Emily Cross and Kyle Goodmen*

The purpose of the study was to test and observe the cloud point properties of different petroleum diesel to biodiesel ratios. The cloud points of five different ratios were tested at room temperature (22°C) using a cooling process, which could obtain water temperatures of approximately -15°C. Once the data was collected, two-sample T-tests, as well as normality tests, were performed to determine the true findings of the study. All data that was tested proved normal and was eligible for averaging and comparison. The T-tests revealed the confidence levels in the true experimental difference of the data. Ratio 1 (100% petroleum diesel) had the lowest overall cloud point of the five ratios with continually increasing cloud points for the ratios proceeding. Ratio 5 (100% biodiesel) had the highest overall cloud point. It was concluded that the observed results were due to the physical composition of each ratio. Ratio 1 contained strictly petroleum diesel, which had the lowest cloud point. As a result, when the amount of biodiesel gradually increased for each ratio, the cloud point, in a direct correlation, gradually increased as well.

## **The Effect of Varying Types of Motor Oil and Temperature on Viscosity**

*Student Research By: Alex Schlump*

This study was done to conclude the difference between the viscosities of GTX and Mobile One, and if there was a correlation between synthetic based oil and non-synthetic based oil. The samples were tested at three different temperatures, -10°C, 20°C, and 50°C, to simulate the various environments to which oils are exposed. It was observed that the synthetic oil did not out perform the non-synthetic oil. For the different grades of oil, it was concluded that for any temperature, regardless of brand, 5W-30 oils had the lowest viscosities. The results occurred as such due to the chemical structure of the oil. 10W-30 oil contains more molecules than 5W-30, which causes its consistency to be much more thick.

## **The Effect of Different Rabbit Feeds on the Growth Rate of Rabbit Kits**

*Student Research By: Paul Gianferrara and Gina Riebel*

The purpose of this study was to determine which brand of rabbit feed would yield a faster growing, larger kit. The feeds that were tested in this study were Purina Advanced Nutrition Professional Formula and Calf-Manna Select Series Gro Formula. Two red Satin does were tested under the same conditions and measurements were taken of the kit's length, girth, and weight. It was observed that the litter fed Purina Advanced Nutrition Professional Formula yielded heavier, longer, and larger girthed kits. This led to the conclusion that Purina Advanced Nutrition Professional Formula yielded larger, faster growing kits compared to Calf-Manna Select Series Gro Formula.

## **The Effects Of Various Forms Of Electromagnetic Radiation On Pogonomyrmex badius**

*Student Research By: Caitlin Jeanguenat, Breanna Rawlins, and Brian Reid*

The purpose of this study was to determine the effects of various forms of electromagnetic radiation on Pogonomyrmex badius, the Florida harvester ant. Between November 2, 2005 and December 14, 2005, a study was conducted at the Macomb Academy of Arts and Sciences, in Armada, Michigan. To complete this study, 15 ants were placed in an ant farm and exposed to different forms of electromagnetic radiation. The three types of electromagnetic radiation tested were visible light, infrared radiation and ultraviolet radiation. At the end of each week, each ant was placed in a twelve inch, plastic tube. The amount of time that it took for the ants to travel half of the length of the tube was then recorded. The ants exposed to the visible light had an average time of 93.79 seconds, the ants exposed to the ultraviolet radiation had an average time of 37.75 seconds and the ants exposed to the infrared radiation had an average time of 19.53 seconds.

## **Fractal Dimension as an Indicator of the Complexity of a Pendulum's Chaotic Motion**

*Student Research By: Becky Nieman and Alex Russell*

The purpose of this experiment was to determine the effects of varying release angles and the presence of magnets on the Hausdorff dimensionality of a fractal created by the chaotic motion of a nonlinear pendulum. An experiment was conducted at the Macomb Academy of Arts and Sciences in Armada, Michigan in which a pendulum was affected by varying release angles and the presence of magnets to create chaotic motion. Trials were completed with the release angles of 5°, 10°, and 15° in combination with either one or two magnets placed on the floor, parallel to the motion of the pendulum's swing. The chaotic motion exhibited by the weight on the pendulum was observed from above using a camcorder. As the pendulum moved past the magnets, chaotic motion was created by the interaction of the floor magnets with the pendulum weight. PEAK Motus was then used to translate the video footage into an image file of the pendulum's path of motion. The image files were analyzed using the Benoit Fractal Analysis Information Method to determine the Hausdorff dimension of each trial. An ANOVA, showed that the average dimension for each level of variance was insignificantly different. Therefore, the data from this experiment was inconclusive in regards to the effects of angle measure and the number of magnets on the dimensionality of a fractal created by a pendulum.

