CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Cameron D. Alsbrook

Project Number

J1501

Project Title

Radioactivity: The Effect of Shields on Beta Particles and Gamma Rays

Abstract

Objectives/Goals

Shields block Beta particles and Gamma rays from reaching a point. Shields of greater density will have a greater effect on blocking the radioactivity.

Methods/Materials

I used a Geiger counter, Beta sample, Gamma sample, and 20 different shields. I set up the Geiger counter and read each source through the different shields. Each shield had a different thickness, mass, and was a different material. I conducted 5 trials on each shield, and then averaged the data.

Results

When Beta particles and Gamma rays were read through a shield with more mass, the reading was lower than if read through a shield of less mass. Also, Gamma rays were much more powerful than Beta particles.

Conclusions/Discussion

My results showed that my hypothesis was correct in that Beta particles and Gamma rays are blocked by shields. This effect varies with the density of the shield. However the readings varied with each trial, so the averaging of five or more times was called for. Averaging multiple trials enabled me to see a trend and draw conclusions from the data.

Summary Statement

The effectiveness of various materials in blocking Beta particles and Gamma rays.

Help Received

Used geiger counter at Ribet Academy science lab. Recieved help on operation of geiger counter from senior student.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Claire R. Arakelian

Project Number

J1502

Project Title

How Temperature Affects a Magnet's Strength

Abstract

Objectives/Goals

My objective is to find out if a magnet's strength changes due to temperature using liquid nitrogen, boiling water and ice water. My hypothesis was that the increase in temperature reduces the strength.

Methods/Materials

I took 3 identical permanent magnets and changed their temperature by immersing them in liquid nitrogen, boiling water and ice water. Thus the magnets# magnetic strength was measured by a Gauss meter at -196 degrees Celsius, 100 degrees Celsius and 0 degrees Celsius. After each immersion the zinc BBs were weighed and recorded.

Results

It was found that as expected, temperature affects the magnets, strength. When the temperature was higher the strength of the magnet was lower.

Conclusions/Discussion

The data supported my hypothesis - the higher the temperature the lower the magnetic strength. The heat caused the magnetic patterns in the magnet to get mixed up and not point in one direction, therefore causing the magnet to lose most or all of its magnetic strength.

Summary Statement

My project was about finding if the temperature of a magnet affects its strength.

Help Received

Aunt helped with graphs; Dad let me use lab at Caltech; Chemistry department at Caltech loaned Gauss meter

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Sunil C. Bodapati

Project Number

J1503

Project Title

Using Sound to Measure Temperature

Abstract

Objectives/Goals

To determine the temperature of the air inside a pipe by measuring the speed of sound.

Methods/Materials

Microphone, speaker, oscilloscope, audio generator, thermometer, hairdryer, and a 3.6 (3 ft and 7 in) foot pipe.

Procedure

· After placing the speaker and microphone at each end of the pipe, measure the length of the pipe, which is the distance between the speaker and the microphone.

· To find the lag time between the speaker input and output for the temperatures from 0 to 100 degrees Celsius, combine the equations: v (sound) =331+0.6T and v=d/t, where d=1.1 meters, and T= temperature in degree Celsius. These two equations would combine to create d/t=331+0.6T.

· Calculate the time it takes sound to travel through the pipe at 0(C), and the time it takes sound to travel through the container at 100(C), and subtract them. Divide this number by a hundred.

· Use a hair dryer to heat the air in the pipe to the desired temperature and turn on the sound waves. Mark the intersection of the wave on the oscilloscope grid before and immediately after the hairdryer has been used. This will indicate the lag time. Now, for every 5 microseconds of lag, add one degree Celsius.

· Calculate the temperature, and compare the number with the thermometer.

· Wait until the pipe cools down, and then repeat the procedure.

Results

After repeating the experiment 10 times, I found out that my calculated and actual temperatures derived from a thermometer differed on average by 2.8(C). My average percent of error was 4.89%.

Conclusions/Discussion

I concluded that I was able to accurately predict the temperature by the velocity of the sound that passed through it. Whenever the temperature was increased, the speed increased; conversely, as the air slowly cooled, the speed decreased. I think this is due to the fact that with a higher temperature, more energy is in the air. With more energy, particles are able to vibrate faster, thus increasing the speed of sound.

Summary Statement

I have determined the temperature of air by using the fact that temperature has an effect on the speed of sound.

Help Received

My mother helped set up my board. My dad helped me understand the theory behind the project. My mentor helped me throughout the entire project.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Sarkis Bornazyan

Project Number
J1504

Project Title
The Effect of Bottom Reflectivity on Solar Pond Performance

Abstract

Objectives/Goals
My 2004 "Solar Energy Trap" project studied solar ponds as an energy collector and storage system combined. I effectively proved that by creating salinity gradient body of water we could store and reuse solar energy for our needs. One of the unanswered questions was the effect of bottom reflectivity on solar pond performance. My 2005 project experimentally investigates this subject. After researching, I hypothesize that decreased reflectivity of the bottom surface of the salinity gradient container will result in the greatest thermal storage efficiency.

Methods/Materials
Solar pond-like vertical salinity gradient was created in the container and exposed to halogen lamplight (sunlight simulator). High absorptive, medium absorptive and high reflective bottom cases were observed. Effects were evaluated by measuring and calculating difference in temperature between bottom and top layers of water as function of light exposure time.

Results
In the high absorptive case, the bottom temperature increased and exceeded top about 6 hours sooner than in the medium case and about 12 hours sooner than in the high reflective case. In the high reflective case bottom temperature never exceeded top.

Conclusions/Discussion
In the high absorptive case, the temperature increased more efficiently than in the medium and high reflective cases, indicating high thermal conversion efficiency for the first case. The data supported the hypothesis and findings agree with the information that is found in the literature and the El Paso Solar Pond research and development project results.

Summary Statement
By creating high absorptive surface at bottom of solar pond-like environment, it was shown that the sunlight, a renewable energy source, could be more effectively converted into thermal energy and stored for future needs.

Help Received
Consulting, transportation to obtain necessary materials and literature.

Name(s)
Ryan O. Brottlund

Project Number
J1505

Project Title
How Do Different Color Filters Affect the Energy of a Laser Beam?

Abstract

Objectives/Goals
The purpose of my project was to find out how color filters would affect the energy of a laser beam. I thought a color filter with the same wavelength as a laser beam would block the most energy and I thought the laser beam energy would increase as the wavelength value of the color filter decreased.

Methods/Materials
A test fixture was built to hold the laser, color filter and solar cell. The energy of the laser was first measured without a color filter in millivolts for 3 seconds with the solar cell. I then placed a color filter in the test fixture. Lastly, I measured the energy of the laser with the color filter in millivolts for 3 seconds. I repeated the measurement process five times for each of 12 different color filters. A 645 nm red laser and a 532 nm green laser were tested using this procedure.

Results
The percent of laser beam energy passing through the color filters at laser wavelengths was 100% for the red laser and 80% for the green laser. With both lasers the 490 nm blue filter blocked the most energy. The green and red lasers reacted to the color filters producing varying results that were not what I predicted.

Conclusions/Discussion
I determined that both points of my hypothesis were not correct. I found out a color filter of the same wavelength as the laser beam did not block the most energy. I also found the energy did not decrease with color filter wavelength decreases. I determined the energy is partially dependent on wavelength but more dependent on the optical density of the color filters.

Summary Statement
My project was on testing the affect of color filters on laser beam energy.

Help Received
My Father helped prepare the test fixture, edit my report, and paste up my display. My Grandfather made the frame for my display.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Alissa K. Clynne

Project Number

J1506

Project Title

Viscosity and Volcanoes

Abstract

Objectives/Goals

The question I asked is: Does temperature affect the viscosity of a liquid? Viscosity is defined as the resistance of a liquid to flow. The results of the experiments were related to volcanoes and how they are formed.

Methods/Materials

Two experiments were done to measure the viscosity of molasses and the affect of viscosity on the flow rate. The viscosity of molasses was measured at different temperatures using the falling rate of a steel ball in a column of molasses. the data were regressed to determine the viscosity at any temperature. then the flow rate of the molasses was measured on an incline at different temperatures.

Results

The result of these experiments show, that my hypothesis was correct. That the temperature does affects the viscosity of a liquid. The higher the temperature the less viscous the molasses. The less viscous the molasses the faster it flows away from the point of origin.

Conclusions/Discussion

The experiments showed that temperature affects the viscosity of molasses and the flow rate is dependent on viscosity. The results of the experiments explain how the composition of lava controls the shape of the volcano it makes. Basalt lava has a high temperature and a low viscosity and therefore a high flow rate. The high flow rate of basalt carries it quickly away from the vent and it spreads out over a large area and builds shield volcanoes with shallow slopes and thin lava flows. Andesite lava has an intermediate viscosity and temperature and therefore as moderate flow rate. The moderately high flow rate of andesite carries it less quickly away from the vent and spreads out a smaller area and builds a stratovolcano with steeper slopes and thick lava flows. Dacite and rhyolite lavas have low temperature and high viscosity and therefore has a low flow rate. The low flow rate of dacite and rhyolite carries it slowly away from the vent causing it to pile up and spread out a very small area and builds a dome volcano with very steep sides.

