

#46

Grade 7-Red St. Joseph School

Herndon, VA

Mrs. Hurley

Physics

How Does Mass Affect Momentum Transfer?

The purpose of this experiment was to determine if balls with less mass would bounce higher on top of a dropped basketball than balls with greater masses bounce on top of a dropped basketball. The hypothesis is if balls of varying masses are bounced on top of a basketball from a drop height of 86.36 cm, then the ball with less mass will bounce higher than a ball with greater mass.

To conduct the experiment, two balls were dropped right on top of one another from the "ball dropper." The "bottom ball" was a basketball, and each "top ball" was one of a multiple of different balls, one at a time, with different masses. Six balls were tested. The control, a basketball on top of a basketball, bounced the lowest, which supported the hypothesis because it had the most mass. Five other balls were also tested. They were: a lacrosse ball, a mini basketball, a golf ball, a tennis ball, and an orange rubber ball. Two ladders were positioned in a driveway. One to support the "ball dropper", a post digger, and one to support a camera, which was positioned at just the right spot to record the whole possible area the balls could bounce in slow motion. The post digger, (see picture on backboard) was the mechanism to drop the balls at exactly the right height and spot each time. To drop the balls, the handles on each side were pulled at the exact same time, releasing the balls to drop. To support the ball on top of the basketball and to prevent it from falling off, 3-D printed supports were used (see picture on backboard). There were two different sized supports, for the different size balls. A tape measure hanging from a gutter was also used to determine the height the balls bounced in inches, which were converted to centimeters later. Each ball was given five trials, so both the average height and the maximum height could be calculated.

In conclusion, the hypothesis was correct because the less massive the ball, the higher it bounced on top of the bottom basketball. The golf ball, which was the ball with the least mass, bounced higher than most other balls except the tennis ball, the second least massive ball. While these bounce heights were almost identical, the tennis ball still bounced a little higher, as you can see on the graph of averages. This may have been because of a difference in compressibility. The tennis ball was able to compress more because it had a hollow center, while the golf ball did not.

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Grade 7-Blue, St. Joseph School

Herndon, VA

Mrs. Hurley

Physics

How Solar Cells are Affected by Their Operating Temperature and the Intensity of the Incoming Light?

The purpose of the experiment was to determine how changes in incoming light intensity and operating temperature of the solar cell affect the power output from the solar cell. The hypothesis was that if the intensity of light is increased and the operating temperature is reduced, then solar cells produce a higher power output. The independent variables were the incandescent bulb wattage and the operating temperature. The dependent variable was the power output from the solar cell. This was determined by measuring the voltage and the current.

To conduct this experiment the following materials: Three Sunnytech 1.25 Watts, 5 Volts, 250 mA Polysilicon solar cells, one Neoteck digital multimeter, one Etekcity digital infrared thermometer, one panel mounted fan, one metal plate about the size of the solar cell, two pieces of plywood about the size of the solar cell, 40 Watts, 100 Watts, and 200 Watts Sylvania light bulbs were used. In the first set-up, the solar cell was placed on a metal plate. The metal plate became hot and increased the operating temperature of the solar cell. In the second set-up, the solar cell was assembled using four 50 mm screws, four nuts, and one piece of plywood allowing air ventilation below the solar cell. In the third set-up, the solar cell was assembled using four 100 mm screws, twelve nuts, one fan, and two pieces of plywood. This set-up allowed forced air ventilation below the solar cell. A 40 Watts bulb was inserted into the lamp. The lamp was placed at a fixed height, 12 cm, above the solar cell in the first set-up. After 30 minutes, the multimeter probes were connected to the solar cell's alligator clip leads. Three different readings of the voltage and the current were taken and recorded in a data table. The operating temperature of the solar cell was also measured using the digital infrared thermometer and recorded in the data table. Then, the lamp with the 40 Watts bulb was placed on top of the solar cell in the second set-up. Recordings for the voltage, the current, and the temperature were taken. Then again, the lamp with the 40 Watts bulb was placed on top of the solar cell in the third set-up and recordings were taken. Finally, all the previous steps are repeated with the 100 Watts bulb and with the 200 Watts bulb. At the end of the procedure, the average values for each set of recordings in the data table for the voltage and the current were calculated and plotted using a bar graph. The following formula was used to derive the power output of the solar cell: Power (watt) = Voltage (volt) x Current (ampere).