## The Effect of Caffeine on Regeneration of *Dugesia tigrina*

*Student research By: Nicole Kuzminski and Becky Nieman*

The purpose of the experiment was to determine the effect of caffeine on the regeneration rate of *Dugesia tigrina*, commonly known as brown planaria. The experiment took place at the Macomb Academy of Arts and Sciences in Armada, Michigan, from November 9, 2005 to December 14, 2005. There were a total of 112 planaria tested during two three-week segments. The regeneration process was initiated by cutting the planaria transversely. The initial length was then measured and each planarian was placed into a sterilized petri dish with 15 milliliters of a caffeinated solution. Fourteen planaria were included in each of the four test groups, which were given solutions that contained 0, 3, 4.5, and 8.7 milligrams of caffeine. The regeneration rate of the planaria was found using a metric ruler and a dissecting microscope to determine the change in length every seven days. On a weekly basis, the planaria were fed beef liver and their petri dishes were cleaned. The findings concluded that the amount of caffeine given to the planaria directly correlated with the resulting lengths. Hence, the planaria given 8.7 milligrams of caffeine had the highest regeneration rate, followed by the planaria given 4.5 milligrams, 3 milligrams, and 0 milligrams of caffeine, respectively.

## The Effects of Composition on the Strength and Elongation of Polypropylene and Polystyrene Compounds

*Student Research By: Amanda Malburg and Anne Schoenherr*

The purpose of the experiment was to test and observe how the properties of polypropylene and polystyrene compounds were affected when the two individual polymers were combined. The compositions were formed in increments of ten, decreasing from 100% polypropylene, 0% polystyrene to 0% polypropylene, 100% polystyrene. After the polymers were created, the eleven compositions were tested using the three-point-bend and tensile strength tests. These tests were executed between the dates of October 19, 2005 to December 29, 2005, at the Macomb Academy of Arts and Sciences in Armada, Michigan and L&L Products in Romeo, Michigan. The results from the three-point-bend tests were determined through measuring the weight at which the sample broke, whereas the results from the elongation tests were measured according to length, and determined through PEAK Motus analysis. The tensile strength test was performed at L&L Products using a mechanical testing system (MTS), partnered with an analysis program on a corresponding computer. It was found that the 100% polypropylene, 0% polystyrene composition both held the greatest average weight and elongated the greatest amount when tested. The weakest composition was found to be 30% polypropylene, 70% polystyrene. These results did not correlate with the results from the tensile strength test, which determined the weakest composition as 40% polypropylene, 60% polystyrene. The sample that elongated the least, in respect to the three-point-bend test, was 40% Polypropylene, 60% Polystyrene while 0% polypropylene, 100% polystyrene had the lowest percent elongation in respect to the tensile strength test.

## **The Effect of Various Catalysts on the Speed of the Iodine Clock Reaction**

*Student Research By: Deanna Beste, Theresa Krawczyk, Amy Martin, and Ryan Spencer*

The purpose of this study was to determine the effects of various catalysts in differing amounts on the reaction time of the iodine clock reaction. Between the dates of October 12, 2005 and December 14, 2005, an experiment was conducted at the Macomb Academy of Arts and Sciences in Armada, Michigan that tested the effectiveness of two, five, and ten grams of silver, copper, nickel, zinc, and high density polyethylene in reducing the reaction rate of the iodine clock reaction. Also, a control, in which no substances were added, was tested to compare results against. The time that it took for each reaction to occur, indicated by the change of color from clear to blue, was recorded and analyzed. The results of the experiment showed that each substance demonstrated catalytic properties by increasing the rate of the iodine clock reaction. Also, there was a significant effect caused by the use of different amounts of each substance. Silver was the most efficient catalyst in all categories and amounts.

## **The Effects of Varying Calculation Rates on a Physics Simulation Program**

*Student Research By: Mark Dehring*

The purpose of this experiment was to determine if varying calculation rates had an effect on a simulation in reactor, a physics simulation program made by Havok. To test the hypothesis, fifty cubes were generated in a virtual space in random placements. The cubes were then allowed to fall using five different calculation rates for simulation: 5, 10, 20, 50, and 100 substeps. It was found that the varying of the calculation rates did not affect the cubes' descent, therefore the hypothesis was supported, which was further supported by statistical analysis. However, due to a fault in the experiment's procedures, it was concluded that the results were inaccurate and thus the hypothesis could not be supported or disproven.