Summary Statement

My project measured the effect of temperature on the viscosity of molasses and explains how viscosity determines the shape of a volcano.

Help Received

My father helped with the design and running of the experiments. My mother helped with the calculations and editing of the report. I borrowed some equipment from my science teacher.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Brelynn A. Conn

Project Number

J1507

Project Title

Exploring Evaporation through Colors

Abstract

Objectives/Goals

My project was to determine what color of plastic (red, purple, black, clear) helps water to evaporate more efficiently.

Methods/Materials

Four plastic containers
-inside each container:
 one small cup
 sixteen cups of water
 six tablespoons of dirt
-covering each container:
 one sheet of colored plastic
 tape
 one quarter/used as weight

Results

Collected water from each container:
-black 0.5 ml
-purple 8.5 ml
-red 9.0 ml
-clear 39 ml

Conclusions/Discussion

My hypothesis was wrong; I thought that the red plastic wrap would be the best because it was a dark shade (which would attract heat) and it was translucent (which would let light shine through). In conclusion, the clear plastic wrap was more efficient.

Summary Statement

How do colors affect evaporation?

Help Received

Dad helped to find the materials.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Cutter Coryell; Clay Evans

Project Number

J1508

Project Title

Ringing Saturn

Abstract

Objectives/Goals

Our objective was to find out if Saturn#s moons caused the gaps in Saturn#s rings.

Methods/Materials

To test this hypothesis, we ran two simulations: one including moons, and one without them. After we simulated 25 years in each trial, we recorded the positions of the particles.

Results

The results show that in the moon test, particles form large gaps near where the moons are. In the test without moons, there weren#t as extreme gaps, but there were some unexpected narrow ones further out. Also, in the moon test, a large percentage of the particles were jettisoned past the distance where we stopped recording, whereas in the test without moons, no particles passed that distance

Conclusions/Discussion

Our results show that gaps form in the cloud of particles near where the moons are, if there are moons. This shows that our hypothesis was correct; Saturn's moons did cause noticeable divisions in the particle cloud.

Summary Statement

Our project focused on how particles in orbit around Saturn react to the gravitation of Saturn's moons.

Help Received

Cutter's dad provided a fast computer and Matlab simulation software. He also helped us learn how to program in Matlab.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Shay C. Edwards

Project Number

J1509

Project Title

Experimental Investigation of High Frequency Plasma in the Infrared Spectrum

Abstract

Objectives/Goals

My main objective was to observe the infrared spectrum through electrically charged gas resulting in a plasma. I will be studying the transmission of infrared light through the plasma. I hypothesized that the plasma would not affect infrared viewing.

Methods/Materials

To test my hypothesis I designed a 4" x 24" plasma chamber constructed from Pyrex. On each end of the chamber is a tungsten electrode. Directly in the center on each side of the chamber is a 2" opening. One opening has a 16 gauge steel plate which is coated with flat black high heat paint. On the other opening is a 2" germanium window. The steel plate was heated by a hand warmer reaching 130 degrees attached directly to the outside. Another heat source I used was a rectangular one gallon metal can that was filled with water and heated by a fish tank heater. I used a Spectroradiometer, which operates in the spectral range from 2.5 to 14.5 um, and an 8-12 micron infrared camera with digital imagery. Testing was performed on Argon, Helium, and Neon plasmas. Before each test, the chamber was evacuated and held at 0 Torr for 6 minutes. Each gas was then inserted through the same vacuum hose to exactly 7 Torr. The power supply was a 5.5kV with 2.0 Amps current, and a frequency of 20 kHz. Clips were attached to the tungsten leads and power was turned on by a pull switch. The plasmas were tested in a controlled environment and photographed before and during the testing.

Results

Using the SR5000 Spectroradiometer wide range capabilities, I was able to look at one micron at a time with each plasma tested. After the SR5000 testing, I was the able to proceed using the information that I had gathered and test with the infrared imaging system on the same plasma to visually look for change in transmission.

Conclusions/Discussion

The data from both types of test supports my hypothesis that Argon, Helium and Neon plasma had no affect on the transmissivity in the infrared spectrum.

Summary Statement

This project was an experimental investigation of high voltage, low current and high frequency observation of plasma in the infrared spectrum.

Help Received

Testing done at NAVSEA in Corona was under the supervision of Ed Trovato; SoCal Edison testing supervised by Chris Perez; Cal Glass Reaearch manufactured chamber according to my design; chamber evacuated under the supervision of Andy Vega; mentored by James Seffrin of Irinfo, New Jersey.

Name(s)

Noel C. Garcia

Project Number

J1510

Project Title

Kinetic Energy

Abstract

Objectives/Goals

My project was to determine if weight distribution inside a cylinder affected the speed of the cylinder while traveling down a slope.

Methods/Materials

The speed of three cylinders was measured at the end of a 6 meter slope. One cylinder had no washers. The second cylinder had washers positioned along the perimeter of the cylinder. The third cylinder had washers stacked in the center of the cylinder. The speed in meters/second was measured 10 times each for all three cylinders.

Results

The cylinder with the washers stacked in the center traveled the fastest with an average speed of 1.99 m/s. The cylinder with washers positioned along the perimeter traveled an average speed of 1.75 m/s. The cylinder with no washers traveled the slowest with an average speed of 1.72 m/s.

Conclusions/Discussion

My conclusion is that all the cylinders had the same potential kinetic energy. However, the cylinder with the washers positioned along the perimeter used more of its original kinetic energy just to get the cylinder rolling. The cylinder with the washers stacked in the center had more translational kinetic energy available at the 6 meter mark which resulted in a faster speed. The cylinder with no washers had less mass, therefore less original potential kinetic energy at the top of the slope.

Summary Statement

My project was about how weight placement in a cylinder affects the speed of a cylinder when in motion.

Help Received

Father helped roll cylinders down driveway.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Dorae D. Hankin

Project Number
J1511

Project Title
Singing Goblets: Measuring Sound Frequencies from Glass Goblets

Abstract

Objectives/Goals
The objective is to test the hypothesis that greater liquid volumes and thicker liquids make a glass goblet resonate at a lower frequency. Also, to determine what effect size and/or shape of goblet has on frequency.

Methods/Materials
I used a KORG Chromatic Tuner CA-30 to measure and record pitches of a small and big glass goblet filled at different volumes with either water, vegetable oil, or molasses. I repeated all trials. I used the formula: f(2) = f(1)* 2^(x/1200), where f(2) represents the sound frequency in Hertz, f(1) the frequency of the closest semitone, and x the number of cents (a unit of pitch based on the equal tempered scale) away from the closest semitone, to convert the recorded pitches to frequencies.

Results
Greater liquid volumes produce lower frequencies than goblets filled with less liquid. Oil produced higher frequencies than water, molasses lower than water, and the smaller goblet produced frequencies lower than the larger goblet. Results were very consistent and repeatable.

Conclusions/Discussion
My hypothesis that as more liquid is added the frequency gets lower was correct. The size and/or shape of the glass also influenced the pitch along with the liquid's density. Liquid volume had a greater effect on frequency than liquid density, however.

Summary Statement
Sound frequencies from glass goblets vary depending on the volume and type of liquid, and size and/or shape of the glass.

Help Received
My dad helped me make graphs and convert pitches to frequencies.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)	Project Number
Matthew G. Harbin	J1512

Project Title

Ott or Not

Abstract

Objectives/Goals

To determine which light bulb (150, 100, 75, 60, 40, 25 watt Incandescent, 13 and 27 watt Fluorescent or 13 watt Ott light) produces the most heat.

Methods/Materials

Materials used included 150,100,75,60,40 and 25 watt Incandescent bulb, 13 and 27 watt Fluorescent bulb and the 13 watt Ott light, a goose-neck lamp and an Ott desk lamp both angled at 44 degrees, a thermometer with Fahrenheit and Celsius readings, a non-metal 12 inch ruler, a digital timer, a notebook, a pencil, a white toweled surface to safely record measurements.

I began my project by placing a white towel on a flat surface and positioning the lamp at a 44 degree angle. Each bulb was individually tested twenty times beginning with the lowest wattage. I inserted each bulb into the lamp and using a ruler I measured 12 inches from the tip of the bulb to the mercury base of the thermometer. Each test took ten minutes (using a digital timer) and the results, both Fahrenheit and Celsius, were recorded in my notebook. The thermometer was placed into the freezer for five minutes prior to each test.

Results

My experiment indicates that the 150 watt Incandescent bulb was the hottest, the 13 watt Fluorescent bulb was the coolest and the 13 watt Ott light was between the 60 watt and 75 watt Incandescent bulbs.

