Name(s)
Abdulla Alexander

Project Number
J1301

Project Title
Dead Zone

Abstract

Objectives/Goals
My project explores what substances affect cell phone signals the most. It also considers which cell phone carriers can resist different substances better than others

Methods/Materials
The first thing that I did was get all the substances that I was going to test and three different phones, each with a different carriers: Verizon, T-mobile, and AT&T. I bought bricks, drywall, plywood, and solid wood. I made a miniature house out of all of these substances and put all three cell phones inside them one at a time. After I finished testing everything, I got all three cell phones and put them extremely close to a microwave to test electrical interference. I recorded all of these things in my notebook and then added them into Microsoft Excel to make a table.

Results
In the findings of this experiment, the substances that affected Verizon#s bars the most were bricks. For AT&T it was the electricity that affected the number of bars the most. The substance that affected the reception the most for T-mobile was also electricity.

Conclusions/Discussion
In conclusion, the substances that affected the signals most were the bricks, and electricity. This was the case for all three carriers that I tested#Verizon,
T-mobile, and AT&T. Drywall caused the next level of interference. Following that, came the solid wood and plywood. In general, AT&T had the strongest reception with all of the barriers.

Summary Statement
My project is to determine what substances disturb cell phone reception the most.

Help Received
My Mentor, Ms. Najwan Naserelddin,

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Maryam S. Amin

Project Number
J1302

Project Title
Super Sound Killer

Abstract

Objectives/Goals
The purpose of this project is to help people insulate sound and reduce noises affecting their neighbors. Many people in the world have experienced annoying loud noises, which interfere with daily activities such as studying and sleeping. I wanted to show people that there is a way to reduce and control the noise in their environment using available household materials for sound insulation. At the same time, I wanted to find which material was the best at insulating sound. I believe the findings of my study will help people design buildings where sound reduction is needed, including libraries and hospitals.

Methods/Materials
In my experiment I used many materials including fiberglass, foam, pinewood, plywood, drywall, and bubble wrap. I took two 1 inch PVC pipes and put insulators between them (I made sure all the insulators were the same thickness). I tested each material 4 times and made sure the room decibel level was 50 dBs at all times. Then I generated 3 different frequencies from one cell phone. I recorded the highest, yet most stable decibel reading from the other phones, using a frequency generator and decibel meter application on an android phone.

Results
Based on my findings, foam was the best insulator throughout all the trials. In the trials with the frequency level at 440 Hz, the average for foam was 51.75 dB. Fiberglass's average was also 51.75 dB. For the 990 Hz trials, foam was the best insulator, giving an average of 53.25 dB. Fiberglass was way off, averaging at 59.75 dB. In the 1031 Hz trials, foam's average was 58.75 dB. Fiberglass's average was a whopping 88 dB. Foam definitely beat Fiberglass by a wide margin and beat the rest of the insulators.

Conclusions/Discussion
I thought the fibers would be able to absorb most of the sound. My hypothesis was completely wrong. I was surprised that the foam beat the fiberglass. The foam, followed by pinewood, beat the fiberglass by a wide margin. I had not anticipated the foam to come as the better insulator nor had I anticipated that the fiberglass would be such a poor insulator. I also had not expected that the pinewood would be a good insulator. I assumed that since it was like wood, it would not be able to reduce the sound. I was completely wrong; fiberglass is one of the worst insulators based on my findings.

Summary Statement
The purpose of this project is to help people insulate loud sounds using inexpensively available household materials.

Help Received
Teacher helped conduct experiment. Sister helped arrange board.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Liana M. Caroccio

Project Number

J1303

Project Title

A Blast of Color

Abstract

Objectives/Goals

My hypothesis stated that by changing the air pressure of a high performance paint gun will it make the color of paint change lighter or darker? To test this hypothesis I followed a long procedure. The first steps were of course to make the specific color paint I had picked out.

Methods/Materials

After a series of mixing different ingredients to make the paint it is then strained into a cup that will be attached to the appropriate spray gun. Meanwhile in the paint booth, there are two manual stands with the spray out cards attached to them. These stands give us the ability to measure your spray distance from the test panel. This is how I didn't get any type of variance of distance. The test panels are then sprayed with a slow right to left motion, giving the same equal layer of paint on the panel. Ten minutes drying time was given to each test panel which is sufficiant in a heated downdraft paint booth. The next morning I measured the RGB in the paint with a colorimeter and gathered the data for results.

Results

The primary colors and overall appearance of the color to the eye changed with differant levels of the air pressure.

Conclusions/Discussion

Proven by reaseach and data the more pressure added the lighter the color. Proven my hypothesis incorrect.

Summary Statement

My project was to see if adding air pressure to paint would effect the change in color.

