

MARIAN UNIVERSITY
— Indianapolis —



MARCH 14, 2020

JUNIOR DIVISION

PROJECT LISTING

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Animal Sciences (AS)

GRADE 4

Kono, Aine (AS)

Melting Jello

"I learned that pineapple can melt jello well and the temperature of the fruit can change the melting speed. This magic power of the pineapple is called 'protein-digesting enzymes'. Some nice steak house using pineapple to make the meat tender and tasty. I learned many things from this project, the reason why pineapple can melt jello was that pineapple has enzymes. This was a very fun and tasty project. Next time, I would like to do a similar experiment using steak or hamburger. "

Fredenburg, Silas (AS)

Mix it Up.

"This project is designed to help my heifer eat better. I think that she will increase her intake rate by adding sugar and garlicy cinnamon. My control was her base feed and it was in every feeding. I also tested her appetite with sugar and garlicy cinnamon separate and together. She ate best with the control base feed, tied with base feed plus garlicy cinnamon. This result did not support my hypothesis."

GRADE 5

Johnson, Jack (AS)

Can Pop Be Healthy?

"I wondered if pop could be healthy, because my mom doesn't let me drink pop. I wanted to do an experiment where I could drink some pop. I also heard a rumor where police officers use pop to clean up pavement due to its acidity. My Father said that he heard Coca Cola could be used to clean a diesel engine. This had me wondering about the acidity of pop, as well as other beverages. I also wondered how much of an impact saliva has on the acidity of liquid. Maybe if I swish it long enough first, it won't be so bad when it hits my stomach? I wanted to find out if saliva helps to lower the pH of beverages. If so, how does saliva affect the pH level of an acidic liquid? I wondered if chewing food or swishing a beverage longer in your mouth before swallowing will lower the pH to help your body digest the liquid."

Agunbiade, Glory (AS)

Plants and Air Pollution

"The purpose of this project is to find out which type of polluted soil will be most harmful to plants. My hypothesis was that if I use different types of polluted soil then, the caffeinated soil will be less harmful because, when you drink caffeine it makes you hyper, so I think the caffeine in the soil will also affect the plants and accelerate their growth rate. To test this hypothesis I added my 4 different contaminants into each pot of seeds and checked and observed them for 8 weeks. The results of the experiment showed that the motor oil plant was the most harmful and the caffeinated soil wasn't harmful to the plants. In conclusion, we should make sure that motor oil doesn't get into our plants because it's very harmful to plants. We should also make sure that oil based substances doesn't get into our water and doesn't go into our plants."

Zupancic, Caleb (AS)

Do Dogs Have a Favorite Color?

"I've always wondered if dogs can really see any color at all. I've always been told that they only see black and white. My science fair project will test if dogs have a favorite color. My hypothesis is that if I place a red, orange, yellow, green, and blue paper plate with a treat on each color of the plate, I think the dogs will choose the red plate more often. I started off offering each dog to choose their favorite in front of them. I had 5 trials. I placed the same size treat. Each dog was brought within 6 feet of the plate. I observed which color plate each dog went to first and recorded the data. Each dog got to go their favorite plate four times. Each trial I rearranged the plates to ensure accuracy. I concluded that the dogs in my study tended to go to the orange plate over the other four colors. However, color did not seem to be the main factor in their choice. I believe they were more concerned with which plate was the closest or a certain direction."

GRADE 6

Mushkooor, Raneem (AS)

Urabi, Hala (AS)

Plant vs Soda

"We concluded that using the soda solely had a harmful effect on the plant, which resulted in the plant not growing. Sugary soda pops are not the most ideal choices for use as fertilizer. Sugar prevents plants from absorbing the water. Therefore, sugary sodas do not aid in a plant's development, and in fact can retard the absorption of nutrients and water, resulting in death. We are trying to see if soda can water plants because there is pollution and it is getting inside the clouds that when the rain pours on the plants it is toxic so most people call the rain toxic rain so we are trying to find a way that the plants can't die but grow healthy."

GRADE 7

Jensen, Colby (AS)

Do Red Worm or Night Crawlers Affect Cress Plant Growth Most

"How do worms affect the growth of plants and will the type of worm affect the growth? If night crawlers are added to the soil, then the plant will increase in height, because plants grow better with worms because the worms dig holes so water and oxygen can get to the roots. If night crawlers are added to the soil then the plant will not affect the height, because plants do not grow better with worms. At the end of the experiment, the hypothesis was supported because the pot with the night crawlers was the tallest plant in height by 4.21%."

GRADE 8

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Behavioral and Social Sciences (BE)

GRADE 4

Shores, Amelia (BE)

Water Experiment

"I created this experiment to see what type of water people like the best. I thought that people would like the types of water both the same. This is my procedure. First, get the materials. Next, pour the bottled water into a dixie cup. After that, pour tap water into a dixie cup. Have your test subject taste both types. Then, ask the test subject if they like tap water better than bottled water or if they like them the same. Record this on the taste test slip. Last, repeat the last 3 steps. These are the results. Seven people liked bottled water, nine people liked tap water, and four people liked them the same. More people liked tap water than bottled water. These results do not support my hypothesis."

GRADE 5

Robbins, Peyton (BE)

Screens vs. Sleep

"The purpose of this project is to test the effects of screen time on one's sleep. To test the data, one needs to set the variables that participants must follow in order to monitor their results. Test participants must wear a Fitbit to monitor the amount of healthy sleep."

Dowell, Eli (BE)

Does VR Cause Stress?

"The purpose of this project was to see if the virtual reality gaming experience can cause more stress than traditional video game play. Stress is a physical, mental, or emotional factor that causes mental tension. It can cause a "fight or flight" response from hormones. These hormones can cause heart rate, breathing, and blood pressure to increase. Virtual reality (VR) is a simulated experience that can be similar to the real world. My hypothesis was that if virtual reality gaming is more intense than traditional video gaming, then stress will increase heart rate and

blood pressure. I measured heart rate and blood pressure in 5 participants before and after playing Mario Kart on Nintendo Switch, a traditional video game system, and after playing the Luge VR game on Play Station 4. The average heart rate for the participants before playing video games was 70 and blood pressure was 102/61. The heart rate was 73 and the blood pressure was 101/62 after playing Mario Kart. The blood pressure went up after playing the Luge VR game to 113/61 and heart rate was 68. My conclusion was the Luge VR experience increased blood pressure more than playing Mario Kart, a traditional video game. This may mean that VR causes stress."

Waddle, Emily (BE)

Pepper Blast

"I've always wondered which pepper was the hottest. I love spicy food. My family loves hot peppers. I decided to ask my family members to help me figure it out. My hypothesis is the ghost pepper would be the hottest because that's what I always heard. We bought a Hungarian Wax Pepper, Anaheim Pepper, Pablano Pepper, Jalapeno Pepper, Serrano Pepper, Habanero Pepper, and Ghost Pepper. Each pepper was cut. We tasted each pepper. We had to eat bread, eat chocolate, and drink milk to cleanse our pallets. We then rated each pepper 0-10 for hotness. All three of us rated the Ghost Pepper the hottest."

GRADE 6

Ewing, Charlotte (BE)

Can music affect the speed of your run?

"Can changing the music a person listens to while running affect how fast they run? My hypothesis was that listening to hip hop music will make them run faster. To do this I had people listen to music while they ran a lap around a park three times, while I timed them running three laps, one with no music, one with hip hop music and one with classical music. When they were done running I recorded and compared times. I had people from ages six to twelve test to see if results vary from age groups. The hip hop music had the fastest times on most people. Hip hop music did not have the fastest time for either six year old or one eleven year old. The fastest hip hop time was 21.78 seconds, the fastest classical time was 22.45 seconds,

and the fastest time listening to no music was 22 seconds. Over all the hip hop music had the greatest effect on speed and matched my hypothesis. This test proved that music helps set pace for running and other physical activities."

Deer, Oliver (BE)

What Genre of Music Improves Academic Performance the Most?

"The purpose of this test was to find a genre of music that would most improve the academic performance of subjects when taking a single-digit multiplication test. My hypothesis was that classical music would improve academic performance the most. To test this hypothesis, the test subjects completed a 10 by 10 single digit multiplication test while listening to one of seven types of music: rap, pop, rock, jazz, classical, no music (control) and country. Test results were recorded and the process repeated until the test subject completed the test with all seven types of music. The results indicated that pop music increases academic performance the most with an average of 73.0 percent correct answers. Jazz music was also found to be the least boosting in academic performance with an average of 67 percent correct answers. In conclusion, my research had indicated that classical/instrumental music was best for studying and I based my hypothesis upon those facts. In my opinion, more testing with increased participants, a different type of test, more genres of music and a wider range of age groups would be beneficial to results."

Leising, LJ (BE)

Does listening to music while you study affect your ability to memorize facts?

"To determine if listening to music while studying will help people retain facts better than studying without music."

Dandelet-Vento, Dominica (BE)

Foster, Kate (BE)

Does age affect reflexes and reaction time?

"In order to answer the question, does age affect reflexes and reaction time, we will collect data from participants across a wide age range. Participants will perform a simple catch reflex."

GRADE 7

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GRADE 8

Webb, Mariah (BE)

How does multitasking affect work quality and efficiency?

"The purpose of this project is to find out whether you can do two things at once and get it right. My hypothesis was that if I give a group of people a math test without music then they will get a better score because they're putting all their attention on one task instead of two. To test this hypothesis, people around the same age group will be getting a test. They will first try to do it with music, their times and answers will be tabled. Then they will be doing one without music and they again will be timed and graded to see if they did better or worse. The results of the experiment showed the test without music works better than with. In conclusion, multitasking isn't the best thing to do it might get it done faster, but it's not making your results better."

Biochemistry (BI)

GRADE 4

Jaradat, Adnan (BI)

Cleaning Pennies

"The purpose of the experiment is to see which liquid cleans pennies best. My hypothesis is I think vinegar will clean a penny best. I had four pennies, four cups and four liquids. I will put the four different liquids in cups. I dropped a dirty penny in each cup. I started a timer. I rinsed the penny with water after 5 minutes. I then dried them with a paper towel and saw the result. I found that vinegar cleaned the penny the best. Lemon juice was second, Fanta was third and Coca-Cola was fourth. In conclusion, my hypothesis that different liquids would clean pennies differently and that vinegar would clean the best was correct. Lemon juice was also good at cleaning pennies."

GRADE 5

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GRADE 6

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GRADE 7

-

GRADE 8

Purohit, Arjun (BI)

Study effect of Blue light on CRY1 protein using fluorescence

"Cryptochromes are a class of proteins that are sensitive to blue light. They are involved in the circadian rhythm of plants and animals and are also thought to be involved in the magneto-reception in birds. I checked the protein sequence in FASTA and the secondary structure through RCSB website. This protein has tryptophan and a number of alpha helices. Since tryptophan has aromatic ring structure I wanted to see if the blue light which will produce a conformation change in the protein which could be studied using fluorescence. Fluorescence was used as it is a very sensitive method to check the structural changes in protein."

Biomedical and Health Sciences (BM)

GRADE 4

Smith, Faith (BM)

Holland, Joanna (BM)

Soak It Up Baby

"Our purpose was to see which brand of diapers holds the most water. Our hypothesis was that Huggies will hold the most water because it has the thickest padding. First, we filled up cups with colored water. Then, we poured one quarter cups of colored water into the diaper at a time. Last we kept on pouring one quarter cup of the water into the diapers until the water stood on the diaper and did not absorb. Our results are that out of the three times we tried Huggies had 16 the first two times and 15 the third time. Pampers had 12 the first time 10 the second time and 13 the third time. Luvs had 5 the first two times and 10 he last time. We have concluded that

Huggies brand of diaper holds the most water because of its padding."