Conclusions/Discussion

My hypothesis was that the 150 watt Incandescent bulb would be the hottest, the 13 watt Fluorescent bulb would be the coolest and the Ott light would be between the 100 watt and 150 watt Incandescent bulbs. My hypothesis was partially supported in that the 150 watt Incandescent bulb was the hottest and the 13 watt Fluorescent bulb was the coolest, however, the 13 watt Ott light was found to be between the 60 watt and 75 watt Incandescent bulbs.

If I were to do this project again, I would angle the lamp upward and somehow suspend the thermometer above it so that the heat from the bulb would flow directly to the thermometer and not build up in the lamp's head.

This project would be useful for people who want the maximum light with less heat, such as people who work in an environment with limited work space.

Summary Statement

My project is a comparison of the heat produced by the Incandescent, Fluorescent and Ott light bulbs.

Help Received

Grandmother helped to type report, Grandfather helped to gather supplies and Mother helped with layout of board display.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

A. Si-Si Hensley

Project Number

J1513

Project Title

Does the Rate of Heating Have an Affinity for Salinity?

Abstract

Objectives/Goals

The objective of my project was to determine how salinity and initial temperature affect the rate of heating and cooling of water.

Methods/Materials

To test this hypothesis, a measured amount of table or sea salt is added to 200ml of distilled water to reach a desired level of salinity. Then, heat is applied using a heat lamp to the water for 15 minutes and removed to cool the water for 15 minutes. An aquarium pump connected to an aerating stone is used to continually mix the water during the heating process to maintain a uniform temperature. A digital thermometer (Extech DTD) records the data every 5 seconds and is then transferred to a laptop computer and plotted onto a graph in Excel. The slope of the temperature versus time is computed using a linear least squares tool in Excel to provide my rate of heating or cooling. Four measurements are made and the standard deviation is used to estimate the error in the heating or cooling rate. Five salinity levels (0, 17.5, 35, 87.5, 175) parts per thousand corresponding to (0, 0.5, 1.0, 2.5, 5.0) times the normal sea salinity level (35 parts per thousand) were tested for both table salt and sea salt for an initial temperature of 20 C. Also, the heating rate was measured for three salinity levels, 0, 1.0, and 5.0 times the normal sea salinity, of both table and sea salt with an initial temperature of 4 C.

Results

After analyzing the measured heating/cooling rates, only a couple of the experiments showed a possible trend with salinity level. The experiments with the largest trend (least squares linear fit of the heating rate as a function of salinity) with salinity were the 20 C ocean salt heating and the 4C heating for table and sea salt. These trends were smaller than the error bars on the measurements and thus could not definitely establish a trend. The trend for heating that was observed with the 20 C sea salt heating and the 4 C heating was shown to be in rough agreement the heating rates predicted using a model for the predicted rate of temperature increase.

Conclusions/Discussion

My analysis indicated there maybe a heating rate increase with salinity in some cases. It was not possible to establish a definite trend of the heating or cooling rates with salinity because the error bars on the measurements were larger than the trends determined by linear least squares fits of the heating rates as a function of salinity.

Summary Statement

The objective of my project was to determine how salinity and initial temperature affect the rate of heating and cooling of water.

Help Received

Mother helped transferring data from Extech DTD to computer and formatting Excel plots, father helped understanding least squares and the density and heating equations.

Name(s)
Alec M. Howard

Project Number
J1514

Project Title
Buoyancy 101: The Effect of Water Temperature on the Bouyancy of a Floating Object

Abstract

Objectives/Goals
The objective was to determine whether a change in water density, as its temperature is raised from 5 degrees C to 95 degrees C, will cause a model boat hull to sink lower in the water to a measurable degree.

Methods/Materials
Ten identical styrene model boat hulls were each weighted with 128 grams of steel. Each was floated in water ranging from 5 degrees C to 95 degrees C. The temperature was increased by increments of 10 degrees from cold to hot. The distance from the waterline at the stern of each hull to its top edge was recorded at each temperature level, using ice to cool the water, and a gas flame to heat it on a stove top. A hot water heater drain pan was used to hold the water.

Results
The results were challenging to record, because the instability of the hulls while floating made the measuring process difficult, but from 5 degrees C to 95 degrees C the hulls showed a drop in the waterline of approximately 2 millimeters.

Conclusions/Discussion
Although each hull was only 33 cm long, it was possible to detect a minimal change in the water line in spite of the small scale, by elevating water temperature from almost freezing to almost boiling, a much greater temperature range than a real ship would ever experience. This demonstrated that increasing water temperature causes water molecules to spread further apart, in turn reducing upthrust, and allowing a floating object to displace more water as its buoyancy is reduced.

Summary Statement
A significant increase in water temperature will create a detectable change in the water line of even a small floating object as the water molecules spread apart due to increased temperature.

Help Received
My father helped me gather research material, and to record the results of the experiment. My teacher regularly reviewed my findings.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Edward Y. Hsi, II

Project Number

J1515

Project Title

The Invisible Force: Will Magnetic Levitation Help Reduce Friction?

Abstract

Objectives/Goals

The purpose of this project is to test if magnetic levitation would reduce friction and understand how magnetic forces can be applied to train technology.

Methods/Materials

A magnetic track laid with ceramic magnets and bordered by magnetic side rails, along with a conventional track, were placed on a board. For the maglev train, three neodymium magnets were glued to each side panel while the base had 16 neodymium magnets to provide it with enough repelling magnetic force to levitate on the track. A standard train was the control. The track was then tilted at three different heights and the trains were timed based on the seconds it took to reach the other end.

Results

The results of the trials at all three heights showed that the conventional train traveled faster and thus my results concluded my hypothesis was wrong as the conventional train had less friction.

Conclusions/Discussion

My hypothesis was proved wrong as the conventional train had less friction and traveled a lot faster. The magnetic levitation train might have gone faster if the magnetic strip was doubled. The use of a longer track might also have allowed the magnetic train to build more momentum and the use of a force to propel the trains might also have resulted in less friction on the magnetic levitation train.

In conclusion, magnetic levitation has practical application to today's technologically-advanced world as maglev trains glide above magnetically charged-tracks at high speeds and the trains have less wear and tear as there are no tracks to create the friction. The downside is whether these magnetic waves are harmful to people. This experiment allowed me to see the potential for maglev trains and its impact on the future of high-speed trains.

Summary Statement

The use of magnetic forces to levitate a train was compared to conventional trains to see if it could reduce friction and allow a maglev train to travel faster in an effort to improve train techonology.

Help Received

My mother took photos and helped time some of the trial runs. Home Depot personnel also gave tips and suggestions on assembly. My teacher, Kevin Soule, taught me how to set up the display board and the notebook.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Nathan M. Jessup

Project Number

J1516

Project Title

Don't Hesitate to Insulate

Abstract

Objectives/Goals

Different kinds of fabrics are being used today to create insulating clothing to protect humans from the elements of nature. Wool fibers has a long history of being one of the best fabrics for insulating. However, new technology has created new man made fabrics that are replacing the use of wool.

Methods/Materials

The insulating abilities of wool, and five other fabrics, cotton, linen, acrylic, polyester fleece, and vinyl were tested in this experiment. The hypothesis of this experiment was that wool would keep the water temperature the warmest, for the longest amount of time. Each of the six fabrics were wrapped around glass jars, and hot water was poured into the jar. At 30 minute intervals, the water in the six fabric covered jars were tested. At the 180 minute mark, the water in the wool covered jar and the water in the polyester fleece covered jar were the same temperature.

Results

The results of this experiment were expected and unexpected.

Conclusions/Discussion

Wool did prove to keep the heat from escaping the jar for a longer period of time, however the polyester fleece did just as well.

Summary Statement

The insulating abilities of wool, and five other fabrics were compared.

Help Received

Parents helped in proof reading and editing.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Kathryn M. Jones

Project Number
J1517

Project Title
Faraday's Law: Creating Electric Current with a Magnet

Abstract

Objectives/Goals
Faraday's Law states that an electric current can be generated by passing a magnet through a coil of wire. This experiment attempted to verify Faraday's Law by using a strong heavy duty magnet, varying the number of coil windings, and passing the magnet through the coils at different speeds to see the amount of electric current created.

Methods/Materials
Wind coils using 32 gauge wire (200 turns and 400 turns). Pass a stong magnet through each of the coils. Measure the amount of electricity generated by the magnet moving through the coils by using a galvanoscope. Repeat the procedure by moving the magnets through the coils at different speeds to see the difference in the current generated.

Results
Coil with more windings produced more current and the faster the magnet was passed through the coils the greater the current generated.

Conclusions/Discussion
By inserting or removing the magnet from the windings of coiled wire, electricity was produced as predicted by Faraday's Law.

Summary Statement
Electricity is generated by passing a magnet through coils of wire as predicted by Faraday's Law.