The hypothesis was proven to be correct. The power output of the solar cell was higher at a lower temperature and with increased incoming light intensity. Solar cells lose their efficiency at higher temperatures. So, enough gaps for air ventilation are necessary to keep the operating temperatures of the solar cells within acceptable limits. Using a 40 Watts bulb with an operating average temperature of 45 °C, the power output was 0.3 Watts. Using a 100 Watts bulb with an operating average temperature of 32 °C, the power output was 0.7 Watts. Using a 200 Watts bulb with an operating average temperature of 27 °C, the power output was 1.2 Watts.

#48

7-Blue St. Joseph School

Herndon, VA

Mrs. Hurley

Physics

Slip 'n Slide

This experiment's purpose was to determine what ice treatment provided the highest static coefficient of friction. The hypothesis for this experiment was that if sodium chloride, calcium magnesium acetate, sand, and fresh cat litter were applied to ice when the temperature was at or below freezing to improve traction; then sodium chloride would create the most friction.

This experiment was conducted by filling up two 38.1×53.34 cm Nordic Ware Aluminum cookie sheets with 2.5 L of water each and freezing them in a chest freezer. Then, a piece of a rubber inner tube was duct-taped around a brick to replicate a car's tire. The trials were done outside at temperatures below freezing on two separate days. On each day, thin layers of the ice treatments (sandbox sand, Morton Safe-T-Salt, fresh Tidy Cats non-clumping cat litter, and Snow Joe Melt-2-Go Nature + Pet Friendly CMA Blended Ice Melter) were applied to a portion of the ice on the frozen cookie sheets. The brick was placed on one end of the cookie sheets for each ice treatment, and that end of the cookie sheet was slowly raised up against a carpenter's square until the brick just started to move. The measurements of the base, height, and angle of the triangle formed by the cookie sheets and the square were written down and used to calculate the tangent for each triangle, which is equal to the coefficient of friction for each ice treatment. The same procedure was also used for the control, which was untreated ice with the brick. The independent variable was the ice treatment used, and the dependent variable was the coefficient of friction.

The conclusion made was that the hypothesis was not supported because the ice treatment with the highest coefficient of friction was the CMA blend with a friction coefficient of 0.7. The rock salt had a friction coefficient of 0.68, the second highest. From the data, it was concluded that the CMA blend improved traction the best, the rock salt worked second best, the sandbox sand worked third best, and the fresh cat litter created the least traction.

49

Grade 7-Red St. Joseph School

Physics

Does golf ball density affect the distance a golf ball travels?

The purpose of this experiment was to determine if a golf ball's density would affect the distance that a golf ball can travel. The hypothesis is that if a golfer was to hit a golf ball with a harder density, the ball would travel farther with less spin. But if a golfer was to hit a golf ball with as softer density, the ball would not travel as far, but it would produce more spin.

To conduct this experiment, three different types of Titleist golf balls were purchased(soft, medium, and hard density). The three golf ball types that were purchased were the Titleist Tour Soft(soft density), Titleist ProV1(medium density), and the Titleist Velocity(hard density). The different densities of the golf balls were the independent variable. The dependent variable was how far the golf balls traveled due to the different densities. The golfer then hit 15 shots with each golf ball. All of the measurements were recorded on Trackman(a golf simulator). Then the data was recorded.

It was concluded that the hypothesis was wrong because the Titleist Tour Soft(the softest ball) averaged the farthest distance. The Titleist Tour Soft averaged 187.5 meters. The Titleist ProV1 averaged 183.6 meters. And lastly, The Titleist Velocity averaged 183.7 meters. One thing that was noted was that the contact made on a shot could have varied the result of a shot.

#50

Grade 7 – Red St. Joseph School

Herndon, VA

Mrs. Hurley

Physics

Temperature Bounce

The purpose of the experiment is to determine if different temperatures of a basketball will influence how high it would bounce. The hypothesis was that if a ball is dropped from the same height of 36 inches that the colder the basketball gets the bounce height will decrease than a heated basketball of a temperature of 100 degrees.

To conduct this experiment, an official size basketball which is 29.5 inches in circumference, a flat cement surface, a tape measure, a hair dryer, a freezer, a video recorder, and a heat sensor were used. The procedure for the experiment was that a basketball of room temperature will be dropped five different times from 36 inches high. A video recording was used to read how high the ball bounced. Then the ball was put into a freezer to be frozen at 0 degrees Fahrenheit. When the basketball reaches 0 degrees Fahrenheit it was taken out to measure how high it bounced from 36 inches high. This was completed 5 different times. Then the ball was heated by a hair dryer to warm it up to 100 degrees Fahrenheit. When the basketball reached 100 degrees Fahrenheit it was taken out to measure how high it bounced from 36 inches high. This was also completed 5 different times.