GRADE 5

Senthil Rajah, Lekna Dheiva Valli (BM)

Jha, Palak (BM)

Zaman, Naheema (BM)

Can we live with one lung?

"The purpose of this project is to request people to protect their lungs because some of the people are now having lung diseases. Sometimes they need to remove one lung and stay with one lung to save their lives. Our hypothesis is that people could live with one lung but they would have a bit of pain. We decided to experiment with 3 models of our lungs working. Model 1 shows both of our lungs working with a plastic bottle. Model 2 shows one of our lungs working and model 3 shows no lung working. We used 3 plastic bottles to show a model of our lung(s). So what we did is we felt air from the straw (trachea) from model 1, and we saw if we felt air from model 2. But we did not feel the air in model 3. Which brings us to the conclusion that we can live with one lung. We researched more about it and found out that we would live the same life as other people, but we can't exercise as much as them. After a few years they have another chance to have another lung cancer, which is still bad for their body since we die from lung cancer. By this we need to learn that we need to take a lot more care about our lungs by not damaging our lungs."

GRADE 6

Aguilar, Alfredo (BM)

How does the diameter of an artery affect the rate of blood flow?

"The purpose of this project is to find and measure the blood flow in the human Cardiovascular System. My hypothesis was that if I changed the type of tubing on each side of the bucket, the water would act differently than it already did. To test this hypothesis, what I have done was check and see if the bucket was leaking. I checked the bucket because I wanted to see if the water leaked, then measure the bucket to see what would happen if it were to happen to a real

human. The results of the experiment showed that the $\frac{3}{8}$ tubing led out more water than the $\frac{1}{4}$ tubing. This shows that if you use the $\frac{1}{4}$ tubing as blood it would not come out faster than the $\frac{3}{8}$ tubing. In conclusion, I would conclude that in the future it is a better resource and a more unique tubing."

Awad, Adam (BM)

Bhai, Saleh (BM)

Synthetic vs. Antacid

"Our stomach is normally at pH levels of around 2 to 3. When we eat food, our stomach produces acid to help digest the food. However, when we eat too much food, our stomach produces too much acid and pH levels may drop below 2. This is when we start to experience heartburn, and that's precisely when the antacids become useful. Antacids are a type of medication that can help treat symptoms of excess stomach acid, such as acid reflux, heartburn, indigestion, gas, and bloating. An antacid works by neutralizing the acid in our stomach and increasing pH levels. They don't need to raise the stomach acid pH all the way to a neutral pH of 7, but just raising the pH to 3 or 4 will make a person feel better. In my experiment, I will compare the effectiveness of natural antacids like turmeric, whole milk, skim milk, ginger root, and apple cider vinegar vs synthetic antacids like tums, Pepcid, and Galveston. I hypothesized that synthetic antacids will be more effective because more research has been done on it and also because it is targeted towards a given disease, unlike naturally occurring form which has more benefits but it is not directed towards a given problem."

Abumahfouz, Jude (BM)

How Antacids Relieve Heartburn

"Although the stomach is a complex organ, I will create an artificial stomach acid that has very similar chemical properties to a real stomach acid by using hydrochloric acid and sodium chloride (table salt) to create a solution with a pH of 2."

GRADE 7

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GRADE 8

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Chemistry (CH)

GRADE 4

Webb, James (CH)

How do the amounts of vinegar and baking soda affect the amount of gas produced?

"The purpose of this project is to figure out the ratio of gas and liquid in the bottle. My hypothesis was that if I mix the baking soda in the vinegar then the balloon will blow up because the chemical reaction between the two will cause carbonic acid and sodium acetate which will blow it up. To test this hypothesis I will be doing an experiment were I mix baking soda and vinegar in a bottle and put a balloon over it. The results of the experiment showed when I put the vinegar in the bottle and I put the baking soda in the balloon, then I put the balloon on the bottle then it got bigger and bigger and bigger and then it went back down. In conclusion, when mixing the baking soda and vinegar the balloon blew up because when having the balloon on the bottle there was no air to release it, so when the reaction happened the balloon filled up."

Berbari, Jackson (CH)

Melting Chocolates

"The Purpose of my experiment was to determine how cocoa affects chocolate melting. Hypothesis: Chocolate with more cocoa will melt at a lower temperature. Null hypothesis: The amount of cocoa will have no effect on melting temperature. Procedure: I used a melting chamber water bath to slowly heat 4 different chocolates with different amounts of cocoa. Then I measured the temperature of the water and recorded the melting temperature of all 4 different types of chocolate. Results: Chocolate with more cocoa had lower melting temperatures. Conclusion: The results support my hypothesis and show that the chocolate with more cocoa had a lower melting temperature."

Dodson, Max (CH)

Gummy Bear Explosion

"The purpose of my project is to see what liquid makes a gummy bear grow the most. My hypothesis was that the gummy bear in the Gatorade would grow the most. I put the liquids in the bowls then the gummy bears in the bowls for 48 hours. The Sprite zero won. I think the Sprite Zero won because of the sugar in it."

Engleking, Nieko (CH)

Taste the Rainbow

"I wanted to know if putting skittles in different liquids made the colors dissolve off the skittles faster. I thought that water would dissolve colors the fastest, but I changed it to sprite after I poured all the liquids and saw the carbonation fizzing in the sprite. First, I sorted the skittles by color. Then, I poured the five liquids into the cups. Next, I put the skittles in the cups all at the same time with help from family members. Then, I started the timer. Finally, I observed the reactions to the liquids and recorded my observations. All of the skittles reacted quickly but the skittles in the vinegar dissolved color the quickest and in less than two minutes they were all without color. My conclusion did not support my hypothesis. Sprite did not dissolve the color off skittles the fastest, it was vinegar that made the color dissolve the fastest, but only by seconds. Most of the colors also dissolved within seconds of each other, so color was not a factor in how fast it dissolved from the skittle."

Stout, Graham (CH)

Pop Goes the Bubble

"During my research, I found that someone had said that gum with less sugar would blow the biggest bubbles. I think that is true because the sugar takes up the space in the piece of bubblegum so you would have less gum when the sugar dissolves. I think Bubble Yum will blow the biggest bubbles because it is tied for the least amount of sugar. It is tied with Hubba Bubba. The results showed that Bubble Yum blew the biggest bubbles. These results agree with my hypothesis that bubblegum with less sugar blows the biggest bubbles. Bubble Yum and Hubba Bubba had the least amount of sugar and they blew the biggest bubbles."

Al Jahmi, Abdulrahman (CH)

Layering Liquids

"You're probably wondering how these liquids are not mixing? It all has to do with density. You might be wondering, what is density? Density is the amount of mass per volume. If an object is heavy, its density is high. Mass is the amount of matter in an object. Volume is the amount of space an object takes up. For example, Volume is the amount of water it can hold. Liquids with a high-density sink, however liquids with a lower density float. The objects that I dropped in, sank to different liquids because the densities are different. For example, the cherry tomato landed in the dishwashing soap because they both have the same density"

Erbosin, Karem (CH)

Ali, Ammar (CH)

The effect of different solutions on red cabbage Blend

"Do you love to mix different solutions with liquids like us? If you said yes, then this science fair project is great for you. If you said no, then maybe you will like this amazing color-changing liquid you can make with cabbage. The purpose of this project is to test the pH of different solutions using red cabbage blend as an indicator to identify each solution as either an acid or base. One of us hypothesized that the color of the blend wouldn't change while one of us hypothesized that it will. We started the project by blending red cabbage with water and laid it out in 5 different cups or bottles, labeling each one with the different types of solutions that it'll be mixed with. Then different solutions we used are lemon juice, baking soda, ammonia, vinegar, and water. We poured around 5 teaspoons of each mix into the red cabbage blend. Then we let them sit and mix for a couple of minutes. The data was analyzed and the conclusion was drawn that the blend did change color due to the solutions."

GRADE 5

Hughes, Bella (CH)

A Butter Meltdown

"The purpose of the project is to see if the consistency of butter (refrigerated, room temperature, or melted) matters when making cookies. I also wondered if the

consistency of butter used makes a difference in the type of cookies being baked. I baked chocolate chip, oatmeal and sugar cookies. I wanted to do this experiment because it's almost Christmas and I will be baking a lot of cookies. When making cookies, does it matter if the butter used is straight out of the refrigerator, room temperature, or melted? Does it make a difference for one type of cookie (chocolate chip, oatmeal, or sugar) and not another? My hypothesis is that the temperature of the butter will matter in each type of cookie. I think all of the cookies will taste and look better with room temperature butter. I think the refrigerated butter will be very stiff and the melted butter will be very liquidy so I think room temperature butter will be just right. The best tasting and most appetizing chocolate chip cookie was the cookie with room temperature butter. The best tasting sugar cookie was the cookie with room temperature butter. However, the most appetizing sugar cookie was the cookie with melted butter. The best tasting and most appetizing oatmeal cookie was the cookie with room temperature butter. My hypothesis was both correct and incorrect. I was correct in saying that the type of butter used would make a difference in the taste and appearance of a cookie. I was correct that the room temperature butter would be best in the chocolate chip cookies and oatmeal cookies. However, the sugar cookie with room temperature butter was the best tasting but not the most appealing."

Morgan, JohnPaul (CH)

Super Stretchy Slime!

"The purpose of my experiment was to determine if more borax would cause slime made from borax and glue to stretch slower. My hypothesis is a higher borax concentration to glue will cause the slime to stretch more slowly, with the order from fastest to slowest being 4.0 mg/mL, 6.0 mg/mL, 8.0 mg/mL, 10.0 mg/mL, 12.0 mg/mL. Null hypothesis: The higher borax concentration to glue will not cause the slime to stretch more slowly. Batches of slime were made from solutions of 4.0 mg/mL to 12.0 mg/mL of borax dissolved in water combined with a 1:1 solution of glue in water. Each slime was stretched by gravity and timed until either it reached 30 cm or it ripped. A linear relationship was found between borax concentration in mg/mL and the rate of stretch in cm/s. The slope of the best fit line was -0.10

(cm/s)/(mg/mL) with an $R^2 = 0.98$, which shows a slower rate of stretch as you increase the concentration of borax. When the average weight of each slime in g was included in the calculation, the slope of the best fit line was -0.0048 (cm/s*g)/(mg/mL) with an $R^2 = 0.97$. The negative slopes of these lines indicates that the hypothesis was supported, and the null hypothesis can be rejected. The close fit of the data to each line as shown by the R^2 values indicates the effect was likely not due to random chance."

Yesh, Hanna (CH)

Vitamin C Titration for Pasteurization

"The purpose of my experiment is to see if pasteurization affects the amount of vitamin C in orange juice. My hypothesis is if orange juice is pasteurized, then the vitamin C amount will be lower compared to fresh squeezed, non-pasteurized orange juice. My null hypothesis is that pasteurization will have no effect on the amount of vitamin C in orange juice. I titrated the fresh squeezed orange juice and pasteurized orange juice that I got from the store with an iodine solution. I compared it to a vitamin C standard solution that I made with a vitamin C pill. I found out that when you titrate fresh squeeze orange juice and the pasteurized orange, the fresh squeezed orange juice will have more vitamin C than the pasteurized orange juice. I think this happened because when they pasteurize orange juice they heat it up. I think this makes some of the vitamin C go away. My results supported my hypothesis."