Help Received
Dad supervised the construction and experimentation.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Kai A. Kamehiro-Stockwell; Sean Sprague

Project Number

J1518

Project Title

Catching Rays: Passive Solar Energy

Abstract

Objectives/Goals

Our project objective is to determine which of 3 materials--rubber, aluminum, and copper--would be the optimum solar energy collector. We chose to do an experiment regarding solar energy because (based on current non-renewable resource consumption levels) coal, gas, and oil reserves are low and will disappear completely very soon. This will require the use of renewable energy sources, such as solar and wind energy.

Methods/Materials

We chose 3 common building materials and used these as our variables. We first went to hardware stores to obtain the materials for the collector (a shallow box with a removable, transparent lid). We also acquired Styrofoam to insulate the collector and a sensitive thermometer to record the temperature inside the collector and the ambient air. We then researched the conduction levels of each material and created a hypothesis. We believed that copper would be the most efficient collector of solar heat.

Our method entailed measuring the temperature inside the collector every 5 minutes for 30 minutes with 1 of the 3 materials inside. A complete cycle of the experiment was finished when all 3 variables were tested. We ran our experiment 4 times, each time noting weather conditions and time of day. Then we compared our data to our hypothesis.

Results

Our results were extremely varied. Aluminum had an overall high temperature, but copper was a better conductor. Copper got hot no matter what the weather conditions or time of day. Aluminum was unpredictable because it would only warm up with hot and sunny weather. Rubber collected a reasonable amount of heat and stored it for a long time.

Conclusions/Discussion

The results of our experiment only partly supported our hypothesis. Copper did not reach the highest temperature, but overall it was predictable and reliable. To improve our experimental design, we could use a more accurate thermometer with a larger range and 3 separate collectors. During our experiment, our accurate thermometer reached its upper limit, so we used a thermometer with a larger temperature range but with less accuracy. With 3 collectors, we could test all 3 materials at the same time and under the same conditions. With these modifications, our project would be more effective.

Summary Statement

The objective of our project is to determine which of three materials--rubber, aluminum, and copper--would be the optimum solar energy collector if placed in the sun in an insulated box.

Help Received

Parents provided transportation to obtain materials, helped assemble collector, and provided advice on our project. Math and science teachers helped us use spreadsheet program.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Tanner B. Kaptanoglu

Project Number

J1519

Project Title

How Temperature Affects Magnets

Abstract

Objectives/Goals

My objective in the project was to find out if temperature would affect magnetism.

Methods/Materials

My method to test my hypothesis was to place the magnets into 4 different temperatures. After we got the magnet in that temperature we placed it into a bowl full of paper clips. The amount of paper clips that came out determined the strength of the magnet.   Materials: 3 alnico magnets, 201 paper clips, low and high temperature thermometers, bowls, gripper, gloves, and Excel program.

Results

After testing the magnets in 4 different temperatures the resuts were when the temperatures were lower the magnets picked up more paper clips.

Conclusions/Discussion

I concluded that higher temperatures decreased magnetism, while lower temperatures increased magnetism. I also saw that there was little difference between temperatures from 100 degrees to 200 degrees because the amount of decreasing strength stops at some point.

Summary Statement

My project is about how temperature will affect magnetism.

Help Received

My dad helped in controlling dangerous items like boiling water and dry ice.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Nicole Kowtko

Project Number

J1520

Project Title

Can You Hear Me Now?

Abstract

Objectives/Goals

I want to determine the relationship between air pressure and sound. I hypothesize that as the air pressure decreases, the sound will decrease at a faster rate.

Methods/Materials

A ringing bell was placed inside a vacuum chamber, along with a digital sound level meter. For each test cycle, I increased the vacuum gauge 5 inches of mercury of vacuum at a time, from 0 to 25. (This decreased the air pressure in the vacuum chamber.) I recorded the inches of mercury of vacuum and the corresponding decibel number from the sound meter. After five tests, I reviewed and evaluated my data.

Results

For each of my tests, the decibels consistently decreased as the air pressure decreased. In particular, the decibels decreased in larger increments every time there was an increase of 5 inches of mercury of vacuum.

Conclusions/Discussion

Based on my test data, I have reached the conclusion that the decibels and inches of mercury of vacuum have an inverse relationship. You can also say that sound level decreases quickly with decreased air pressure. Either way, there is a logarithmic pattern. In other words, the decibels decrease at a rate that is exponential and not linear.

Summary Statement

My project is about identifying the relationship between air pressure and sound, by adjusting the air pressure in a vacuum chamber, while the sound remains constant.

Help Received

My mother helped me with Excel and gave me lots of support and advice. My science teacher helped review my work. My math teacher tried to figure out a pattern to my test results, and my two neighbors patiently taught me about the vacuum chamber.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Leslie J. Koyama

Project Number

J1521

Project Title

181.4°C in the Sun! Factors that Affect Solar Oven Efficiency

Abstract

Objectives/Goals

I investigated: 1.) How different insulations affect the temperature within a solar oven; 2.) How the cooking vessel to heat absorber plate contact affects the temperature in the cooking vessel. Based on literature research, my hypothesis was that worst to best oven insulation would be: air; shredded newspaper; shredded newspaper + Al foil baffle; shredded newspaper + Al foil baffle + Styrofoam. My hypothesis for the cooking vessel contact experiment was that the better the contact between the vessel and the heat absorber plate the higher the temperature in the vessel.

Methods/Materials

Four (4) identical solar ovens were constructed out of cardboard, and Al foil, with tempered glass used in the oven lids, and Al heat absorber plates. The insulation and cooking vessel experiments were first performed using a 250-watt heat lamp as the energy source. The insulation experiments were later repeated using the sun as the energy source (4 ovens at same time). Thermocouples were used to monitor the oven temperatures so accurate temperature versus time data could be gathered for plotting.

Results

The Insulation Experiment: The solar oven with no insulation (air) had the lowest efficiency, and the oven insulated with a combination of shredded newspaper + Al foil baffle + Styrofoam had the highest efficiency (181.4°C in the sun). The oven insulated with shredded newspaper alone had a higher efficiency than the oven insulated with a combination of shredded newspaper + Al foil baffle. The Cooking Vessel Contact Experiment: For all cooking vessel contact conditions, the temperature inside the vessel was about the same (2°C to 2.4°C higher than the absorber plate temperature). In addition, the rate of rise of temperature inside the vessels was the same for all conditions investigated.

Conclusions/Discussion

The Insulation Experiment: My hypothesis was correct that the oven with no insulation would have the lowest temperature, and the oven insulated with the combination of shredded newspaper + Al foil baffle + Styrofoam would achieve the highest temperature independent of the energy source. But my hypothesis that adding an Al foil baffle would increase the insulation efficiency of shredded newspaper was incorrect. The Cooking Vessel Contact Experiment: The experiment did not support my hypothesis that the better contact between the vessel and the heat absorber plate the higher the temperatures in the vessel.

Summary Statement

The main objectives of this experiment were to investigate how different solar oven insulations and cooking vessel contact affects solar oven efficiency.

Help Received

My Mom secured the thermocouples, thermocouple meter, and helped gather data. My Dad secured materials for building the ovens, supervised the building of the ovens, and assisted with data collection. My teacher, Ms. Robinson, for encouragement and suggestions for my board.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Nitish Lakhanpal

Project Number

J1522

Project Title

Tempest in a Teacup: An Experiment to Examine Post-Superheating Nucleation in Microwave Heating

Abstract

Objectives/Goals

The objective of this study is to explore microwave heating and to examine the factors that impact post-superheating nucleation, in which a sudden violent boiling event occurs when a liquid is heated past its boiling point. Specifically, is post-superheating nucleation affected by: (1) the shape of the container? (2) the presence of pores on its internal surface? (3) the presence of scratches on an otherwise glossy internal surface? and (4) dissolving solutes such as salt, sugar and coffee in the water? These questions formed the basis of this experiment's hypotheses.

Methods/Materials

Materials: Microwave oven; Tap water; Distilled water; Glass containers in 3 shapes - walls flaring upwards, straight walls, and walls flaring downwards; Non-glossy internal surface container with small pores (Styrofoam); Salt, sugar, and coffee; Insulated gloves.

Protocol to measure time to post-superheating nucleation:

Put 200 mL. of liquid into container and place in microwave oven. Heat for 7 minutes. Observe when boiling first occurs and record time elapsed from initiation of heating. Let heating continue until sudden nucleation and accompanying 'explosion' occurs and again record the elapsed time. Use insulated gloves to carefully remove container.

Repeat this protocol for each set of independent variables described in each hypothesis - different container shapes, container materials, container surfaces, and solutions.

Results

The container with upward flared walls had the highest time to post-superheating nucleation followed by the one with straight walls and the one with walls flaring downwards. The container with pores on the internal surface had no post-superheating nucleation; once normal nucleation began, it continued. The container with scratches on the internal surface had similar results. Finally, the salt solution too had no post-superheating nucleation, while the time to post-superheating nucleation for the sugar and coffee solutions was longer than that for plain water. Error bars of one standard deviation were used for analysis.