The conclusion was that the hypothesis was supported. When the basketball was at 100 degrees Fahrenheit the average bounce was 33.9 inches. The basketball at room temperature of 72 degrees Fahrenheit had an average of 29.6 inches high. The frozen basketball of 0 degrees Fahrenheit had an average bounce of 18 inches high. The hypothesis was supported because a colder basketball did not bounce as high as a warmer basketball.

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Grade 7-Blue St. Joseph School

Herndon, VA

Mrs. Hurley

Zoology

Why Do We Not See Butterflies in the Winter?

Have you ever wondered why you never see butterflies in the winter time? Could it be that their life cycle is dependent on the temperature of their environment? If the temperature of the environment is decreased then, the length of time the butterflies spend in each stage of life will be increased.

Received by expedited shipping, two separate cups containing Painted Lady caterpillars and their food each arrived in the same package. One cup, Group A, was placed at room temperature indoors, where a daily log monitoring temperature was kept. The second cup, Group B, was placed in an unfinished basement setting, without a direct heat source. A daily temperature log was kept for Group B. Temperature for both Groups was checked between 5 and 7pm daily and recorded in Celsius. Following the instructions from Carolina Biological Supply Company, the insects were transferred to a butterfly net when all the insects in one group reached the chrysalis phase and maintained it for three days. After the first butterfly hatched in each group, the insects were provided with a sugar water solution as food, which was replaced every other day. The progress of each group of insects was closely monitored for the effect of temperature on the length of time in each phase of the Painted Lady Butterfly life span. The experiment ran for 31 days.

Group A had an average temperature of 23.8 degrees Celsius over 31 days. Group B had an average temperature of 17 degrees Celsius over 31 days. There was a 6.8 degree temperature average difference. Group A stayed in the caterpillar form for 8 days, while Group B spent 29 days as caterpillars. Group A was in chrysalis form for 8 days, while Group B was in chrysalis for 12 days. Group A, as of day 31 and the final day of the experiment, had spent 23 days as Painted Lady Butterflies. Group B, as of the final day of the experiment, had hatched two butterflies of the six chrysalis'.

As the results indicate, temperature has a significant effect on the lifespan of Painted Lady Butterflies. Group B grew much slower and spent a much longer time in each phase of the lifespan than Group A, which was raised at a warmer temperature. It is clear that butterflies prefer a warmer climate, and that's why we do not see them in the winter.

#52

Grade 7B- St.Joseph

Herndon VA

Zoology

If You Give a Mouse a Monster

In this experiment, 5 mice were given different caffeine-filled drinks while a sixth mouse was just given water. This was to see if mice were given caffeine would their weight increase. This was done over two weeks where the mices' weight, drinks, and food were measured in grams in milliliters. If the mouse drinking their assigned energy drink with water and one mouse was given plain water, then the mice drinking their assigned energy drink with water would weigh more and eat more than the ones not drinking their assigned energy drink. The independent variable was the energy drink and the dependent variable was the mice weight and how much food they ate.

The experiment lasted two weeks where the mice had 48 milliliters of water mixed with 12 milliliters of their assigned energy drink. The mice were given 57 grams of food and two nutrition nuggets. The mice were weighed and their food and drink were measured every 3 days for two weeks.

The mice ate more towards the end of the experiment then the beginning. The control drank less than the mice drinking Coffee, RedBull, Monster, 5-Hour Energy, Coke-Cola. The mice weighed about the same throughout the experiment.

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Grade 7, Red St. Joseph School

Herndon, VA

Mrs. Hurley

Zoology

Does gender affect horse behavior?

The purpose of this experiment was to determine if gender impacts horse behavior. The hypothesis was that if horses are asked to do the same routine, their gender will not affect their behavior.

To conduct this experiment, the horses were divided into mares (females) and geldings (males). Each horse was put through the same routine including grooming, tacking and completing a simple course of 4 rail jumps measuring .6096 meters each. Riders were instructed to record the number of undesirable behaviors while performing the three tasks: grooming, tacking and riding. The independent variable was the three part routine and test of behavior. The dependent variable was the gender of the horses. The results were combined and male and female behavior was compared. The results were put into graphs to show the good and bad behaviors.