Help Received

My father supervised all my hands on processes with preparation of paint, workstation, and equiptment. He also supported the cost of the project.

Name(s)

Matthew Cho

Project Number

J1304

Project Title

A Study of a Graphite Line's Electrical Conductivity

Abstract

Objectives/Goals

My goal is to see if graphite lines on paper conduct electricity. Also, if it does, how do the length, height (the number of times you draw over the line), and the grades of graphite affect the conductivity? My hypothesis is that the graphite lines on paper will conduct electricity and the length, height, and the grade of graphite line will affect the conductivity.

Methods/Materials

In this experiment, I used a HB, 4H, 2H, 2B, 4B pencil, piano, musical tuner, cardboard paper, ruler, and a Drawdio Kit.

1) Make the Drawdio Kit(a toy that makes different sounds based on electrical conductivity) . 2)Make the Note Grading scale: On a piano keyboard picture, give a point to each key on the piano from the lowest to highest sound. 3) Length Test: Draw an 11 cm line and mark the 3cm, 6cm, and 9cm points. Listen to the sound each point makes using the Drawdio Kit. Find the notes of these 3 marks using the piano and tuner. Give scores for each note a line makes. 4) Height Test: Draw three 6cm lines that have been drawn over 5 times, 15 times and 30 times each. Listen to the sound each line makes and find the notes for all the lines. Give scores for each note a line makes. 5)Pencil Grade Test: Draw 7 cm lines for each pencil grade with the 4H, 2H, HB, 2B, and 4B pencils. Listen to the sound each line makes and find the notes for all the lines. Give a score for each note a line makes.

Results

The graphite lines on the paper conducted electricity and made sounds when I used the Drawdio Kit. In the length tests, the shortest line had the highest points. In the height tests, the line with the highest height had the highest points. In the grades of graphite tests, the lines made with softer and bolder graphite had higher points.

Conclusions/Discussion

The graphite lines on paper conduct electricity. Also, the length, height, and the grade of the graphite line affect the conductivity. The length tests show that the shorter the line was, the better the conductivity was. I believe this was due to the larger amount of resistance encountered over a longer distance. In the height test, the higher the height was, the better the conductivity was.I believe this is because of the small particles that come off from the pencil are more condensed when a line has a high height. In the grades of graphite tests, the higher the softness and boldness was, the better the conductivity was. This is probably because the graphite does not mark easily if the pencil is hard but if it is soft and bold, the graphite will mark easily and provide a stronger connection.

Summary Statement

Does the length, height, and the grade of graphite affect the electrical conductivity of a graphite line?

Help Received

Father helped me assemble the PCB.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Catherine M. Colella

Project Number
J1305

Project Title
Got Thermal Conductivity?

Abstract

Objectives/Goals
My objective is to explore how some common metals of different thermal conductivities can be used to achieve good thermal management in various applications.

Methods/Materials
I selected copper wires gauges 4, 8, 12 and gauge 18 aluminum, copper, and steel wires. I applied one end of each meter long wire to my heat source to get steady one-dimensional heat conduction. I then measured the temperatures at various distances along the wires' heat paths leading down the wires and to the atmosphere.

Results
Copper exhibited the best heat conduction followed by aluminum and steel. At about 200 mm to 400 mm from the heat source all the temperatures for all the wires remained relatively constant near room temperature. This occurred despite that the thermal conductivity of copper is twice the thermal conductivity of aluminum and 25 times the thermal conductivity of steel. This also occurred despite testing the same material, copper, but with different gauges.

Conclusions/Discussion
Some of the variables that are prominent in heat sinks or cooling devices are their material, surface area, and arrangement. High thermal conductivity is one of the characteristics that make heat sinks efficient. The surface area of the material is also important in cooling electronics. Therefore, I think how a material's surface area, size, shape and thermal conductivity are combined in various ways can be used to help build heat sinks that run more efficiently to achieve good thermal management in electronics

Summary Statement
In my experiment I compared heat flow in wires made of different metals and in different gauges to explore how metals can be used to achieve good thermal management in various electronic applications.

Help Received
I borrowed equipment from a lab and took it home, my parents drove me to various stores to get wires, my dad showed me how to enter data in Excel and make a graph, my science teacher read and commented on my data analysis, and I got useful critiques from Placer County STEM Expo judges including Matt

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Lilly Congo; Madeleine Fontenay

Project Number

J1306

Project Title

Which Insulation Material Will Best Regulate Water Temperature?

Abstract

Objectives/Goals

Our objective was to determine which insulation material regulated water bottle temperature the best. Our hypothesis was that the insulation materials with the least of air pockets would be the best insulator. We believed this because the air pockets would change the water temperature, and without air pockets the water wouldn#t be able to come in contact with the air and drastically change the temperature.