Conclusions/Discussion

The observations supported all 4 hypotheses. Post-superheating nucleation is impacted by the characteristics of the container - the shape and the internal surface - as well as the characteristics of the liquid being heated. Results from this experiment offer suggestions for better regulating post-superheating nucleation and avoiding its catastrophic effects.

Summary Statement

This project examined post-superheating nucleation in microwave heating. Specifically, I studied the effect of varying a container's characteristics, as well as those of the liquid being heated, on the time to post-superheating nucleation.

Help Received

Parents helped with transportation and with buying materials.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Christian Lopez-Juarez

Project Number

J1523

Project Title

Magnetic Force

Abstract

Objectives/Goals

My goal was to find out if temperature affects the strength of a magnet.

Methods/Materials

My Materials were a plastic bowl, standard #1 paper clips, containers to hold ice and dry ice, small pot for boiling water, thermometer, and 4 magnets. My methods were that first I got the pot and the plastic containers. Second, I put water into the pot, and ice and dry ice into the plastic containers. Next, I put the water to boil and started putting a magnet in each container and pot, i left one magnet in room temperature. After, I got a plastic bowl and put 200 paper clips in it. Then, after 10 minutes had past I took each magnet out from each obstacle and put each magnet in the plastic bowl(full of paper clips)for 2 seconds. Finally, I counted how many paper clips each magnet had for each trial. (4 trials)

Results

My results were that temperature does affect the strength of a magnet. It seems to be that the magnet in the boiling water was the most affected because it was the one that picked up less paper clips. While the magnet in the dry ice was the one who got the most.

Conclusions/Discussion

In conclusion, my hypothesis were proven right. Temperature does affect the strength of a magnet. In this experiment, the magnet that was in the boiling water was the most affected magnet out of all. It was the most affected because it got less paper clips than the others. Meanwhile, the magnet in the dry ice was the one who got the most paper clips, and it seems to be the magnet which got affected the least. It seems to me that the hotter the magnet, the less strength it has, while the colder the magnet the more stength it has.

Summary Statement

My project is about magnets, and trying to see if temperature affects their strength.

Help Received

Mother helped me organize the project.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Jason E. Ma

Project Number

J1524

Project Title

Light Reflection and Refraction off Liquids

Abstract

Objectives/Goals

The objective of the project is to determine what properties of mediums affect the light reflection, refraction and intensity off different liquids and in what quantity. Another goal is to learn and understand the concept of light physics.

Methods/Materials

The experimentation process of the testing was divided into two sections, light reflection and refraction. The two tests were both conducted in a controlled enviroment where the experimenter could work efficiently. Reflection testing was done with a setup of a tripod with the laser light, a table with the container of liquid and a wall with a measuring poster. The Refraction testing was done with the same setup except the measuring poster was underneath the container. This was the ideal setup since it is easier to conduct and to figure out the trigonomic functions needed in the experiment. The light was shined at a controlled 45degree angle for both tests onto the setup and then were tested with different liquds. The liquids were all common substances that would be found in many households. The light source that was used was a laser pointer that had a 630-680nm wavelength and the light meter that was used was a normal flash/light meter.

Results

The results of the experimentation came in two parts, one was the actual reflection and refraction of the light and the other was the properties that affected it. The light reflection testing results were constant because all of the liquids reflected the light at 45 degrees. The results for light refraction were different and were affected mainly by the viscosity property. Some of the results really puzzled the experimenter and made him dwell on what occured for quite some time.

Conclusions/Discussion

The properties color, opacity, and viscosity affected light reflection, refraction, and intensity by increasing or decreasing the angle of refraction and the intensity. The patterns in this experiment were that the reflection testing was constant and the properties had very little affect on it. Also in the refraction testing their were two main groups of results; watery liquids which averaged 1.7cm of refraction and oily liquids with an average of 2.2cm of refraction. The results prove the part correct hypothesis that the experimenter proposed in the beginning. Properties of different mediums do have an affect on light reflection and refraction.

Summary Statement

Determining what properties affect light reflection, refraction and intensity off of different liquids.

Help Received

Teacher helped with experimental problems and Dad helped explain math and helped out during testing

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Lauren R. Matich

Project Number

J1525

Project Title

Living Color

Abstract

Objectives/Goals

Hypothesis: White light, and additive colors all come from the primary colors red, green and blue. I will try to use the wavelengths of the primary colors to calculate the additive colors, as well as white light. I will make a machine to demonstrate my project with.

Methods/Materials

Materials

wood, reflectors, paint, dimmers, wiring, red/green/blue lights, timer, diffuser strip, nails and screws calculator, note pad, pencil, camera

Methods

1. Research was done, and materials purchased
2. Lights, dimmers, and wiring assembled into color machine
3. Tests were conducted while blending lights and photos taken
4. Container was tested by blending primary colors to create additive colors and to create white light. A diffuser strip was added for prism distinction
5. I applied wavelength numbers to the primary colors and tried to predict the additive colors by calculating averages of two primary colors that could be blended
6. I tried predicting the wavelength of white light by using a calculation of all three primary colors.
7. I tested my calculations in the machine.

Results

When I took the wavelengths of each of the primary colors in pairs, I was able to calculate the wavelength of the additive colors that the color machine would produce.

However, when I took the wavelengths of all three primary colors and tried to calculate white light, I was unable to find a mathematical formula that worked.

Conclusions/Discussion

I was able to use the wavelengths of primary colors and mathematics to calculate additive colors that come from blending primary colors. With my machine I was able to blend the primary colors to make the additive colors that I calculated.

I was also able to make white light in the machine. However, I was unable to use mathematics to calculate white light. In conclusion, my hypothesis was part correct in saying that white light and additive colors comes from the primary colors. It was incorrect in saying that white light could be calculated mathematically like the additive colors.

Summary Statement

My project is about understanding how color happens, and how white light happens.

Help Received

Dad helped me understand primary colors and Uncle Tom helped me build the machine

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Lindsay H. McHugh

Project Number

J1526

Project Title

Insulation Value: Straw vs. Modern Insulation Methods

Abstract

Objectives/Goals

The purpose of my project is to compare straw insulation to conventional insulation types that are commonly used today, which are fiberglass and solid foam sheets. My hypothesis is that straw will provide the best insulation of the types I am testing for heat retention and sound proofing, even though it does not seem possible. In order to test my hypothesis, I have designed two tests. Both of these tests required that I build four structures each identical in size and construction, with different types of insulation. I designed and built four identical stud frame structures with an internal volume of 2.73 cubic feet, one insulated with straw, one insulated with fiberglass, one insulated with solid foam, and one with no insulation to serve as a control structure.

Methods/Materials

Experimental Method: First, I tested which insulation is the most sound proof. I tested the sound insulation by testing to see how much sound can pass through the structure with each type of insulation. I put a speaker inside each structure playing a constant sound at 100 decibels. I measured the number of decibels that came through the wall to the outside of the structure. The insulation that let the least amount of sound pass through the walls provided the best sound insulation.

Second, I tested which insulation kept the indoor temperature warmest when it is cold outside. I tested the heat retention by testing to see how quickly the inside temperature of each structure cools down when exposed to outdoor temperatures. I warmed the structure inside and out until the inside temperature was between 68 and 70 degrees, by bringing them into my house. I then moved them outside and recorded the dropping temperature inside each structure over a 12 hour period. The insulation that drops temperature the slowest and drops the least amount of degrees is the best insulation for retaining heat.

Results

In the sound test straw was the most sound proof, allowing the lowest volume of sound to come through the walls. In the temperature test it retained heat the longest, it cooled down the slowest and it had the highest ending temperature.

Conclusions/Discussion

In the two tests that I conducted straw provided the best insulation for heat retention and sound proofing, of the types that I tested.

Summary Statement

The purpose of my project is to compare straw insulation to conventional insulation types that are commonly used today, which are fiberglass and solid foam sheets.

Help Received

Father guided the building process; Mother gave advice for display

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Soumyo M. Mitra

Project Number

J1527

Project Title

Sunderbans Estuary Simulated: The Effect of Salinity on the Height of a Floating Object Above the Water

Abstract

Objectives/Goals

This experiment was designed to see the change in the height of a floating body above water, as the level of salinity of water was changed.

On the basis of Archimedes principle, it was calculated that the amounts of salt added to the water and the lengths of the object above the water, if plotted on a graph, will fall on a straight line.

Methods/Materials

This was done by floating a cylindrical object in a glass of water and gradually adding salt to the water.

A large transparent cup of water, about 100 grams of common salt, a cylindrical cork commonly used in wine bottles, a rubber band, a teaspoon, a few coins, a ruler, and a ballpoint pen were used to perform the experiment.

Results

The measurement of added salt in the water and height of the object above the water were tabulated and a graph was drawn which more or less confirmed the hypothesis.

Conclusions/Discussion

From the result, it was verified that the height of a floating body is linearally related to the salinity of the water.