Hancock, Ashton (CH)

Which Microwave Popcorn is Best?

"I wanted to find out which brand of microwave popcorn has the least amount of unpopped kernels. The impact is so people can get the best popcorn for their money."

GRADE 6

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GRADE 7

Rimawi, Danya (CH)

Analyzing the Amounts of Casein in Various Types of Milk

"My project's purpose is to figure out which type of milk has the largest amount of casein. I hypothesized that Whole milk would have the most casein. I completed this experiment because I was curious about what was in the milk I drank every day. Also, the results of my experiment may help to assist individuals looking for milk with high amounts of protein, specifically, casein because it helps strengthen tooth enamel, muscle recovery, and building muscle. People may take casein as a supplement for their daily needs. For example, casein is good for muscle synthesis and muscle recovery when an individual exercises. To complete this project, I tested four types of milk: Fat-Free milk, Low-Fat milk, Reduced-Fat milk, and Whole milk. I poured one cup of each type of milk into 4 different bowls. I added approximately 1/4 teaspoon of acetic acid (vinegar) to each bowl, which is the most important step because of the pH of the milk. PH is a scale of 0-14, measuring how acidic a water-based solution is. Milk's neutral pH is 6.6, but when adding the acetic acid, it dropped down to 4.6, which is its isoelectric point. It is also the point in which casein becomes insoluble in milk, allowing me to filter the milk through a strainer and measure how much casein is present in the milk. I tested this for a total of 3 trials, so I would have accurate results. In the first trial, Low-Fat milk had the largest amount of casein, with 1.65 grams per cup of milk. In the second trial, Fat-Free Milk had the largest amount of casein, with 2.91 grams of casein per cup of milk. In the third trial, Low-Fat Milk had the largest amount of casein again, with 1.31 grams per cup of milk. In the end, I averaged the results and Low-Fat Milk and Fat-Free Milk tied with 1.66 grams of casein per cup of milk. Reduced-Fat Milk averaged 0.98 grams of casein per cup, and Whole Milk averaged 0.6 grams of casein per cup of milk. It is clear that my hypothesis was incorrect. I am not exactly sure why Low-Fat milk and Fat-Free milk had the largest amounts of casein, but I believe it's because they have less fat and more space for protein, unlike whole milk and reduced-fat milk, which have more fat and, as a result, less space for

protein. Whole milk had the least amount of casein, which further supports this idea. For individuals looking for milk with the highest amounts of casein to help their muscle recovery and tooth enamel, they should choose to include either Fat-Free milk or Low-Fat milk in their diet. If I were to do this project again, I would experiment with more types of milk, such as almond, coconut, and soy milk, and I would make sure my methods of research were more accurate by conducting more trials."

Hruskoci, Leah (CH)

Perez-Montiel, Perla (CH)

Will forming a new dish soap decrease the time it takes to wash dishes

"The purpose of this experiment is to decrease the time it takes for anyone to wash dishes. And increase the time they are away from the sink and with friends and family. If the strongest ingredients from dish soaps are fused together with a pre-made dish soap one by one then, the time it takes to wash dishes with regular dish soap will decrease and compare the other three with an extra ingredient added will compare to the regular pre-made dish soap because, when the three ingredients are fused into the pre-made dish soap will create a stronger new chemical."

Yesh, Keira (CH)

Does the different forms of activated charcoal affect the levels of free chlorine, alkalinity, pH, and calcium hardness in chlorinated spa water?

"The purpose of my experiment is to see if the different forms of activated charcoal affect the levels of free chlorine, alkalinity, pH, and calcium hardness in chlorinated spa water. My hypothesis is if activated charcoal is in powdered form, then it will lower the levels of free chlorine, alkalinity, pH, and calcium hardness from the spa water compared to the granular form. My null hypothesis is that the form of the activated charcoal will have no effect on lowering the levels of free chlorine, alkalinity, pH, and calcium hardness in chlorinated spa water. I made filters from two forms of activated charcoal: powdered and granular, and I also had a control where I only used plain coffee filters. I poured 250 ml of water at the same rate of ten seconds to empty and then tested for the levels of free chlorine, alkalinity, pH, and calcium hardness in chlorinated spa water. In all of

the areas tested the powdered activated charcoal filter had lower numbers compared to the control and the granulated activated charcoal. There was no change between the control and the granulated activated charcoal. This shows that my setup did not allow the granulated charcoal to make any change to the spa water. In conclusion the powdered activated charcoal lowered the levels of free chlorine, alkalinity, pH, and calcium hardness. This shows that my result did support my hypothesis."

GRADE 8

Rimawi, Noor (CH)

Extricating and Weighing the Deoxyribonucleic Acids of Polyploid Fruits

"The purpose of my project is to inform people that you can see Deoxyribonucleic Acids, or DNA with the naked eye. As well as to allow poorer countries around the world have a procedure for extracting the DNA because they don't have as much technology as wealthier countries. I hypothesized that we would be able to see the DNA and specifically you would be able to see it clearest with strawberries. This is because strawberries are octoploids meaning they have 8 sets of chromosomes, which is more sets than the other fruits which were kiwis and bananas. Kiwis are hexaploids and bananas are triploids. So what I did first was make a control. In my experiment I used fruits to extract the DNA. I would put it in a bag and mush it until it becomes a liquid, then filter it and alcohol for the DNA to precipitate out of solution. However, for my control I did the same exact experiment, but without any fruits, and just water. No DNA came out from the control. Once I did the same exact procedure for each fruit, I figured out in the end that strawberries did have the most DNA out of the three fruits."

Shah, Yash (CH)

The sports drink with the most electrolytes

"In my project I wanted to know which sports drink has the most electrolytes. My hypothesis stated that Gatorade would have the most electrolytes. The purpose was to know which drink was the best for all athletes. After running through my experiment I had calculated the conductance, which proportional to the electrolyte concentration, I found that Body

Armor Super Drink had the most electrolytes. My hypothesis was proved incorrect. This would help athletes around the world to know what drink will give them the upper edge against their opponent.”

DeVoe, Ava (CH)

Living' La Vida Mocha

“The purpose of my experiment is to find how the brew method of coffee affects the coffee’s qualities, such as strength and taste. I am interested in this experiment because I know a lot of avid coffee drinkers (including myself). The information and results that I gather will inform coffee drinkers how to brew coffee to their own preferences. Based on this purpose the question, 'How does the method of brewing affect the qualities of the coffee?: was developed. The hypothesis stated that If I brew coffee in a French Press, Cold Brew, and a Drip coffee maker then the French Press will consistently generate the strongest cup of coffee due to the basis that a French Press coffee maker brews a thicker bodied and higher concentrated coffee. This hypothesis was proved wrong once the analysis of the data occurred. The conclusion that Cold Brew coffee brewed a thicker, higher concentrated and fuller-bodied brew proved true.”

Consumer Science (CS)

GRADE 4

Walsworth, Wesley (CS)

Can You Hear Me Now

“My Dad always complains about background noise when we talk to him in our kitchen on my Mom’s iPhone. Is he just complaining or is the sound he hears distorted? There are specific sounds that are distorted (either volume or frequency) for the iPhone listener. Here’s what I needed: 4 iPhones with volume set to maximum; 2 with speaker phones to call each other; 1 with Tuning Fork App (110 Hz – 1,2543 Hz); 1 with Sound Monitor App to measure Volume (dB) and Frequency (Hz); 1 Mom (or other assistant) to call me and operate the Tuning Fork app. I expect that dad might be a bit of a complainer, OR just have very sensitive ears. I don’t think there is anything wrong with the sound the iPhone speaker delivers. But we will see. I heard distorted sounds (both frequency and

volume) at specific sending frequencies. Both frequency and volume is distorted for iPhone listeners for specific sending frequencies. Distortions occur outside normal conversation frequencies, which helps explain why this is not a problem for most iPhone users. Kitchen background noises are within the frequency range magnified for listeners, which could explain why my Dad complains about background noises. The iPhone distorts both frequency and volume at very low and high sending frequencies, suggesting the iPhone does not work as well for these sounds. Further Testing: 1. Do phones other than iPhones (for example Samsung, Google Pixel) have the same distortions? 2. Do internet calling apps (e.g. Facetime) have the same distortions as iPhone calls?”

GRADE 5

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GRADE 6

Klitzsch, Paxton (CS)

What brand of fit bit produces the most accurate data?

“To determine which brand of fitbit provides consumers with the most accurate data.”

GRADE 7

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GRADE 8

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Earth and Environmental Science (EA)

GRADE 4

Erdogan, Zeynep (EA)

Power of Grass - Soil Erosion

"My question is how grass effects the movement of water in nature. The purpose of the project is to find out the best ground cover which resulted in less soil erosion in the nature. I found that my hypothesis was

correct. The soil with grass showed the least amount of erosion."

Hauck, Benjamin (EA)

The Effect of Temperature on Epsom Salt Deposition into Crystals

"The purpose of my experiment was to figure out what temperature conditions result in the biggest crystals. Hypothesis: The largest crystals will be in the cups that were cooled at 25°C and evaporated at 15°C, however, the greatest total mass of crystals will be in the cups that were transferred from 15°C to 25°C. Null Hypothesis: Temperature will have no effect on crystal deposition. I cooled cups containing supersaturated hot Epsom Salt solution (Magnesium sulfate) at 15°C and at 25°C (6 cups for each temperature) and then transferred one set (3 cups) at each temperature to the opposite temperature. After incubating for 1 week, the average mass of the largest crystals as well as that of all the crystals grown in the cup was calculated. While the faster cooling and slower evaporation temperature resulted in the most Epsom Salt deposition, the largest crystals were formed when the solution was cooled slowly and evaporated slowly. The results partially support the hypothesis."

Ladd, Kate (EA)

How to Prevent Water Erosion?

"The purpose of my project was to study water erosion. The goal of my project was to determine which material would be a better solution for erosion: rocks, netting or mulch. My data supported my thought that all the materials would be better than bare dirt. This was based on the clarity ratings for the run-off for each material as well as the erosion run-off amounts by weight, compared to the control of bare dirt. My data shows that netting had the cleanest run-off of the materials. This meant that the netting had the least amount of topsoil loss. Mulch prevented run-off but had some topsoil loss, because data for clarity showed it to be worse than netting. Mulch had the least amount of erosion run-off, with the mean weight being the least. So, mulch was the best at preventing run-off by letting the water soak into the soil/dirt. From my project, I learned that overall mulch is better at preventing run-off on my model's amount of slope. So, for non-steep slope, my project suggests that you should use mulch to prevent

erosion. Mulch could be used on a sloped hill without vegetation or grass. "

Daliboyina, Praneel (EA)

Global Warming Real?

"Scientists reported that the concentration of Carbon dioxide has increased in Earth's atmosphere over decades mostly due to increase in emissions from industries and transportation, deforestation and thus leading to more warmer earth called Global Warming. The results of my experiment will show how the increased level of carbon dioxide leads to increase in temperature thus showing how Carbon dioxide in our atmosphere is contributing towards making our planet warmer. Our environment totally depends on human actions which starts right from home. I want to know how big is my family's Carbon footprint? Is it more or less than USA average Household's Carbon Footprint? By knowing this, I can plan what actions can be taken at home to reduce my family's Carbon Footprint. Finally I have some simple ways to help decrease the Global Warming which are easy to follow yet make a big impact."

Jasionowski, Evie (EA)

Sand Does fluidized sand act like a fluid?

"Student made a fluidized bed. Conducted several tests while changing variables as in the amount of holes, air pressure, and sand. Project will use an air compressor to put air into the sand."