It was concluded that the hypothesis was correct because all of the horses showed some bad behaviors. The amount of bad behaviors were almost equal in mares in geldings and showed that that gender had little or no impact on horse behavior.

#54

Grade 7-Blue St. Joseph School
Hendon, VA
Mrs. Hurley
Zoology
The Power of Pets

The purpose of this experiment was to determine if having a pet makes people happier. The hypothesis for this experiment is that if people have pets then they would be happier than those who did not have pets.

To conduct the experiment subjects were asked a selection of questions to be answered about having pets, happiness with pets and interactions with pets. The independent variable for this experiment is the subjects happiness levels and stress levels. The dependent variable is if they had pets or not. The subjects answered a group of questions asking if they had pets, how many pets they had and of what type of pet they had. The subjects were also asked what their levels of stress and happiness while owning that pet. They were also asked what the subjects favorite thing to do with their pet. If a subject indicated that they didn't have any pets, they would still answer the questions as best they could.

It was concluded that the hypothesis was correct because the subjects that replied that owned pets indicated higher levels of happiness than stress. It was found that people with no pets indicated they did not have any because they were not allowed to have them at their home, health reasons and allergies or they thought it could be too stressful to own a pet. One important thing that was noticed during this experiment was that people with pets were very willing to talk about all the good and fun with their pets. The subject also would talk about all the little details, the funny, the loving, and even sometimes the bad things they do that their pets do.

Grade 7 Blue - St. Joseph School

Herndon, VA

Mrs. Hurley

Zoology

Do Dogs Have a Paw Preference?

The purpose of this experiment was to determine if dogs have a paw preference. The hypothesis was that if dogs have a paw preference, then they will use the same paw more than 50% of the time when tested.

To conduct this experiment, six dogs were tested in two ways to demonstrate whether or not they had a preferred paw: first, when given the command to “shake” or “paw,” and second, when trying to eat a treat that required the dog to use the front paws to get the treat from a toy. Each of the dogs were given the command “shake” or “paw” by putting out a hand for the dog to shake. The paw given to shake was recorded. This was repeated three times using the right hand and three times using the left hand. For the second “treat” test, the dog was given a treat inside a toy that required the dog to use its paws to get out the treat. The paw the dog used to hold down the toy to pull the treat out was recorded as the preferred paw. The control variables were the number of dogs, the type of dog treat, and the toy used. The independent variables were the type of tests done on the dog (i.e. the “shake command” and “treat” test). The dependent variables were the preferred paw of each dog. This was determined by observing which paw the dog used to execute the command that was given.

The conclusion showed that the hypothesis was correct and that the dogs can have a paw preference. There was a flaw in the experiment in that not many of the dogs tested knew the command “shake” or “paw.” Also, dogs may not show a preference when doing the command because the dog might be trained to do the command with the same paw. This experiment relied heavily on the dogs demonstration of the dominant paw when retrieving the treat from the toy. Both the dogs that did not know the “shake” or “paw” command, as well as the dogs that didn't, showed a clear paw preference when trying to get the treat out of the toy. It is possible that some of the dogs may have been “ambidextrous” and used both paws for one or both tests.

#56

Grade 7, St. Joseph School

Herndon, VA

Mrs. Hurley

Zoology

Do Dogs Have A Color Preference?

The purpose of my experiment was to determine if dogs have a color preference. My hypothesis is that if dogs have a color preference between red, yellow, green, blue, yellow, and black then they would most likely go to the dark blue bowl because dogs see in shades of gray, which is a darker color.

To conduct this experiment, dogs were tested one at a time in their own homes. There were five dog bowl colors that included red, green, blue, yellow, and black and each dog bowl had a dog treat. I did three rounds and mixed up the bowls in a different order each time I also used eleven dogs. The independent variable in my experiment was the dogs being tested and the dependent variable was the dog bowl colors that were chosen by the dogs.

In conclusion my hypothesis was not supported because not that many dogs chose the blue dog bowl, they mostly chose the green dog bowl. As I was testing my experiment I noticed that some dogs went to the bowl closest to them and not really a specific color. I also noticed that some dogs didn't go to a dog bowl or they just sniffed the dog bowl and never ate the treat so it may also be the choice of treats that you use could affect the dog bowl choice.

#57

Grade 7R St. Joseph's School

Herndon VA

Mrs. Hurley

Zoology

Are Certain Breeds of Dog Smarter Than Others?