However, lack of precision in measurements and possibility of air bubbles being attached to the object could have introduced some errors because of which a few points did not exactly fall on a straight line in the graphs.

The results suggest that the drop in salinity of water when a boat laden with fish returns from the estuary into the river, may be a contributing factor for the accidental drowning of some of these boats. The fact that the variation in the height of the boat before and after the boat is loaded in the estuary is the same as that in freshwater, can be used to avoid accidents on this account.

Summary Statement

The variation in the height of a boat with varying salinity of estuary water was simulated by gradually increasing the salinity of the water in a beaker and observing the variation in the height of a floating cork.

Help Received

Dad helped finding material, printing photographs and guiding the mathematical deductions ; teacher, Mrs Begbie, helped me with encouragement and gudance.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Derick L. Olson

Project Number

J1528

Project Title

Are You Hot and Attractive or Cold and Repelling?

Abstract

Objectives/Goals

My goal for this project was to find out if the temperature of a magnet affected its magnetic pull. Also, I wanted to know in what ways and rates the magnetic pull would be affected by temperature change and how the rates would return to normal.

Methods/Materials

First, I heated or cooled each magnet to its appropriate temperature: -108*F, 32*F, 212*F, and 400*F, which were compared to my NORM temperature of 65*F. I tested each magnetic attraction by placing each magnet, with non-magnetic tongs, in a bowl of steel plated BB's. I immediately removed the magnet and BB's from the magnet and placed them (the BB's) in a seperate bowl. I repeated the procedure after one, five, and thirty minutes. Afterwards I counted the BB's and then weighed them in grams.

The main materials I used were: ten ceramic bar magnets, three thousand (two packages) of steal plated BB's, a triple beam balance scale, two slabs of dry ice, five porcelain bowls, a stove and glass pot, and towels to handle dry ice.

Results

The results of my experiments were as follows:

The colder the magnet became, the stronger its pull and the hotter it became the weaker its pull. When the cooled magnets were returning to room temperature, their magnetic pull would lower very rapidly for the first minute. After five minutes, the pull would lower more gradually. The magnetic pull continued at a gradual rate until it stopped falling after thirty minutes. The heated magnet's pull strength would rise in the same way as the cooled magnets pull strength fell when they were left out in room temperature (65*F). There was no permanent damage done to the magnets; they all returned to (within a few grams)their original strengths when returned to their original temperatures.

Conclusions/Discussion

I concluded that my hypothesis was correct, but there were some points that were off a bit. I hypothesized that there would be permanent damage done to the magnet heated to 400*F, but there wasn't.

Another experiment that I could do with my data is this: To determine what temperature the magnet is at by counting how many grams of BB's it picks up. I could use my data and find out that a magnet that picked up 271 grams is -108*F and that a manget that picked up 177 grams is 212*F. With that information i could make a formula to find that a magnet that picked up 236 BB's, would be about 40-50*F.

Summary Statement

How magnetic attraction is altered by temperature.

Help Received

Father edited Introduction which was too long. Teacher edited question and lowned triple beam balance to weigh BB's. Mother bought supplies.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Nathan R. Pederson

Project Number

J1529

Project Title

The Study of the Force Generated from a Changing Magnetic Field

Abstract

Objectives/Goals

The objective of this experiment was to measure the induced magnetic force due to a changing magnetic field (Lenzs Law) by dropping a strong magnet down conductive metal tubes.

Methods/Materials

Two different strength Neodymium-Iron-Boron (NIB) magnets were dropped down a 0.91 m length aluminum and copper tubes. As each magnet passed through a given portion of the metal tube, a changing magnetic field was set up that exerted a braking force on the falling magnets to slow them down. Thus, due to magnetic repulsion, the magnets fall much slower than a non-magnetic reference weight. Then Newtons Second Law (F = ma) was used to measure the magnetic braking force by connecting the NIB magnet with a string that was attached to a cart (with weights) that was pulled up an incline ramp (using a pulley) as the magnet was dropped down the aluminum tube.

Results

Measured freefall times of the large NIB magnet were 23.2 and 12.6 times longer than the reference weight for the copper and aluminum tubing due to Lenzs law. For copper tubing, the magnet takes the longest time to fall and it is a much better conductor than aluminum, therefore it generates a larger braking force. The NIB magnet force, mass of the cart, and its velocity were experimentally measured and found to be linear. The measured force of the larger NIB magnet ranged from 0.5 to 0.84 Newtons (weight of cart affected force), with the smaller NIB magnet varying from 0.15 to 0.29 Newtons for a 0.635 cm thick aluminum tube.

Conclusions/Discussion

The larger NIB magnet and the thicker copper tube took the longest time to fall due to a larger magnetic force generated to oppose the falling magnet. Changing from aluminum tubing (tw = 0.635 cm) to copper tubing (tw = 0.3 cm) for the large NIB magnet increases the measured magnetic breaking force for freefall from 0.94 to 1.8 Newtons, almost a factor of 2 for about half the tube wall thickness.

Summary Statement

When a NIB magnet is dropped down a conductive metal tube a changing magnetic field is established, causing a current to flow and an induced magnetic force created to oppose the magnet fall (Lenzs Law), which was experimentally measured.

Help Received

My dad helped me understand the basic laws and principles; helped build the experiment; also helped durring the experiment if I needed more than two hands.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Christopher J. Raguse

Project Number
J1530

Project Title
The Chill Factor

Abstract

Objectives/Goals
To prove that altering a typical magnet's temperature will affect its magnetic strength.

Methods/Materials
Using two refrigerator magnets, I will test to see if changing the magnet's temperature through different variables (room temperature, boiling hot temperature, and freezing temperatures), that the colder I get the magnet the stronger its magnetic field will be and therefore be able to pick up more Ball Bearings.

Results
Magnet A Steel BBs:
RT Test 1. 112BBs RT Test 2. 113BBs RT Test 3. 119BBs Avg 114 R2BBs
HT Test 1. 103BBs HT Test 2. 103BBs HT Test 3. 103BBs Avg 103BBs
FT Test 1. 130BBs FT Test 2. 124BBs FT Test 3. 123BBs Avg 125 R2BBs

Magnet A Copper BBs:
RT Test 1. 104BBs RT Test 2. 99BBs RT Test 3. 102BBs Avg 101 R2BBs
HT Test 1. 98BBs HT Test 2. 104BBs HT Test 3. 100BBs Avg 100 R2BBs
FT Test 1. 138BBs FT Test 2. 137BBs FT Test 3. 144BBs Avg 139 R2BBs

Magnet B Steel BBs:
RT Test 1. 112BBs RT Test 2. 117BBs RT Test 3. 112BBs Avg 113 R2BBs
HT Test 1. 92BBs HT Test 2. 103BBs HT Test 3. 99BBs Avg 98BBs
FT Test 1. 121BBs FT Test 2. 122BBs FT Test 3. 128BBs Avg 123 R2BBs

Magnet B Copper BBs:
RT Test 1. 103BBs RT Test 2. 102BBs RT Test 3. 100BBs Avg 101 R2BBs
HT Test 1. 92BBs HT Test 2. 89BBs HT Test 3. 94BBs Avg 91 R2BBs
FT Test 1. 124BBs FT Test 2. 119BBs FT Test 3. 117BBs Avg 120BBs

Conclusions/Discussion
Based on my results, I learned that changing a magnet's temperature does affect its magnetic field. The atoms within the magnetic field of the magnet moved slower and closer together allowing the magnet to pick up more Ball Bearings.

Summary Statement
My project is about magnets and the effect temperature change has on it.

Help Received
Father helped in making the graphs, and cutting out display board letters; Mother helped organize binder, and glueing of board.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Raven M. Rios

Project Number
J1531

Project Title
Hot Homes -- Cool Solutions

Abstract

Objectives/Goals
My objective is to determine if designing a different roof system helps with regular ventilation.

Methods/Materials
*Bolsa Wood *Hot Glue Gun
*Hobby Knife *Nails
*30 Glue Sticks *2 Candles
*Sand Paper *1 Electric Fan
*Battery *4 Brass Hinges
*Plexy Glass *Textured Paint

Results
My results was that the experimental house with the exhaust fan was cooler than the control house with the regular ventilation.

Conclusions/Discussion
By redesigning a house with an exhaust fan, the temperature cooled down faster. The pressure of the fan gave enough energy to send the hot air out faster.

Summary Statement
My project is about comparing the results of temperature of regular ventilation versus an installed exhaust fan in a roof

Help Received
Uncle helped build house, board, and complete papers;Mother helped with paper work: Father helped with installing fan:Janelle helped with board and materials.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Ryan A. Robie

Project Number

J1532

Project Title

Count on Calories

Abstract

Objectives/Goals

My project was to calculate the approximate food energy content in a peanut, an oyster cracker, and a mini-marshmallow and then compare my data with the actual Calorie count as listed on each foods nutrition facts label. The comparison of the experimental values with the label values will help me understand how the Calories in different types of food relate to the amount of energy one gets from those foods.