GRADE 5

Tijani, Farida (EA)

How do different methods for melting ice affect how fast the ice melts and the health of your lawn?

"The purpose of this project is to see if the color of the ice would change color if I use different types of substance. My hypothesis was that if I change if I use different things to melt ice for example sand, table salt, rock salt, etc., then, which ice that has table salt would melt faster than the rest of the other ice cubes. To test this hypothesis, I used my experimental procedure to help me conduct this experiment. The results of the experiment showed that I was right about the table salt will melt faster than the other ice

cubes. I concluded that this experiment would help other people who love to try an experiment that involves lawn and grass melting ice cubes and protecting the lawn. I hope this project helps other families."

Fareed, Nura (EA)

Don't Chill It's An Oil Spill!

"My project is to find an environment friendly way to clean oil spills using natural materials. I tested different materials like ostrich feathers, peels of fruits, rice, hay, soil and felt paper. My first step was to get the same amount of each test material. I took 1.5 oz of each test material and placed them in a clear sock and tied a knot. For really lightweight items like the felt, hay and feather, I only took 0.5 oz of the material, and while comparing I multiplied their volume by 3. Next, I filled the measuring cup with 1 cup of vegetable oil. I then put the test material in the measuring cup and put the timer for 2 minutes. At the end of the 2 minutes, I took the material out and placed it in a bowl. I then recorded the weight of the material, and how much oil was left in the measuring cup. I repeated the same step for all the different test materials. I then made a graph of the recorded data to determine which material absorbed the most oil."

Pearce, Lily (EA)

Think Before You Drink

"I read a book about somebody who didn't have clean water. She had to carry it a long way to boil it and try to get it clean. I wondered if there were other ways to help clean water. With the help of my Dad. I gathered four different water sources (melted snow, tap water, lake water, and retention pond water). I measured the number of dissolved solids in each water source using a TDS tester. Then I used four different methods of cleaning the water (boiling, evaporation, iodine tablets, and a life straw) to see which one cleaned the water the best."

Meyer, Heidi (EA)

No More Brown Apples!!

"The purpose of my experiment is to determine what solution will keep sliced apples from turning brown. My hypothesis is that I think the lemon juice solution will keep the apples from turning brown. The procedure that I used was to first make the solutions that I will dip the sliced apples. The first solution was

the control, which was just water. Solution #2 was 1 tablespoon of salt in 1 cup of water. Solution #3 was 1 tablespoon of lemon juice in 1 cup of water. Solution #4 was 1 tablespoon of baking soda in 1 cup of water. Solution #5 was 1 tablespoon of apple cider vinegar in 1 cup of water. Then I sliced 5 apples into quarters. I dipped 4 slices of apples into solution #1, which was plain water and my control for the experiment. I then placed them into a container. I did the same with 4 slices of apples into the remaining solutions. I observed the apples immediately and recorded my observations. Finally, I observed each set of apples at 30 minutes, 6 hours, 24 hours and 48 hours and recorded how brown the apples had become over time. The results showed that the salt water (solution #2) did the best at keeping the apples from turning brown over the 48 hours of observations. The next best solution was the lemon juice (solution 3#), which was followed closely by the control solution of water. The baking soda solution (solution #4) was the worst at keeping the apples from turning brown. The apples in solution #4 were very brown and dried out after 48 hours of sitting on the counter. In conclusion, my hypothesis was incorrect. The lemon juice solution was not the best at keeping the sliced apples from turning brown. The best solution to use to keep sliced apples from turning brown was the salt water (solution #2). Unfortunately, the salt water probably would not taste the best though!"

GRADE 6

Iyer, Vidhatri (EA)

Assessment of water quality in sanitary waste water treatment plant

"Sanitary waste water from the local neighborhoods and businesses are collected at the waste water treatment facility for a step-wise purification process. The purpose of this study was to collect quantitative data on several parameters such as pH, temperature, total suspended solids, ammonia and phosphorus levels at various steps of the waste water treatment process. I tested the hypothesis that step-wise waste water treatment will result in significant improvement in water quality in the effluent sample. Samples were collected between 7 AM and 8 AM

from various steps in the waste water treatment process- a) influent grab sample (water entering the treatment facility); b) effluent grab sample (water exiting the facility); c) VLR anoxic zone and; d) Clarifier 4 effluent (c and d are two intermediate steps during water treatment). The pH of the water ranged from 7.9 (effluent grab) to 7.54 (influent grab) with minimal changes in temperature (16-18 C). There was an improvement in total suspended solid content after water treatment (142 mg/ml influent vs 4.2 mg/ml effluent grab samples). VLR anoxic zone had the maximal total solid content (7620-10360 mg/ml) which was reduced in the clarifier effluent (28-44 mg/ml). Ammonia and phosphorus contents in effluent grab samples (0.033mg/ml, 0.31 mg/ml) compared to influent grab samples (27 mg/ml, 2.8 mg/ml). Overall, these studies demonstrated significant improvement of water quality after waste water treatment. Additional studies will be needed to study the impact of seasons on overall water quality."

Raimi, Kafilat (EA)

How does the amount of chlorine in a carbon filter affect its effectiveness?

"The purpose of this project is to determine whether the efficiency of a carbon filter equalizes faster at higher concentrations of chlorine. My hypothesis was that if I change the concentration of chlorine in a carbon filter, then the higher concentration would equalize with the carbon filter faster because the carbon filter has a defined amount of space so that means when you put the chlorine in the carbon filter it is going to fill up the space faster at higher concentration. To test this hypothesis, I had put 10, 15, and 20 percent of chlorine and I did the trial 2 times to test how many minutes it takes to equalize. The results of the experiment indicated that the highest concentration of chlorine takes a shorter time to equalize so the average time in total was 43 minutes compared to concentration 1 which was 55 minutes and concentration 2 which was 49 minutes. In conclusion, I concluded that raising the concentration of chlorine in a carbon filter reduces its lifespan with an indirectly proportional relationship."

Jivraj, Ronak (EA)

Water (Cu)ality: Do heavy metals, like copper, affect aquatic life?

"The purpose of the experiment was to investigate how heavy metals, such as copper (Cu), affect an aquatic environment. My hypothesis was that the water with the most parts per million (ppm) of copper would have the highest mortality (death) rate. In my procedure, I prepared a stock solution of copper sulfate, and then diluted the copper sulfate using a dropper to put the copper sulfate into each container. I then placed snails in the water with different concentrations of copper sulfate: 0, 0.1, 0.2, 0.3, and 0.4 ppm. I measured the mortality rate of the snails by looking at the number of snails alive after, 0, 1, 2, 3, 4, and 5 days. The results showed that the container with the most amount of copper (0.4 ppm) had the highest death rate of 100% by 5 days. In conclusion, my hypothesis was correct, that the container with the most copper had the highest death rate. If I repeated the experiment process, I would have more snails in the experiment, use different chemicals (e.g., nitrate), test different types of aquatic environments (e.g., stream) to see how chemicals could affect aquatic life."

Dahlstrom, Lukas (EA)

Is Tap Water Really Cleaner Than Creek Water?

"The purpose of this experiment was to analyze how water quality changes during the water cycle. This experiment tested the water from three different locations for 5 consecutive days to test if tap water was cleaner than water from a small creek and from the Eagle Creek reservoir. The hypothesis is tap water in the Pike school district has a better water quality than water in the Eagle Creek reservoir and upstream creeks because it has already gone through a treatment plant. This experiment was conducted by collecting water samples from each location and measuring the water quality using a water quality test kit. The water quality test kit measured pH level, carbonate root, free Chlorine, hardness, iron, total alkalinity, iron, and copper. The test results showed that there were some differences in water quality between the test locations, but most had similar results within the normal range of safe drinking water. The factors outside EPA standards need to be investigated further. Safe drinking water also

depends on other factors such as bacteria levels that were not measured in this experiment. This data can help improve our everyday lives by knowing where it is safe to use or drink water. Based on these results, I could only partly prove the hypothesis because the results only showed a small improvement for some factors and that there were factors in the water at all locations that were higher than the recommended safe levels."

Kelley, Devon (EA)

To Till or Not to Till

"My yard is always a muddy mess, so I asked the question: What types of soil erodes by water the fastest? My hypothesis was: If tilled field soil dirt gets put in the water, then it will erode the fastest in the water because the soil will fuse together by soil glue. I thought this because soil glue is when small soil particles get wet and fuse together, like mud, so it will slowly ooze into the beaker. In the end, I found that no-till soil was the most durable, proving my hypothesis correct. "

GRADE 7

Kolurejo, Opeyemi (EA)

Which Water Pollutant Is The Most Harmful To Aquatic Plants?

"The purpose of this project is to find out which water pollutants is the most harmful to aquatic plants. My hypothesis is that if I simulate pollutant in an aquatic environment by adding vegetable oil, Coca-Cola, laundry detergent, and motor oil then the motor oil will be more harmful to aquatic plants because motor oil sucks out the minerals and nutrients from the water that the plant needs to survive. To test my hypothesis, I used 5 plants and put them each in a bucket with 3 gallons of water. I labeled each bucket with their water pollutant. I put 50 ml of the different pollutants in each bucket. Then, after observing the plants after a period of time, I measured it by checking the pH of the water pollutant. The results of the experiment showed that motor oil was most harmful to an aquatic plant because it had the highest pH level out of water, coca cola, laundry detergent, and vegetable oil. In conclusion, motor oil was the most harmful to aquatic plants because the pH of the

motor oil was the highest meaning it was the most basic out of the other water pollutants."

Ajibola, Adegakinro (EA)

How will the use of dry ice to extinguish wildfires contribute to the levels of CO2 in the atmosphere?

"The purpose of this project is to determine if dry ice would be a feasible method to extinguish wildfires to test if whether the height of the fire affects the effectiveness of the dry ice in extinguishing the fire. My hypothesis is that if I use carbon dioxide to extinguish fires the effectiveness would be inversely proportional to the height of the fire because CO2 is a heavier gas so it would only displace the oxygen at the bottom and not at the top. To test this hypothesis I will create fires at different heights and try to extinguish it using dry ice. The results of my experiment show that the fire on 4in. Kebab stick had extinguished faster than the 8in. Kebab sticks. The results also show that the 4in. Kebab sticks amount of dry ice used to extinguish the fire had a higher volume than the 8in. Kebab sticks. In conclusion, 4in. Kebab sticks had extinguish had faster because dry ice is a heavy gas so it would fall to the base and displace the oxygen at the bottom. Yes, height does affect the effectiveness of dry ice."

Maddi, Adam (EA)

Abulail, David (EA)

Removing micro plastics from water

"We have become increasingly interested and passionate in our project because of our Mediterranean diet is largely based on seafood and ocean-based products. We were startled to learn that almost everything, and we mean everything we eat has some amount of microplastics. Microplastics are very small pieces of plastic that pollute the environment. Microplastics are not a specific kind of plastic, but rather any type of plastic in fragments that is less than 5 mm in length (U.S. The National Oceanic and Atmospheric Administration). We are now learning that this is a growing global issue. My partner and I decided to take on this project further on to contribute to something greater than science fair."

Green, Caleb (EA)

Worm-a-posting

"For my project I did composting. I set up my experiment three times, resulting in six compost bins (three with worms and three without worms). For my experiment, I waited six weeks to see how much weight was lost between the compost bins. My hypothesis is that if worms are added to a compost bin, then the worms will speed up the process of decomposition. My hypothesis was rejected. On trials B and C, the total weights lost were 0.04 to 0.05 and 0.1 to 0.34, respectively. I discovered that one error I made was not using enough worms. According to thesquirmfirm.com in order to speed up the process of decomposition, the pile must include ½ the amount of pounds in worms as the amount of compost."