Methods/Materials

We filled six plastic tubs with six insulation materials. These materials included, water, sand, wool, cotton balls, and aluminum foil, and control (air). We then filled six water bottles with cold water at 3º C. We placed the water bottles in the tubs, and after thirty minutes we took the water#s temperature. After another thirty minutes we took the temperature again. Then we repeated that procedure with hot water, heated to 50º C. We repeated this whole procedure two times before we analyzed the data and came up with our conclusion.

Results

On average wool insulated cold water (initial temperature 3ºC) the most effectively, with cotton coming in a close second. After 60 minutes wool insulated water was 7.4º Celsius and cotton was 7.45º C.

For our hot water (initial temperature 50ºC) averages after sixty minutes, cotton worked the best as an insulation at 46.7º C., and wool was 0.6º cooler than cotton after 60 minutes.

The worst insulator for cold water on average was room temperature water. Its water sample temperature had risen to 14.35ºC.

For hot water, the worst insulator was room temperature water again. Its water sample had dropped to 23.05º C. after 60 minutes.

In order from best to worst for our cold water experiment, the insulators were wool, cotton, control(air), aluminum foil, sand, and water.

For hot water, best to worst was cotton, wool, aluminum foil, control, sand, and water.

Conclusions/Discussion

The best two insulators were wool and cotton. The worst were sand and room temperature water. The opposite of our hypothesis was true: The more air-pockets there were, the better they insulated. We think that the temperature of the sample water heated or cooled the air in the insulation material, and the air retained that temperature longer than others because it was isolated from the outside air that would have changed the temperature.

Summary Statement

Our project is about which materials will keep the water bottle water temperature the closest to the beginning temperature.

Help Received

Father helped buy the materials.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Sydney E. Haupt

Project Number

J1307

Project Title

Can Common Materials Increase the Breaking Point of Ceramics?

Abstract

Objectives/Goals

The purpose of my project was to determine if common materials could strengthen ceramics.

Methods/Materials

Five sample tiles were prepared for each of the following additive ingredients: glass, grog, aluminum mesh, and steel wool. A batch of plain clay was prepared and split into five equal samples. The test materials were prepared and were equal to 10% of the weight of the clay samples. The test materials were then individually mixed in with their portion of the clay. Five control samples were also prepared from the same batch of clay without any additives. The samples were then all fired in a kiln. An apparatus was created to measure the breaking point of each tile. In turn, each tile was placed on the apparatus and then weight was applied to the center of the tile in measured amounts until the tile fractured.

Results

The controlled samples held the most weight, followed by steel wool, glass, aluminum mesh, and finally grog.

Conclusions/Discussion

My conclusion is that as prepared, these materials could not strengthen ceramics. The test materials' size and way they mixed with the clay tended to introduce weak areas in the samples where the materials clumped together. If I were to do this project again, I would use smaller particles of the added materials and mix them more consistently.

Summary Statement

Can common materials be added to ceramics to increase its breaking point due to bending.

Help Received

Mother helped type and edit report, Mr Scott helped with editing, Father helped move heavy weights, use kiln and safely prepare sharp materials.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Oliver N. Hill

Project Number

J1308

Project Title

Surface Tension: When Does It Break?

Abstract

Objectives/Goals

My objective was to test if temperature and dissolved molecules will have an effect on breaking the surface tension of water. I believe the lower the temperature of the water, the higher the surface tension will be. I believe that baking soda will increase the surface tension and powdered detergent will lower the surface tension.

Methods/Materials

My objective was to test if temperature and dissolved molecules will have an effect on breaking the surface tension of water. I believe the lower the temperature of the water, the higher the surface tension will be. I believe that baking soda will increase the surface tension and powdered detergent will lower the surface tension.

Results

All of the 50 degree water experiments had higher surface tensions than the 100 and 150 degree water experiments. My highest average result was 13.393 grams to break the surface tension with 50 degree water and no dissolved molecules. My lowest average result was 4.906 grams to break the surface tension with 100 degree water and powdered detergent.

Conclusions/Discussion

I learned that if you put sugar, salt, powdered detergent or baking soda in water, the surface tension will be lower. If you have a lower temperature of water, the surface tension will be higher.

Summary Statement

My project tests the effects of temperature and dissolved molecules on breaking the surface tension of water.

Help Received

Mom helped with research and grammar.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Zack B. Hirschhorn

Project Number

J1309

Project Title

The Most Force Absorbent Material

Abstract

Objectives/Goals

The objective of this project was to compare four materials (as well as no material) and determine which one absorbs the most force.