Methods/Materials

I used a simple homemade calorimetry system to measure the changes in the temperature of the water heated and I also measured the changes in the mass of each food burned. My materials consisted of the following: a cork, sewing needle, peanuts, oyster crackers, mini-marshmallows, water, pie tin, large tin can, small tin can, metal skewer, lighter, small digital scale, stopwatch, hemoststats, tweezers, thermometer, measuring cup, nutrition facts labels from the different food items burned, and a pencil and paper to record my observations. Three trials were made for each food item. My constants for all trials were the mass of the water and the initial temperature of the water.

Results

The peanut consistently had the longest combustion time and effected the greatest temperature increase in the water heated in the calorimeter. The mini-marshmallow was the most flammable, burned the fastest, and effected the smallest temperature change in the water. The oyster cracker was the most difficult to ignite, but when it did its time to complete combustion was more than twice as long as that of the mini-marshmallow, yet less than half the time of the peanut.

Conclusions/Discussion

Using the data from my experiment, I verified that the calculated food energy content of different types of food does closely approximate the Calorie count as listed on each foods nutrition fact label. A calorie is a unit of energy defined as the quantity of heat needed to raise the temperature of 1 gram of water 1 degree centigrade. Through the process of combustion the chemical energy in each food substance was released and converted into the heat energy that raised the temperature of the water. My results suggest that of the three food items burned, the peanut sustains the longest lasting energy. This confirms the Calorie count information as listed on the nutrition facts labels. The peanut provides the most Calories per gram of the three food items tested.

Summary Statement

I will quantify the energy available in three different foods and compare it to the food labels Calorie count.

Help Received

Dad supervised the construction of the simple calorimetry system.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Alexandra L. Simon

Project Number

J1533

Project Title

Density's Effect on Amplitude: The Untold Story

Abstract

Objectives/Goals

The objective is to test jars full of helium, air, and carbon dioxide, all different densities, to see if density affects the amplitude of buzzing in the jar. I believe the density of a medium does affect the amplitude of sound traveling through it. The amplitude of the buzzing in CO(2) will be greater than the buzzing in air, which will be greater than in helium because the more dense the medium, the faster sound travels. If sound travels quickly, it's carrying a large amount of energy. The greater amount of energy sound carries, the greater its amplitude.

Methods/Materials

3 half gallon jars and lids, 3 microphone transducers(16 VDC),more than .5 gallon of helium, 1 oscilloscope, 4 small chunks dry ice, 3 electrical buzzers(20 VAC)

Results

The sound wave of the buzzing was shown on the divisions of the oscilloscope screen. The crests and troughs of the wave in each division were recorded in mV. The average amplitude of buzzing in helium was 1.03125 mV. The average amplitude of buzzing in air was 1.25 mV. The average in CO(2) was 0.5125 mV. CO(2) has the lowest amplitude, helium has the middle amplitude, and air has the highest. The CO(2) was in the form of dry ice, so the jar got very cold. At -37°C it has a density of 1.1 grams per liter, but it was found on a website that at 25°C, the density of CO(2) is 1.527 grams per liter. CO(2) is in it#s most dense state from 0°C to 4°C when it is in the form of dry ice because it is a solid. It's believed that as the temperature of CO(2) increases, the density increases. Another reason why the amplitude of the buzzing in CO(2) was low is there was a small amount of frost on the buzzer. If the buzzer was so cold it had frost on it, the cold may have been restricting the buzzer#s oscillations. This would appear to be a low amplitude, when in fact the buzzer is not making as much noise because of the low temperature.

Conclusions/Discussion

The hypothesis was partially correct. It was found that while density does have an affect on the amplitude of sound traveling in a medium, temperature also has an affect on it. While the buzzing had a higher amplitude in air than helium, the buzzing in CO(2) had the lowest amplitude of the three. The buzzing in CO(2) may have been affected by a small bit of experimental error. Therefore, the density of a medium does affect the amplitude of sound traveling through it, but density can vary based on temperature, pressure, or altitude.

Summary Statement

To see if the density of a medium, in this case a gas, effects the amplitude of sound, in this case buzzing, in that medium.

Help Received

Mr. Raymond Hunter helped recommend and obtain many of the electrical devices in the experiment from Mouser Electronics, an electrical supply catalogue. Used the oscilloscope at St. Margaret's Episcopal School under the supervision of Mr. Joseph Ingalls.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Mark V. Skovorodko

Project Number

J1534

Project Title

A Noisy Gas: Testing Sound Decay in Different Gasses

Abstract

Objectives/Goals

Sound decay is a subject that has not been deeply probed by the scientific community. I would like to expand that knowledge in both myself and others, so with my experiment, I would like to explore the aspects of sound decay, and whether or not it varies directly with the density of the atmosphere it is being tested in. I would like to see a consistent half-life for sound for each trial tested in the same conditions, and a varying half-life in all the different tests, either descending or ascending consecutively.

Methods/Materials

I tested the sound decay of a 127 Hz tuning fork inside of a bell jar dome. The tuning fork was suspended from a stand on the inside, and the bell jar was tilted so the tuning fork would swing and hit a mallet adhered to the bell jar lid. The resulting sound was recorded by a microphone attached to a computer, using volts and seconds for units. The resulting #sound curve# would be analyzed and the half-life of the sound determined. 3 gases were used, each at different pressures. They were carbon dioxide, helium, and air (a mixture composed mainly of nitrogen and oxygen) and they were each tested at 10, 20, and 30 inches of mercury. An additional trial in vacuum was also tested.

Results

The results of this experiment proved to be very interesting.
Half-life when tested in air at 30 inches of mercury: 3.85 seconds
Half-life when tested in air at 20 inches of mercury: 7.15 seconds
Half-life when tested in air at 10 inches of mercury: 5.7 seconds
Half-life when tested in carbon dioxide at 30 inches of mercury: 1.2 seconds
Half-life when tested in carbon dioxide at 20 inches of mercury: 0.75 seconds
Half-life when tested in carbon dioxide at 10 inches of mercury: 0.9 seconds
These results were not ascending or descending consecutively, which led me to my conclusion.

Conclusions/Discussion

With my results, I concluded that sound decay does indeed vary directly to the density of the gas it is transmitted through, but that is not the only factor that affects sound#s half-life. This topic requires further research, involving more complex issues than density, such as the gas#s ability to resonate sound (especially when working with different pressures). The gases themselves appear to have ideal pressures: pressures in which sound is transmitted with the most ease. This theory, however, requires more in depth study.

Summary Statement

I tested the decay of sound emitted from a tuning fork to test the correlation between sound decay and density of the gas it is being tested in.

Help Received

I was greatly assisted in my experiment with the help and expertise of Professor Warren Rogers from Westmont College, whose excellent knowledge in the field of sound helped me set up and test my experiment. I also used equipment from the Westmont physics lab.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Jillian A. Stokes

Project Number

J1535

Project Title

The Solar Heating and Night Cooling of Surfaces

Abstract

Objectives/Goals

In this project I investigated the question of how various colored surfaces heat up in the sunlight during the day and how they cool under the open night sky.

Methods/Materials

In order to answer the question I set a number of the samples with different paints on them on a foam insulation pad on the ground outside. Then I let them heat in the sun during the day and cool under a night sky. I chose times when the weather was fairly clear. Then I measured the temperature at various times using a hand-held infrared thermometer. I kept track of the air temperature during the experiment. During the day I measured sun elevation because the angle that the sun hits the samples determines how much light energy they receive.

Results

In this experiment I found that the paint temperatures were at their highest point during midday and decreased as the sun angle decreased. At night the paints were all closely related in temperature, but the average temperature showed only a moderate change throughout the night. The paints were significantly hotter than the air during the day, and at night and in the late afternoon were actually cooler than the air.

Conclusions/Discussion

The color of a surface affects how much light it reflects. The light energy not reflected by a paint turns to heat energy and raises the temperature. Energy conservation can be accomplished in many different ways and paint color is one of them. This experiment may apply to transportation vehicles and selecting a color paint to help keep the vehicle at a suitable temperature. It may also be a valuable procedure in the construction of energy-efficient houses.

Summary Statement

I studied how color of paint affects the temperature of 16 metal squares in sunlight and under the night sky.

Help Received

Used infrared thermometer from Dad's work. He showed me how to do tables and graphs on the computer, and helped me collect data.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Lindsey K. Sweeney

Project Number

J1536

Project Title

Blackbody Thermal Emission

Abstract

Objectives/Goals

My project objective was to determine if color has any effect on thermal emission in an enclosed environment. It is common knowledge that black objects warm quicker than non-black objects. This experiment was developed to find out if black objects emit and thus cool at a greater rate.