Bhosale, Rohan (EA)

CARS RUNS ON COFFTEA-Green Biofuels Made From Coffee and Tea Waste

"The purpose of this project is to study the impact of geographical locations on the biofuel levels generated from the processed wastes [spent coffee grounds (SCGs)] of coffees/teas. I hypothesize that the spent coffee grounds (SCGs) from South American countries will have more biofuel content in comparison to SCGs from other geographies as measured by the extracted oil (mg/g) levels. The levels could be higher in South American countries potentially due to the agricultural friendly soil composition. Null Hypothesis: There is no relation between the geographical location of the coffee/tea and its biofuel content. Twenty different fresh and spent coffee/tea extracts from various geographies were subjected to oil extraction in triplicates. The color, oil levels and viscosity [in-house penny pebble method was developed to measure viscosity] from the saponified and non-saponified extracts were measured (approximately 600 data points) and compared using a software-driven algorithm developed at home using python. The results indicated that oil extracted from fresh and spent coffee/tea extracts obtained from South American countries such as Brazil, Peru, and Colombia had higher levels of oil (9-18% of the total weight for SCGs and 9-29% for FCGs) in comparison to those obtained from Central American, North American, Asian and

European countries (3-10% of the total weight). The oil extracts were more viscous and darker in color as well. I screened 20 different coffee varieties from different geographies for Biofuel levels. Screening was done using both Fresh and Spent ground extracts; saponified and non-saponified extracts. In addition, I developed software based algorithm to analyze data from experiments. Among all geographies studied, South American coffee from Brazil had highest levels of Extracted oil [16-29 %] levels in comparison to American coffee [5-6%]. Results supported proposed hypothesis. Finally, High level of Biofuel level can help us to make economics case for green biofuel."

Burke, Conor (EA)

Where is the best air quality?

"I will determine where the best air quality is based on readings of carbon dioxide and carbon monoxide in different indoor and outdoor locations."

GRADE 8

Makanjuola, Goodness (EA)

How do different concentrations of food preservatives affect the growth of microbes?

"The purpose of this project is to use liquid cultures and agar plates to investigate the effects of different concentrations of a food preservative on microbial growth. My hypothesis was that if I change the amount of salt I use on food, then the growth of the microbes is going to be affected, because, when a preservative is added to food, it makes the moisture in the food to dry which will kill microbes. And to test the hypothesis, I changed the amount of salt I put in the food to see how fast the microbes die."

Dropsey, Noah(EA)

What Shirt Material Best Blocks UV Light?

"After playing around with a UV reactive keychain, I wondered if my shirt could protect me from sunburns. This project's purpose was to determine how well your clothes protect you from UV rays. To collect data, a total of four tests were conducted over two days. A total of nine swatches of different materials that are commonly used to make clothing were tested. Using a UV index meter, a control was taken of the UV index of the sun before each

measurement. Then, one of the fabrics was placed over the UV meter. This was repeated for all nine materials. The entire test was repeated one hour later and the next day at the same time. The UV index of the sun during testing ranged from 8 to 9. Denim, flannel, and silky solid blocked out all UV rays, and cotton gauze allowed a UV index of 2 to get through. All other materials ranged somewhere in between those values. Surprisingly, the UV index for all but two materials only had a variation of .5 or less. Overall, there was a strong correlation between transparency and UV blockage. The results showed that the more transparent materials, such as Cotton Gauze, admitted the most UV light, whereas the most opaque materials, such as denim, blocked all UV light.”

Engineering (EN)

GRADE 4

Torvik, Grace (EN)

Conductors and Insulators

“The purpose of my experiment was to find which material would be the best conductor out of the 7 materials I used. Hypothesis: Water will be the best conductor. Null Hypothesis: The water will have no effect on conductivity. Procedure: I made a circuit out of a lightbulb, four wires and a battery. Then I tested different materials to see which one would be the best conductor using a current meter. Results: I found plastic, paper and glass were not conductors. I also found water, aluminum, copper and steel were conductors. I found that aluminum was the best conductor overall. Conclusion: My results did not support either hypothesis. Water was not the best conductor, but it was still a conductor.”

Ramsey, Ashlyn (EN)

Best Insulated Tumbler

“My findings did not match my hypothesis. I believed in the hype of the Yeti but the much less expensive Ozark Trail Tumbler did slightly better than all the others.”

Sundling, Luxtonridge (EN)

The different shapes of parachutes

“My project is testing the shape of parachutes to see which shape will allow the safest fall to the ground. I want to determine which parachute shape would be the best parachute to use for the Air Force Paratroopers. In my experiment, I tested 4 different shapes (circle, rectangle, diamond and triangle). My hypothesis was the circle shape parachute would fall the slowest. I performed 5 tests on each shape parachute. The rectangle shape parachute fell the slowest. My hypothesis was incorrect.”

GRADE 5

Joseph, Omotola (EN)

How does the shape of the hull on a boat affect how much weight it can carry?

“The purpose of this project is to find out how the shape of a hull affects how much weight a boat can hold. I hypothesized that the circle-shaped hull will hold the most weight. To test this hypothesis, first, I made boats with different hulls made with aluminum foil. Then, I filled each of them with pennies until they sank in the water. I recorded how much weight they each held before they sank. The results of the experiment showed that oval-shaped held the most weight. In conclusion, oval-shaped boats should be considered when heavy load-bearing is needed.”

Samlali, Rasheed (EN)

Balloon Powered Car

“When you blow a balloon, it stores potential energy. This energy is converted to kinetic energy that has the power to move things. The purpose of my project is to test if a balloon can power a car. Does blowing the balloon bigger move a car farther? I hypothesize that if you blow the balloon bigger, the car will move farther. I first built the car. I made four holes in a plastic bottle. I then put two wooden skewers inside two straws. I used hot glue to fix the bottle caps to make the wheels. I made two other holes in the bottle and inserted a straw connected to a balloon. After designing the car, I started testing my hypothesis. I blew into the straw to inflate the balloon (small size), then closed the opening at the tip of the straw. I placed the car on a smooth surface, then let go of the straw. In the end, I measured how far the car moved using a measuring tape. I repeated the above steps,

but this time I blew the balloon larger (medium size). Lastly, I repeated the above steps again, this time I blew the balloon even larger (large size). When I blew the balloon to a small size, the car moved 54 inches. When the balloon is blown to medium size, the car moved 73 inches. When the balloon is blown to a large size, the car moved 86 inches. Blowing a balloon can power a car and make it move. The bigger a balloon is blown, the farther the car will go."

GRADE 6

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GRADE 7

Koleszar, Andrew (EN)

Electric Generators Powering the World

"The purpose of this project was to determine which shape of magnet produced the highest current. I tested a total of seven different shapes of magnets to get my results. The magnets were attached to wood blocks and 2in nails were inserted into the center of each of the wood blocks. A wall outlet drill was mounted to a table to spin the magnets. The magnets were spun next to a 2in nail that had an entire spool of enameled copper magnet wire spun onto it. Each of the magnets were spun for a full minute before results were recorded. I found that a 1in square magnet produced the most electrical current in my testing. In conclusion the 1in magnet produced the most electrical current because it had the second largest volume and has the only large magnet that was one solid shape."

GRADE 8

Salehi, Alborz (EN)

Iron Man Helmet

"I got the idea for my science fair project from watching a YouTube named the Hacksmith. I decided to use some of his ideas, but instead of using hud glasses I used a projector for the hud and an Arduino for the hinge system. Instead of buying a metal iron man helmet I decided to 3d print mine. I used someone else's code for the Arduino since I don't know how to code C++. Finally for the hud display

display I used a projector and used a wide angle lens and a mirror system to project the image onto the helmet plan on finishing the hud display and hopefully upgrading my raspberry pi zero."

Gao, Hannah (EN)

Rainbow Robot

"Machinery sorting objects by color is certainly not a new innovation, and has been applied across numerous industries such as the food, medicine, and manufacturing industries. Because I enjoy crafting projects with beads, the purpose of this project is to automate the tedious process of sorting colored beads by hand. My project utilizes a color sensor to detect the RGB value, which determines the container to which the bead will be directed. The machine sorts the beads by color into five different compartments; red, orange, yellow, green and blue. My project met all of my design criteria, as it is able to sort beads by five colors without human intervention (except to turn it on and to put in the beads)."

Chaffee, Hunter (EN)

What is the best motion sensor to keep people out of my room?

"My problem is that I want to know when people come into my room. I found two different motion sensors on the internet. I want to determine which would be the best one. My project is 2 motion sensors. They both use a P.I.R (passive infrared module) to scan for body heat. One sends out a loud scream sound that can be heard from the top of the house to the bottom. The second one instead of making a noise, it sends your phone a text message through Wi-Fi. It uses a device called a wemos (weemos{most}) board that allows you to solder wires to do different spots so you can do many things with it. My hypothesis is that the Wemos motion sensors is the best because it was most effective at notifying when a person that enters my room or exits."

Harley, Brayden (EN)

Making an Automatic Pet Feeder that can be set to dispense a specific amount of food at a specific time of the day.

"I am creating this so people don't have to get up and get their dog's treats. So you don't have to leave your

comfortable spot on the couch. It could be that, or it could be that you have a handicap and it is either difficult, or impossible for you to walk without someone's assistance. I made a pet feeder that works at the press of a single button. My hypothesis was that it would take some testing to get it working perfect. I had to gather the parts and begin constructing. The base design was a motor that had a container on top of it, it would spin. The container is sectioned off so you can put your treats in either one at a time, or however much small food pieces will fit. The sections are separated by cardboard that will be spun by the motor. All of this is inside of a shoebox. It failed the first three times, then was successful the rest of the time. In conclusion, it took some adjustments, but I got the product I was looking for in the end."

Weidenbach, Cole (EN)

The Impact of Reed Absorbency on Saxophone Tone

"This test was conducted to determine the effect of reed absorbency on the tone a saxophone creates. The expected outcome was that the tone of the instrument will increase in quality as the level of absorbency of the reed increases. The test conducted consisted of recording a clip of the saxophone being played on the software program Audacity, and repeating this process with different levels of absorbency of reed. When the clip was converted to a spectrogram and compared with others, it was found that the longer a reed was soaked in water, the higher note amplitude. However, after they were soaked for a minute, there wasn't much difference between soaking times (e.g. between 5 and 10 minutes). This information can be helpful to many musicians on a daily basis. If musicians knew exactly how long they needed to soak a reed, they could know and plan ahead for how long it would take to prepare their instrument."

Microbiology (MI)

GRADE 4

Kimmel, Grace (MI)

The Effect of Pollution on Brine Shrimp Eggs

"The purpose of this experiment was to see if Brine shrimp would hatch in water polluted with sugar or vinegar. Brine shrimp eggs were put in Petri dishes with saltwater for 3 days. One group of the Petri dishes were filled with normal saltwater. Another group of Petri dishes had saltwater and sugar added to it and another group had saltwater with added vinegar. The number of live shrimp, eggs, and dead shrimp were recorded over 3 days. It was found that Brine shrimp can hatch and live in water polluted with sugar and they can hatch but not survive in water polluted with vinegar. Sugar seemed to increase the chances of survival for hatchlings somewhat over saltwater alone and vinegar seemed to increase the hatch rate but decrease the number of shrimps that survived."