The purpose of this experiment was to see if certain breeds are smarter than others and to see if age and sex have to do with intelligence. If the dog immediately figures out the obstacle/puzzle, then that will mean that that certain breed is more intelligent in solving problems than others. The hypothesis is that out of all of the breeds the Border Collie would score the highest, then the Australian Shepherd, the Beagle, and lastly the Boxer.

To conduct this experiment, the dog being tested will sit in front of two folded chairs that have been placed in a "V" shape with a slight gap between the chairs. The dog will watch as the treat is slowly placed in the gap between the chairs. On command, the dog will get up and try to get around the barrier while being timed. As the scores are recorded, each dog will be ranked. A: Subject immediately goes around barrier to get to treat. B: Subject wanders a bit, sniffs around, then gets around barrier. C: Subject gets completely distracted and wanders away, then after a while gets around barrier. D: Subject breaks through gap in barrier/ jumps over barrier. This is tested on multiple dogs for each breed.

It was concluded that the hypothesis was incorrect. The highest scoring dog was the Australian Shepherd, then Border Collies, Boxers, and Beagles. The Australian Shepherds scored on average 3 seconds. The Border Collies scored on average 12 seconds. Boxers scored 19 seconds. Lastly, Beagles scored 23 seconds.

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Grade 7-Red St. Joseph School
Herndon, VA

Zoology

What noises make dogs bark?

The purpose of the experiment was to determine the kinds of noises that make dogs bark. The hypothesis is that dogs would bark more frequently, longer, and louder when exposed to noises related to protecting their owners or territory than noises related to play or other common noises.

To conduct the experiment, two different breeds of female dogs, a chihuahua mix and foxhound mix, which were both 6 years old, were exposed to 10 different noises. These noises included opening and closing the front door (1 time), ringing the doorbell (5 times), opening and closing a car door (1 time), shaking car keys (5 seconds), squeaking a dog toy (5 times), bouncing a tennis ball (5 times), singing a song (happy birthday), clanging tablespoons (5 times), making a kettle whistle (5 seconds), and turning on the vacuum. There were five trials conducted with each dog. The 10 different noises were the independent variables. The dependent variables were the number of times the dogs barked after each noise, how long the dogs barked, and the highest decibel of their barks. After each noise, the number of barks, the duration of barks, and the highest decibel of the barks were recorded in a data table and then averaged across the five trials for each dog.

It was concluded that the hypothesis was only partly correct. The chihuahua mix barked more times, longer, and louder at noises most related to protecting her owners or territory than noises related to play or other common noises. The foxhound mix barked more times, longer, and louder at a noise most related to play than noises related to protecting her owners or territory or other common noises. The breed of the dog may influence the types of noises that make a dog bark.

#59

Grade 7, St. Joseph School

Herndon, VA

Mrs. Hurley

Zoology

Do Dogs See Color?

The purpose of the experiment was to determine if dogs can see color. The hypothesis was that dogs do see color. If 3 dogs are tested to recognize color to receive a treat, then the dogs would be able to recognize the color to receive a treat at least 9 out of 15 times.

To conduct the experiment, three dogs, 1 blue Easter egg, 1 yellow Easter egg, six cheese sticks, three dog treats, 3 sheets of white paper and a pen were used. The dogs were tested one at a time in separate places on different days. First, the dogs had to be trained to choose the blue Easter egg over the yellow Easter egg. This was done by offering the blue and the yellow eggs in each hand simultaneously to the dog and saying the word "touch". When the dog touched the blue egg, either with its paw or nose, the researcher enthusiastically said "Good!", and rewarded the dog with a piece of a cheese stick. If the dog chose the yellow egg, the researcher would flatly say "No." The researcher repeated the exercise, switching which hand the eggs were in, until the dog chose the blue egg five consecutive times, indicating it recognized the blue egg as the correct egg to choose. Next, the dog had to be tested. The researcher simultaneously offered the dog the eggs, again switching which hand the eggs were in five more times and observed and recorded which egg the dog chose. The training and testing exercises were repeated with two more dogs.

The conclusion was that the hypothesis was correct. The first test subject, Blaze, chose the blue egg four out of five times, as did the second subject, Ranger. The third and final subject, T-Bone, chose the blue egg one out of five times. Nine out of 15 times, the dogs chose the blue Easter egg. Since the dogs chose the blue egg more often than the yellow egg, regardless of which hand it was in, indicates that dogs can see color.