Methods/Materials

Two aluminum blocks are used for the project because they have a large amount of mass and will cool slowly, making it easier to check the temperature. First, a standard has to be set, so both blocks are uncoated. Then, after the desired data is obtained, one of the blocks should be lightly painted with a flat black, durable to high heat, paint. Two environments, for these blocks to cool in, have to be constructed, in which conduction and convection are controlled. Radiation should be the only variable. Two wooden dowel structures and two cardboard boxes are used to control conduction and convection. The boxes must have closeable openings that are used for readings. Two mercury candy thermometers will be put in a hole drilled in each aluminum block. These should be checked every five minutes until the graphed line of the recorded temperatures becomes almost horizontal.

Results

After all data was analyzed, it was found that the black coated aluminum block cooled down faster than the non black block consistently throughout all three experiments, supporting the hypothesis. What was not expected was the difference in the rate of cooling between the two blocks. At some points in the cooling, the black aluminum block cooled twenty-five degrees or more than the other block.

Conclusions/Discussion

The results acquired from the experiment supported the hypothesis, but more than that, it showed that the effect of a nearly insignificant coat of flat black paint was the cause of a 25-degree Celsius difference, during the time of the greatest rate of change, between the two aluminum blocks. A Difference of 5 degrees Celsius would have been enough to conclude that the hypothesis was supported. This was five times that! The temperature drop due to the flat black paint was so much more than expected that I was certain that I would find it used everywhere that efficient cooling is required. It is apparent that this cooling effect is not common knowledge because while looking around for applications, barely any were found.

Summary Statement

This project was determining whether a heated blackened mass emits infrared radiation more efficiently than a heated non-blackened mass.

Help Received

My father helped me research information on my project, and helped me drill the holes in the aluminum blocks.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Josephine Welch

Project Number

J1537

Project Title

Long and Short Wavelength Colors: Will They Balance Out Interior and Exterior Temperature and Insulation Rate?

Abstract

Objectives/Goals

This project studied the interior and exterior temperatures of houses and their insulation rates given that the houses were painted with both solid colors (red, blue, green, orange) and combination colors (red/blue and green/orange). The colors were combined to test long wavelength colors in combination with short wavelength colors. The goal was to determine whether or not long and short wavelength combination colors would balance toward the middle in terms of averaging out temperatures and insulating rates of solid color counterparts.

Methods/Materials

Oil paints were used on foamboard houses. A control house was painted white. Digital and infrared thermometers were used to obtain temperatures.
Temperatures were taken throughout the day at set times.

Results

Data showed that the order of interior temperature readings from highest to lowest followed fairly closely the color wavelengths from longest to shortest. Combination color houses fell generally in between their solid counterparts. Exterior temperature data showed that the green/orange house was the warmest, followed by red, red/blue, green, blue, orange, and control. The highest insulation rate was obtained from the blue house, followed by green, green/orange, red/blue, red, orange, and control.

Conclusions/Discussion

Regarding interior temperatures, my hypothesis was proven with the red/blue combination house; interior and exterior temperatures were nearly at an exact average of the red and blue solid houses.
In the case of the green/orange house, data was not as consistent. Its interior temperature nearly matched the orange solid house, while its exterior was warmer than either of the two solids. I believe that in this case, the wavelength difference between the green/orange house was not as great as in the red/blue house. The further the wavelengths lie from each other, the better the averaging tendency.
Insulating rates were highest on the blue house. The rates increased as the wavelengths decreased. Importantly, combination house insulation rates maintained an average between that of their solid counterparts.

Summary Statement

This is a study on interior and exterior temperature and insulation rate differences among houses of combination wavelength colors.

Help Received

Teacher as facilitator.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Edwin W. Young

Project Number

J1538

Project Title

Tired of Noise? Here's a Solution!

Abstract

Objectives/Goals

The objective of my project is to find out the best sound absorbing pattern.

Methods/Materials

Insulative styrofoam was cut under the supervision of a parent, and tested by lining all four sides of a box. A tuner was placed on one side, a microphone on the other, and a towel was placed over the top. To test it, the microphone was connected to a computer, which was running the program Cool Edit Pro#. After each pattern was tested, they were switched for the next pattern.

Results

The rectangular and triangular patterns absorbed the most sound before reflection. The peaked surface proved to be the worst absorber.

Conclusions/Discussion

Sound pollution in large cities has become a problem since the early 20th century. Using such infrastructure in buildings near congested freeways, airports, and other areas could potentially reduce the number of people going deaf each day. At only 80 dB, the triangular and rectangular surfaces were able to absorb sound at a higher rate than a flat, peaked, or semi-circular pattern. These patterns for insulative materials should be heavily used near areas where loud noises are a commonplace.

Summary Statement

This project was to find out the best insulative pattern for urban development near noisy areas.

Help Received

Thanks to my teacher, Mr. Post, for his advice, and my music teacher, Mr. Boulton, for letting me borrow his equipment.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Lauren J. Young

Project Number

J1539

Project Title

Don't Wanna Have Cold Feet? Spare the Heat!

Abstract

Objectives/Goals

The objective of my experiment was to determine which type of insulation maintains the temperature of warm and cool water the longest.

Methods/Materials

Six identical jars were obtained, five were wrapped with different types of insulation and one was left unwrapped as a control. Water was heated to ninety-two degrees fahrenheit and added to each of the jars, the change in temperature was recorded every five minutes for forty-five minutes. This test was repeated three times. The same procedure was used with water cooled to forty degrees fahrenheit. This test was also repeated three times.

Results

The jar wrapped with the foam material held the temperature closest to the original starting point. The control without any insulation showed the greatest change in temperature.

Conclusions/Discussion

My conclusion was that of all the materials tested the foam worked as the best insulator for maintaining temperature for both warm and cold water.

Summary Statement

This project studied different insulation materials and their effect on warm and cold water.

Help Received

California Pretzel donated thermometers and different examples of insulation.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Bill Greenwald; Jordan Sayyah

Project Number

J1598

Project Title

May the Force Be With You

Abstract

Objectives/Goals

Our First Goal was to picture the shape of the field around an electromagnet.

Our Second Goal was to measure the strength of the force field near a pole of the electromagnet.

We hypothesized that modifying certain features of an electromagnet would affect the force field.

Methods/Materials

We tested the strength of the electromagnet by comparing the weight of a metal disk when the electromagnet was on or off. We tested these features: distance from the disk, magnet core, number of coils of wire, and amount of current (I).

We graphed the disk's change of weight in these experiments to see if any mathematical rules applied.

Results

An electromagnet generates greater force with: more current (I), more coils, a closer distance, and a ferromagnetic core.

Conclusions/Discussion

Our initial hypothesis was qualitatively correct but quantitatively incorrect. We found this by graphing the results of our experiments. For example: when you have three times the current the force triples, but if you get three times as close, the force is nine times as great.

By understanding the physics of electromagnets, one can predict how an electromagnet will work. By understanding how electromagnets work you can use them to create new inventions in today's technology.

Summary Statement

The goal of our project was to derive the mathematical equation for the magnetic field at the pole of an electromagnet.

Help Received

Bill's dad helped type part of the report, helped with set up for the experiments, and also helped us conduct the experiments.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Ernesto Botello

Project Number

J1599

Project Title

The Gauss Rifle

Abstract

Objectives/Goals

I continued in this project because I felt that I had more to learn in this subject and that my project had not yet been able to reach to its full potential. In my research, I discovered the many laws that when using magnetic acceleration you are altering the forces that are attracting one magnet to an object. The reversal is used in switching plates and gears in most machines because the heavy equipment can only be moved using a powerful enough shift of energy to move the gears in action so that the mechanic within the machine are kept moving. I also learned about how transportation vehicles are going to the next level with GPS inside.

Methods/Materials

The materials I used in my project were two wooden meter sticks, tape, five neodymium rare earth magnets (cube in shape 1 ½ cm x 1 ½ cm), eleven nickel plated steel bell bearings around the same height as the magnets or larger, a sharp pair of scissors, and a wooden board. The procedures I took were to attach the five magnets to the wooden rulers with the tape about twelve centimeters apart from each other. Tape the rulers so the magnets do not become attracted to themselves easily. To the right of each magnet, I placed two steel ball bearings. I fired the device by setting the eleventh ball bearing in front of the leftmost magnet and the energy would pass through the magnets launching the ball at a very high speed, so fast your eyes can#t even see it.

Results

When angled in an uppward position the speed gradually decreased because the force of gravity was acting against it. When angled in a downward position the speed increased gradually as the force of gravity added on to the acceleration form the device. Since I used two sizes of ball bearings the speed also changed when I changed the sizes or combined them.

Conclusions/Discussion

In conclusion I found that when angling the device in an upward position the device went slower because of the force of gravity which I did not take into consideration was going to act against it. I also found that when you angle the device in a downward position the force of gravity acts with the decice which makes the device go faster. When using the larger sizes balls the device goes slower because of the mass. When using the smaller balls the device goes faster and is because of less mass.

Summary Statement

My project is simply a device that launches steel ball bearings at very high speeds with neodymium magnets.

Help Received

None