GRADE 5

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GRADE 6

-

GRADE 7

-

GRADE 8

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Physics AND Astronomy (PH)

GRADE 4

McGuinness, Angus (PH)

The Most Electric

"With this experiment, we proved which battery type (Energizer, Kirkland or Ace) lasted the longest. We used flashlights to measure how long each set of batteries lasted, recording our data in a spreadsheet. Following the experiment, we were able to conclude

our hypothesis was correct and that Ace batteries last the longest of the three brands.”

Alysavy, Adam (PH)

Testing for Static Electricity.

“Are all materials good conductors of static electricity? An electroscope is the tool I will use to measure static electricity in different types of materials. I think the more an object is rubbed against another, the greater the build-up of static electricity will be. If there is friction any object or material can have an electrical charge.”

Walters, Reese (PH)

Thermal Conductivity of Metals

"Thermal conductivity of metal is my project because we learned about this in school and I was interested in learning more about heat. Which metal is the best conductor of heat? Does the gauge of the metal make a difference? It is hypothesized that copper will be the best conductor of heat because it is a darker metal and darker colors absorb more heat. Smaller gauge metal will conduct heat better because the heat will pass more easily through smaller metal. I labeled 7 styrofoam cups hot and 7 cups cold. I bent the 18 gauge copper, steel and aluminum wires into a U shape and placed one end each in a hot and cold cup. My dad helped me bend the 4 gauges of copper into U shapes and I put one end of each in a hot and cold cup. My mom helped me boil water. I measured the temperature of the hot and cold water and recorded it in my notebook. I poured 1 cup of hot water and 1 cup of cold water in each hot and cold cup with the aluminum, steel and copper 18 gauge metals. I measured the temperature in the hot and cold cups every 5 minutes for 30 minutes, and recorded the temperatures in my notebook. I repeated this with the 4 gauges of copper metal. It was concluded that copper was the best conductor of heat. Aluminum was the second best conductor of heat. Steel was the worst conductor of heat. Larger gauge metal conducted heat better than smaller gauge metal.”

Dahlstrom, Leila (PH)

Which materials reduce the sound level from a speaker the best

"This project compares how different items found in a home can be used to reduce the sound level from a

speaker. Some materials can reduce the sound better than others. The experiment placed a speaker behind a bean bag, fleece blanket, wall insulation, and a cardboard box, and measured the sound level 3 feet away. My hypothesis is if wall insulation is placed in front of a speaker, then it will reduce the sound more than a bean bag, fleece blanket, or a cardboard box. Three different test audio tones were used: 400 Hz test tone, 1000 Hz test tone, and 4000 Hz test tone. The results of the experiment showed that all materials reduced the high frequency 4000 Hz sound, but only wall insulation showed a big reduction in sound level for the low frequency 400 Hz test tone. The average reduction in sound level for all three test tones showed that the wall insulation was about 10 decibels lower than the bean bag, fleece blanket, and cardboard box. Based on this, the hypothesis that wall insulation will reduce more sound is correct. The wall insulation is better than a cardboard box because the cardboard is just a thin layer while the wall insulation has a thick layer of material that creates a better sound barrier between the speaker and the adjacent areas."

Dahlstrom, Lilian (PH)

Which type of water bottle will keep water cold the longest?

“This project compares how well different water bottles designs can keep ice water cold in a warm room. The bottles tested in this experiment were a metallic water bottle, an insulated bottle, a regular plastic water bottle, a coffee mug, and a glass. The hypothesis tested if ice water is placed into a metallic water bottle, it will keep the water cold longer than if using an insulated bottle, a plastic water bottle, a coffee mug, or a glass cup. The procedure for this experiment was to fill all water bottles with 2 cups of water and refrigerate them for one hour. The baseline temperature was measured with a thermometer. To test the ability to keep the water cool, one ice cube was placed in each bottle, and the water temperature was measured every two minutes for the next 30 minutes. The results of the experiment showed that the coffee mug keeps water cold the longest. After thirty minutes, the water temperature in the coffee mug was four degrees lower than before ice was placed in the water. The water temperature in the metallic water bottle was 2.9 F lower than before the ice was added, the insulated bottle was 0.3 F higher,

the glass cup was 1.7 F higher, and the plastic water bottle was 2.4 F higher than the baseline. The results of the test showed that the hypothesis that the metallic water bottle would keep water the coldest was incorrect. The coffee mug kept the water cold the longest. This shows that something designed to keep water warm also works very well for keeping water cold. The metallic water bottle kept the water cold second longest.”

Gopal, Anirudh (PH)

LeVora, Patrick (PH)

Friction in Action

“The purpose of the project is to understand why people slip and cars skid on icy roads in winter. We will set up an experiment in which we will slide two objects on two different surfaces. The objects will be a hot wheels car (to represent a car) and a LEGO person with a piece of felt attached to the bottom (to represent a person wearing shoes). The surface used will be a straight section of hot wheels track (dry and with a layer of ice). The same launching mechanism will be used for each object on both surfaces. We will measure the time and distance for each combination of surface and object. Further, we will perform three trials for each test condition. The average of these trials will be calculated and reported, along with the speed. “

Krishnan, Ashwin (PH)

Drop Wars - The Rise of Skyfaller

"The purpose of this project is to experimentally investigate and understand how far behind the car will a ball fall if it fell from the ceiling of a moving car. The hypothesis is that the ball will fall behind the car; and, as the car speed is increased, it will fall further behind. A tower with a trap door was designed using building blocks and mounted on a toy car. The release of the trap door drops the ball from the top of the tower. A long string of twine is used to release the trap door. Four different types of speeds were tested: (a.) a stationary-car test to confirm that the ball drops vertically when released - this tests the design of both the tower and the trap door mechanism to ensure that the speed-based experiments are not biased by the experimental setup, (b.) a low constant car speed, (c.) a high constant car speed, (d.) an increasing car speed (acceleration) . The output measured variable

is the difference between the horizontal distances respectively covered by the ball and the car. A method of accurately measuring the distance covered by both the ball and the car (from ball release to ball bounce) was needed. To accomplish this, a lined chart background was used behind the point of ball release, and a slow-motion camera was used to record the video of the ball and car movements. The results show that, contrary to the hypothesis, the ball falls directly below, and, on the car, for both constant car speeds (and, also, as expected, for the stationary car condition). When the car accelerates, the ball does indeed fall behind the car. The reason for the observed results has been researched and is found to be a consequence of Newton's First Law of Motion - The Law of Inertia."

Pomeroy, John (PH)

Eggcellent Protection

“Bubble wrap is used to protect things every day including shipping, storing and moving. The purpose of this project is to determine which type of bubble wrap protects the best. The hypothesis is that there will not be a difference in the level of protection between small bubble wrap, large bubble wrap and foam. To test the hypothesis, eggs were wrapped in the different types of protective wrapping (independent variable) and dropped from a stool to determine if they broke (dependent variable). In conclusion, the foam wrap protected the eggs better than either the small or large bubble wrap. Small bubble wrap provided more protection than large bubble wrap.”

Sprunger, Corgan (PH)

The Car Question: Does Weight Matter?

"My question was, does the weight of the car effect how far the car goes? This is important because manufacturers of cars need to know how weight affects the car. I think that the lighter cars will go farther than the heavier cars because they have less weight to carry on them so there will be less friction. I got 9 cars that go fairly straight and were a variety of sizes and labeled them with letters so I could keep track of them. I measured the weight of the cars and then released them down a track. I released each car three times and measured the distance in feet and inches. I converted the feet and inches to centimeters with two decimal points. I put all the data in a chart

and figured out the average distance for each car using the three measurements. Then I grouped the three heaviest, three middle ones and the three lightest cars. I figured out the average weight and distance for the three groups of cars. The lightest cars went the farthest and the heaviest cars went the least far. I was able to support my hypothesis because I figured out that the lighter cars actually do go farther than the heavier cars. I believe the lighter cars go farther because they have less weight to create friction to slow them down. "

Herring, Ellie (PH)

Which Fins Make You Go Faster?

"I, Ellie Herring, am a competitive swimmer. I am always trying to figure out how to be a stronger and faster swimmer. I tested different competition suits last year. This year, I decided to test the different types of fins swimmers use at practice. I noticed that I have always had the long fins for the past 4 years. Swimmers in the next group up that I will move to next year, have different fins. Can these shorter fins make me stronger and faster? So, when a swimmer swims, will they go faster with long fins or short fins? My coach and I had 22 swimmers swim 50-yard kick two times. Once with the long fins and once with the short fins. I timed their speeds. I did this a second time with short fins first and then long fins. I found that no matter what order you swim in, the long fins make you go faster. I learned that if you have more surface area kicking, you go faster through the water. The long fins have more surface area, so you are kicking through the water faster."

Sobers, Qudus (PH)

The Great Paper Caper

"The focus of this project was how the material of a paper airplane affects the distance traveled. I wanted to make airplanes out of material that I have never used before. I had only used printer paper and notebook paper before to construct a paper airplane. I also chose these materials because they were all available at my house. I assumed that the heavier paper would cause the airplane to fly a shorter distance. This theory did not hold true because the two heavier airplanes flew on average a longer distance. The material type had a significant effect on the lift. The lighter airplanes had more lift during their flight. This caused the plane to spin or swerve more in

the air, which caused the airplane to travel a shorter distance. In addition, the lighter airplanes swerved back towards the starting position during flight. The planes made out of printer paper or card stock did not experience the same lift force affects as the lighter material planes. The heavy paper made for a stiffer airplane. The heavier paper kept their shape. I attempted to throw each airplane the same way. This force is called thrust. It was very difficult to be consistent in throwing the planes exactly the same way but I tried my best. It was assumed this would have an effect on the results that is why I threw each airplane 3 times. In conclusion planes made of printer paper flew the farthest. In the future, I would like to use a different plane design to determine if this would affect the outcome."

Mamasidikova, Safiyya (PH)

Glue vs. Gum

"Adhesive which is a type of mechanical force explains the adhesion between substances and materials used in this experiment. Since gum has more mass than glue it has more sticking property than glue. Force=Mass Acceleration."

GRADE 5

Munaf, Nuha (PH)

Does ambient temperature affect solar panel output?

"Solar cells (or photovoltaic cells) are devices that can generate electricity directly from sunlight. Solar cells provide a clean way of making electricity directly from sunlight. You may have seen arrays of solar cells on a roof in your neighborhood, or perhaps a much smaller array powering an emergency phone along a highway. In this project, I am going to investigate how power output from a solar cell changes with temperature. In this project, I want to build a simple solar panel setup to investigate whether the power output of a solar cell changes with ambient temperature."

Palmer, Safiyya (PH)

Just Beat It: Can Music Make Meringue?

"The purpose of my experiment was to determine if adjusting the volume of music (amplitude of sound waves) affects the disruption of the proteins in egg

whites to be used to make meringue. It is hypothesized that higher music volume in dB (higher sound wave amplitude) will result in a greater meringue height in cm (more air in disrupted egg white proteins.) Null Hypothesis: Music volume (sound wave amplitude) will have no effect on meringue height (air in disrupted egg white proteins.) Over 3 sound trials, 2 egg whites per trial were exposed to the same music for the same duration varying only the volume of the sound, and 2 types of sugar were added later during each trial. After baking these mixtures and a whisked comparator under the same conditions, meringue heights were measured and recorded. Sound waves successfully introduced air into disrupted egg white proteins, with higher music volume (higher sound wave amplitudes) associated with more visibly beaten eggs. Mixing added sugars into the egg whites using sound was less successful than in the whisked comparator. Higher music volume was correlated with higher meringue height, although the meringues from the sound trials were inedible in contrast to the whisked comparator. The results support my hypothesis, but also demonstrate the importance of sugar as a stabilizer of the air in the disrupted proteins of beaten egg whites. When making meringue music can "Beat It", but due to poor mixing you may not want to eat it."

Swallows, Ayden (PH)

Ison, Cayper (PH)

Burton, Matthew (PH)

Air Time

"In our Air Time project, we looked to discover which basketball would bounce higher when filled with Helium, Carbon Dioxide, or Air. We did a test experiment first, with a standard size basketball, so that we could best organize our experiment efficiently. We were able to set our control points by keeping the balls the same size, inflated to the same PSI, dropped on the same floor, and dropped from the same height. We discovered by research that while Helium weighs less than Air, and Air weighs less than Carbon Dioxide, that Air bounced the highest. The heavier the ball was the faster it traveled when dropped. Even though Carbon Dioxide is heavier than Air, it is also denser. So, when the Carbon Dioxide ball hit the floor, it did not squish as much and hit the same amount of surface area that the Air-filled ball

did. Therefore, it did not bounce as high. Air hit the floor with more squishing, causing the ball to be forced back up into the air higher than Helium or Carbon Dioxide."

Addepalle, Aanya (PH)

Thermal Conductivity

"Materials of different types, lengths and sizes transfer heat differently. I use different materials for different uses in our daily life. Some of the typical materials I use are Wood for house construction, Steel for large buildings, Copper as an electrical conductor and as a heat sink for computer chips, and Aluminum for cooking vessels and as an electrical conductor. Some materials are good at conducting heat while others are not. The materials that don't conduct heat are better at insulating, such as wood, which keeps us warm during the cold seasons by not letting the outside temperature from coming in. The materials that conduct heat also transfers heat to surrounding objects at a faster rate. In this project I wanted to see the impact of material type, and material size in transferring heat. I tested our hypothesis using observation and by recording temperature changes periodically, while different materials transfer heat from a constant heat source (boiling water) to water."

Cummings, Hazel (PH)

Glue It!

"This project is to determine what material is best for this type of glue. The project uses several materials to see which holds together best with this glue. The glued materials were tested by gluing together two sheets of the same material and then pulling them apart horizontally with a scale to determine how strong the glue is. The results are that the glue works well for wood, styrofoam, and markerboard but does not work well for subway tiles (smooth or rough sides) and steel."

GRADE 6

Miller, Ethan (PH)

Effects of air pressure on a soccer ball

"The purpose of my test was to find out if you change the amount of air pressure in a soccer ball, will it

affect how far it goes when kicked. My hypothesis was that if I pump up my soccer ball more it will go farther. I made a device that will kick a soccer ball, which had different amounts of air pressure in it (in pounds), at the same speed and height, then I measured the distance from its starting point. I did this test a total of five times for the same amount of air pressure in pounds, then took the average of the measurements. I used six different amounts of air pressure which include 10lbs, 8lbs, 6lbs, 4lbs, 2lbs, and 0lbs. For 10lbs of air pressure, the ball travelled an average of 22.9ft, however when I deflated the ball to 6lbs I got an average of 26.28ft and at 0lbs the average distance was 24.62ft. I found that the heaviest ball and the lightest ball travel the shortest distance. In conclusion, this series of testing proved that my hypothesis was incorrect."

Alcantara, Benjamin (PH)

*Catapulting Into the Future of Space Travel:
Analyzing Projectile Launch Angles Given
Constant Potential Energy with Analysis of
Applications in Low Earth Orbit*

"The purpose of this experiment was to determine which launch angle is the most efficient for propelling a projectile via catapult if all other conditions are the same, including potential energy. Applications for a theoretical space catapult launch system were also analyzed. Hypothesis: Given the same potential energy when launched via catapult, a projectile's endpoint will be farthest with a launch angle of 45°, followed by 30° & 60°, then 15° & 75°, with 0° & 90° producing the closest endpoints. The higher the launch angle, the longer the flight time. Null Hypothesis: There is no relationship between catapult launch angle, trajectory, and flight time. Procedure: A catapult was used to launch a projectile from the angles of 0°, 15°, 30°, 45°, 60°, 75°, & 90° using the same potential energy with a pullback angle of 60°, with 10 trials performed for each angle. All 70 flights were video recorded, and the trajectories were analyzed using Tracker Video Analysis software to record data which were averaged and analyzed. Results: The launch angle which produced the farthest average endpoint was 45°, followed by 60° & 30°, then 15° & 75°, with 0° & 90° producing the closest endpoints. Higher launch angles produced longer flight times. Conclusion: The results support

the hypothesis and prove that 45° is the most efficient launch angle for propelling a projectile via catapult given the same potential energy. Higher launch angles result in longer flight times. Developing a catapult launch system would make space travel more efficient."

Munuswami, Indhranitha (PH)

Surfing on Sound Waves

"The purpose of the experiment is to prove that the reduction of frequency of different tuning forks inside different liquids has a constant factor. When a tuning fork at its natural vibrating frequency is put inside a liquid, the natural frequency of the tuning fork is decreased. Denser the liquid, more the decrease in frequency and frequency reduced by a constant factor. When the decreased frequency value is plot in a graph, each tuning fork should yield similar shape. I took water in a cup. I measured the frequency of the tuning fork immersed in water. After that I repeated that with the other liquids (milk, dish soap, oil and pancake syrup) with the same tuning fork. Then I moved on to test with other tuning forks. I recorded my results as I performed these steps. Then, I charted the data and analyzed it to determine if the variation of the frequency in different liquids yield a constant factor between different tuning forks. The decrease of the frequency doesn't have a constant factor. I was able to see the frequency decreasing when I immersed the tuning fork in each liquid. I was able to see a constant factor in the decrease of frequency for each tuning fork in various liquids I used. The result yielded similar shape in the graph for each tuning fork, proving the hypothesis that reduction of the frequency by various liquid for each tuning fork has a constant factor."

GRADE 7

Jensvold, Caleb (PH)

Bultemeier, Chase (PH)

Weight wood can hold

"Does the density of wood affect how much weight the wood can withstand? The independent variable is the type of the wood and the woods density. The dependent variable is the amount of weight (in grams) the wood can support. The connection to life

science is the ability to build housing with a reliable wooden frame that is inexpensive to build (other types of construction with wood would work as well). If different densities of wood are used, then it is hypothesized that the densest wood would be able to withstand more weight because the denser the wood is the stronger the bond is with the matter inside of the wood. Null Hypothesis: The hypothesis used is if different densities of wood are used, then the least dense wood would be able to withstand more weight because the denser the wood is the weaker the bond is with the matter inside of the wood. The two platforms would be used to then have the cut wood be placed onto those same platforms. The control was pine because people use pine to build house/building frames. The data showed that density affected how much each piece of wood can hold. The also showed that pine was the weakest overall and that oak was the strongest. One error may have occurred because of how little overlap was on each platform. The data supported the hypothesis because the oak wood held the most weight. It held almost double the weight and had over double the density."

Theobald, Ashlyn (PH)

Branson, Elaina (PH)

A low shot, or a cool top shelf shot, which is more accurate in the line of offense?

"The purpose of our experiment is: In hockey, which is more accurate and more likely to result in a goal, a shot with low follow through kept low to the ice or a shot with high follow through aimed at the top of the net? We hypothesize that if a hockey player takes a low shot with less follow through from the top of the circle, hashmarks, and the offensive blue line, then the puck will go into the net more often than shooting with a higher follow through, because there is less chance of the puck going too wide or too high. Our Null hypothesis is: there is no difference in the accuracy between the low and high follow through shots from the top of circle, hashmarks and offensive blue line. The experiment was conducted to find out if a puck shot low will go into the net more often than a puck shot high. The expected results were that low shots would go into the net more often the high shots. The reason low shots were expected to go into the net more often is because there is less chance of inaccuracy because of lift. The hypothesis was

supported. The shooter shot 40 pucks, 20 shots low and 20 off the ice, from three different places on the ice. The top of the circles, about 9.14m away from the goal. The hash marks, about 6.71m away from the goal. Finally the blue line, about 18.29m away from the goal. With the low shots, the shooter shot 93% of them into the goal, while only 53% of the high shots were made. From the top of the circle, 9.14m away from the net, 20/20 low shots were made and 10/20 high shots were made. From the hash marks, about 6.71m away from the net, 20/20 low shots were made and 16/20 high shots were made. Finally from the blue line, 18.29m away from the net, 16/20 low shots were made and 6/20 high shots were made."

Wilson, Mia (PH)

Francis, Claire (PH)

Which Material will make a Swimmer Move Fastest Through the Water?

"The purpose of our experiment was to see if buying hundreds of dollars' worth of tech-suits is really worth it. If a swimmer swims with different densities of materials for 25 meters, then when the swimmer swims with the thinnest material, they will go the fastest because less material creates less drag. If a swimmer swims with different densities of materials for 25 meters, then when the swimmer swims with the thinnest material, they will go the slowest because less material creates more drag. First, the swimmers put on the tech suit and swim down to the other end of the pool with the strap of the pulley on, then half of the swimmers weight was put into the bucket. Then the swimmers were released from the wall in a streamline then the other swimmers were tested and then the swimmers were tested again with the two other material suits. The data showed that tech-suits are worth the money because the data showed that they are 2-4 seconds faster than the meet/practice suit (which was the control group) and in swimming 2-4 seconds in an eternity. An error in this experiment was we didn't have a pull buoy, which is a piece of equipment that keeps a swimmers legs straight and together, we didn't have this at first and the swimmers were moving very crooked thought the water which was throwing off the data. Our results supported our hypothesis because the least dense suit went the fastest. The densest suit went the slowest."

GRADE 8

Forbes, Elijah (PH)

How Diamagnetic Materials Are Used to Achieve Static Levitation and Their Use in Magnetic Cloaking

"People sometimes hear things like 'magnetic levitation' and 'anti-magnets', but what are those things? First of all, many people may already know what magnetic levitation is, but do you know how it works? In this experiment, I used things that were anti-magnets, graphite, a special kind of glass, and aluminum foil. You would put a floater magnet on each and test to see how many turns it took to make the floater magnet levitate and hit the top of one of the bars. My hypothesis was if the diamagnetic effects then it will take less magnetic force to float the object. My results supported my hypothesis by showing that things like glass and aluminum foils had a greater anti-magnetic effect on the floater magnet, making it have more turns."

Plant Sciences (PS)

GRADE 4

Simmons, Treasur (PS)

How do different solutions affect plant growth?

"The purpose of this project is to see if the plants will grow when I put the 6 different liquids in the plants. My hypothesis was that if I change the types of liquids in the plants then the salt water will grow the most. To test this hypothesis, I put 6 different liquids in the plants then I waited 8 weeks for them to grow, then I measured all of the plants to see which one grew the most. The results of the experiment showed that the pure life water and the ruby red grape Juice grew the most. In conclusion, at the end of the project I measured all of the plants and I saw that the pure life water and the ruby red grape Juice grow the most. "

Soomro, Ibrahim (PS)

The battle of fruits and veggies

"Everything that you see needs some kind of energy to move or to do the work. The basic forms of energy

are potential energy and kinetic energy. Potential energy is the stored energy and kinetic energy is when anything is in motion. In this experiment, you will see if fruits have more stored (potential) energy than vegetables. "

GRADE 5

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GRADE 6

Suggs, Simone (PS)

Time to grow

"I chose growing plants with various liquids as my topic. I was inspired by this topic because my Grandma and Grandpa care for houseplants indoors and plant flowers outdoors every year. They use water to grow these plants I was always curious to know if plants could grow from other types of liquids besides water. So I decided that this was a good opportunity to do an experiment and answer my question."

Mehta, Arhita (PS)

Organic or Conventional?

"The purpose of this experiment was to determine how the method of farming affects the amount of pesticides in the produce. Hypothesis: The fruits/vegetables that are organic will have less pesticides than the conventional fruits/vegetables. Null Hypothesis: The detectable pesticide levels for organic and conventional fruits/vegetables will have no significant relationship. Procedure: Four samples of each strawberry, spinach, apple, and grape were tested for pesticides using test strips, with 2 replications each, for organic, and conventional produce. The test strips were then read to see whether each produce and method of farming was either positive, negative, or low, in pesticides. Results: Overall, there was not a major difference in the amount of pesticides that were in organic produce, compared to conventional produce. Strawberries were high, apples were negative, and spinach was negative, each with no differences between organic and conventional. However, grapes had slightly higher pesticides in organic. Conclusion: The results did not support my hypothesis, and they

proved that when it comes to pesticides, there is no difference between conventional or organic produce. Instead, my results proved my null hypothesis right."

Chitty, Anna (PS)

How Plants Grow Best

"The purpose of this experiment is to see how water affects plant growth. My question is, do green bean plants grow taller with salt water, boiling water, cold water or room temperature water? My hypothesis is, if the green bean plants get watered with room temperature water, they will grow taller, because room temperature water is more nourishing. Plant 5 seeds in each pot with the Miracle Grow potting soil, layer of pea gravel on the bottom for good drainage. Put them in a sunny spot where they will all get equal sun. Using the sharpie, label each pot with the different water type being used. Water each plant every other day for three weeks with a ½ cup (118.3ml) of their labeled water. Every 2 days record how tall each plant is in centimeters and calculate average height per pot. My conclusion is my hypothesis was that the room temperature water plants would grow the tallest. The room temperature water plants grew more quickly and to a taller final height. The cold water plants grew more slowly and to a smaller final height. The salt water seeds and the boiling water seeds never even germinated. "

Hawkins, Leah (PS)

Mallon, Charlotte (PS)

What is best for reviving plants? Compost or fertilizer?

"Is compost or fertilizer better at reviving plants? We think that composting is best because it is more natural. It will keep soil moist over time while improving the soil quality by adding organic matter. We purchased dying plants and treated them with nothing, compost, or fertilizer. For 10 days we watched their growth."

GRADE 7

Malineni, Sanjana (PS)

pH Problems

"People all around the world suffer with hunger, yet the field of plant science still has a lot of unanswered

questions. Plants, although they look simple, have a lot going on and they need more than just some soil, water, and sunlight to reach their maximum potential. In this experiment, the question of whether the pH of the water you water plants with can affect their growth was tested. As pea plants were used in this experiment, which tend to thrive in slightly acidic soil, it was predicted that if the pH of the water the pea plant was watered with was a lower number, or more acidic, then the plant would thrive and grow more rapidly than if it were watered with water of a high pH, or alkaline. Eighteen Early Perfection Pea seeds were planted, and divided into three different groups of six. In each of the three groups, one plant was watered with water with a pH of 2, one with pH 4, one with pH 6, and so on. Plants received the same amount of water, the same environment, were watered every other day, and measured every six days. After averaging the final results of all three groups, the plants watered with acidic water grew, on average, 2.62 centimeters taller than the plants watered with alkaline water. The plant group that grew the tallest overall were the plants in each group that were watered with pH 4 water. The plant group that fared the worst were the plants watered with pH 12 water, or extremely alkaline water. As the plants watered with more acidic water did indeed grow taller than the plants watered with alkaline water, my hypothesis was supported."

AbuMahfouz, Laila (PS)

Analysis of Antioxidants in Tomatoes

"The purpose of my project is to find out what tomato products out of ketchup, uncooked tomatoes, and cooked tomatoes have the highest amount of antioxidants, and what effect the temperature of the cooked tomatoes has on the level of antioxidants and comparing the level of antioxidants found to the vitamin C capsule, which is used as a reference in comparison. My hypothesis is that the uncooked tomatoes will have the highest amount of antioxidants, followed by the ketchup, and finally, the cooked tomatoes in the order of 200 degrees, 250 degrees, and 300 degrees. The first step you take is weighing 100 grams of fresh tomato. Then, blend it to make it possible to titrate. Pour this mixture into a beaker and add distilled water up to 400 milliliters. Next, take 50 milliliters out of the 400 and add to a flask. After that, add 5-10 drops of starch (1%) as an

indicator, into the flask. Then, fill the burette with iodine as the titrant. In order to start the titration process, add drops to the flask until reaching the endpoint, which is the change in color from clear to a dark blue/purple. Make sure the color is fixed for at least 10 seconds before moving on to recording the endpoint. Now, weigh 100 grams of fresh tomato and blend it. Bake this in the oven at 200 degrees for 15 minutes. Dilute the cooked tomatoes afterwards with distilled water up to 400 mL. Repeat the same titration steps as used with the previous sample. Repeat the cooking steps with the tomatoes except at different temperatures of 250 degrees and 300 degrees. For the ketchup sample, weigh 20 grams and dilute with water up to 400 mL. Repeat the same titration steps like the previous samples, then record the endpoint. For the analysis of the Vitamin C capsule used as a reference, open the capsule and empty the content into a flask. Then, add only 50 mL of distilled water, repeat the titration process, and finally, record the endpoint. In conclusion, my hypothesis is partially correct. The uncooked tomatoes did have the highest amount of antioxidants, followed by the cooked 250° tomatoes, then comes the cooked 200° tomatoes. Although in my hypothesis I stated that the cooked 200° tomatoes would have more antioxidants than the cooked 250° tomatoes, they still had comparable values, which makes my hypothesis partially correct. The same conclusion is also applied to the 300° cooked tomatoes and the ketchup, where they both had similar & comparable values. Getting the recommended amount of daily antioxidants, specifically vitamin C, is very important in order to protect our bodies from free radicals. Protecting our bodies from free radicals might take us consuming higher amounts of some natural products to get the same amount of vitamin C that we get from over-the-counter supplements provided in drugstores. By doing so, we can avoid ingestion of unwanted chemicals and additives coming from the vitamin C capsules and more forms.”

Wright, Ashley (PS)

To Grow, or Not To Grow

“The purpose of this experiment was to see whether or not the growth rates of marigolds are impacted by soil microorganisms. The hypothesis was if plants are grown in sterile soil and more plants are grown in the

unsterile soil (using the same kind of plants) then the plants grown in the soil with the microorganisms will have a faster growth rate than the plants in the soil without microorganisms because microorganisms help plants grow quicker. To do this experiment, start out by baking half of the soil and planting marigolds in both the baked soil and the non-sterile or not baked soil. Use an LED grow light on a 12 hour timer and gave the plants 1 tbsp (14.7868 mL) of water per day. Keep the sterile soil and non-sterile soil at least 45 cm apart to avoid contamination. Measure the plants’ height every week and take the average for each group (sterile and non-sterile). The data showed that plants in non-sterilized soil typically grow much better. However, the plants in the sterilized soil tended to grow faster. There was just one small problem: about 80% of the plants in the sterilized soil died. In conclusion, my hypothesis was supported by my data. Almost all of the plants in the sterilized soil died while the plants in the non-sterilized soil continued to grow at a steady rate.”

Pothuri, Tanvi (PS)

Algae and Nutrients

“The purpose of my experiment was to find what was the ideal ratio of nitrogen and phosphorus to algae growth. If the amount of nutrient media relative to the total amount of liquid in the flask is increased above 10%, then the algae will stop growing because the amount of nutrients is above the optimal ratio for growth. If the amount of nutrient media relative to the total amount of liquid in the flask is decreased below 10%, then the algae will continue growing because the amount of nutrients is perfect for optimal growth. This experiment is performed by taking 8 flasks and naming them A through H. Then the flasks are filled with the same amount of water and *Nannochloropsis* algae. The flasks are filled with varying amounts of nutrient media, starting at 0 and going up in intervals of 15. The control is flask A with zero mL of nutrient media. The experiment group are flasks B-H. The flasks are then all connected with air tubes which connect to an aquarium air pump. Lastly the water turbidity is measured to 17 days. The results are as follows. Agnes, which got 0 mL of nutrient media, grew 0 mL. Bill, which got 15 mL of nutrient media grew 1 mL. Carol, which got 30 mL of nutrient media, grew 1 mL. Doug, which got 45 mL of nutrient media, grew 1 mL. Edgar, which got 60 mL of

nutrient media, grew 0.5 mL. Frank, which got 75 mL of nutrient media, grew 1 mL. George, which got 90 mL of nutrient media, grew 1 mL. Lastly Henry, which got 105 mL of nutrient media, grew 1.5 mL. An error made was that Edgar spilt in day 0, and the amount of water was estimated. The results support the null hypothesis, which was, if the amount of nutrient media relative to the total amount of liquid in the flask is decreased below 10%, then the algae will continue growing because the amount of nutrient media is perfect for optimal growth. This was supported because 10% is Carol, everything below Carol continued growing, and therefore the null hypothesis is supported by the data. The results did not support the original hypothesis, which was, if the amount of nutrient media relative to the total amount of liquid in the jar is increased about 10%, then the algae will stop growing because the amount of nutrients is above the optimal ratio for growth. This is shown in that data. 10% is Carol, it was assumed that everything above Carol would stop growing, which was not the case. Therefore the data did not support the original hypothesis.”

GRADE 8

Hunsader, Judian (PS)

Tie Dye? Use This

“The purpose of the experiment was to see the best way to tie-dye when tie-dying for fun. The hypothesis was if the socks are soaked in liquid dye, powder dye, and cabbage water, then the socks soaked in liquid dye will be the most vibrant because according to ritdye.com, which is the website of the brand of dye being used, the liquid dye is already dissolved in water and more concentrated than the powder dye, and the liquid dye is pre-mixed, so there is less room for human error. The null hypothesis was if the socks are soaked in liquid dye, powder dye, and cabbage water, then the socks soaked in powder dye will be the most vibrant because the powder is more concentrated in the water than in the liquid dye. The procedures included making the dye bath by either boiling cabbage with 12 liters of water and then putting the liquid created after boiling with more water, adding 12 liters of water to powder dye and mixing it together, or adding liquid dye to 12 liters of water,

and adding vinegar to every dye bath. The control was just socks that didn’t have anything added to the water except vinegar, which was a pretreatment to set the dye. The data showed that powder dye produced the most vibrant tie-dyes, as the CMYK values were closest to that of the packaging. The liquid CMYK values were second closest to the packaging, the cabbage values were third closest and the vinegar values were furthest. Errors were that the lighting for the pictures used to measure the CMYK might not have been the same, or that the natural way of dying might not be the best way naturally. The results support the null hypothesis because the powder dye had a CMYK value of ”

Fick, Keegan (PS)

Pygmy Portions

“The purpose of this experiment was to test how much prey a pygmy sundew could digest. A pygmy sundew is a small carnivorous plant. I hypothesized that they would only be able to digest one bug per trap. I tested this by squishing one bug until it was dead, but not obliterated, and then putting one onto the trap and leaving it for a few days. I would repeat this multiple times. I would test one bug per trap four times, then two bugs per trap, and so on. In conclusion, I could see that the plants could digest 2 bugs per trap, since the plant physically could not fit any more on its traps.”