Methods/Materials

The materials used were one box of play-dough, two books (9.75 inches by 11.25 inches by 1 inch each), a viscoelastic material (pillow), a pillow made of polyester fiber, a pillowcase full of styrofoam peanuts, newspaper, a roll of bubble wrap, and a ruler. After all the materials were collected, the play-dough was molded into a rectangular prism (5 cm tall). The play-dough was then placed on a book on the floor, with no material protecting the play-dough. Another book was dropped on to the play-dough from six feet above. The height of the now-compressed play-dough was measured. These steps were then repeated using the different materials to protect the play-dough: bubble wrap, newspaper, a polyester fiber pillow, and a viscoelastic material (pillow). Each material (as well as no material) was tested four times.

Results

The average height and standard deviation (s) of the clay when protected by each material was as follows. No material: 1.68 cm (s = 0.37 cm), newspaper: 2.59 cm (s = 0.27 cm), bubble wrap: 3.05 cm (s = 0.2 cm), polyester fiber (pillow): 3.61 cm (s = 0.5 cm), viscoelastic material (pillow): 4.19 cm (s = 0.08 cm), and styrofoam peanuts: 4.28 cm (s = 0.08 cm).

Conclusions/Discussion

The styrofoam peanuts absorbed the most force, with the clay being an average height of 4.28 centimeters when protected by it. The viscoelastic material absorbed the second most force, with the clay being an average height of 4.19 centimeters when protected by it. Newspaper absorbed the least force with the clay being an average height of 2.59 centimeters when protected by it. The hypothesis was that the viscoelastic material would absorb the most force. The hypothesis was proven incorrect.

Summary Statement

This project tries to find the packaging material that absorbs the most force.

Help Received

Mr. Hartung helped me revise my report. My father helped to come up with the project idea. .

Name(s)
Sebastian Larson Moreno

Project Number
J1310

Project Title
Quick Stop: Shear Thickening Properties of Oobleck

Abstract

Objectives/Goals
The purpose of this experiment was to test how the concentration of cornstarch and water, Oobleck affects its shear thickening properties. It was hypothesized that a 75% solution would prevent the penetration of a standard hammer head.

Methods/Materials
The hypothesis was tested using a constant force projectile, a "Hammer-Tron", impacting various concentrations of Oobleck, using various projectile heads. One cup samples were made between 0%-100% concentrations of cornstarch, Samples were tested multiple times at constant force and angle of impact. Preliminary results prompted additional focus samples at concentrations between 68%-74%.

Results
Testing results showed that as the concentration of cornstarch increased, projectile penetration decreased. The original hypothesis was disproved. At 68% concentration, shear thickening properties were limiting penetration. At 72%, there was no penetration by the hammer. The multiple impact heads changed the pressure but not the impact force, giving more visibility to the Oobleck's shear thickening properties.

Conclusions/Discussion
The results showed that as the concentration of cornstarch increased, projectile penetration decreased, with no penetration recorded 72%. Some of the challenges of Oobleck solutions are keeping the cornstarch suspended in solution as it falls out of solution easily (colloidal suspension). Future studies may be improved by the addition of an emulsifier. This would also require viscosity testing to measure effect of emulsifier addition. Shear thickening properties are rare, so studying Oobleck and it's properties may lead to improvements in technology. It is the ability of this fluid to respond proportionally to shear forces which could make it a good design option for safety applications. Possible applications may include power transmission media, military impact protection gear, vehicle safety equipment and/or breaking fluid.

Summary Statement
The purpose of this experiment was to determine at what concentration of cornstarch, Oobleck's shear thickening properties would stop the penetration of a hammer.

Help Received
My mother helped assemble board, some typing and proof-reading report. My father helped with the photography and experiment materials. They both helping me practice being judged.

Name(s)

David A. Linton

Project Number

J1311

Project Title

Combust This: Can Wood Preservatives Increase the Effectiveness of Fire Retardants?

Abstract

Objectives/Goals

To see if wood preservatives can increase the effectiveness of a fire retardant and to find an improved fire retardant.

Methods/Materials

110 pieces of wood, a two burner camping stove, 2 ring stands, a postal scale, paint, and wire. The chemicals compared were borax and copper sulfate (aqueous solutions). The wood pieces were soaked or painted using these solutions. A wire hanger that hung the wood pieces above the burner was crafted. It was found that the insides of the burners produced a more powerful flame. The pieces of wood were burned at 4 one minute increments. The weight of each wood piece was measured before and after burning.

Results

Experiment 2 tested wood soaked in the solutions. Piece A was untreated wood, piece B was wood soaked in borax, piece C was wood soaked in copper sulfate, and piece D was wood soaked in borax and copper sulfate. In this experiment, piece D had the best results, loosing an average of 1 gram. Experiment 3 tested wood dipped in paint mixed with the chemical solutions. Piece A was dipped in only white exterior paint, piece B was dipped in paint mixed with borax, piece C was dipped in paint mixed with copper sulfate, and piece D was dipped in paint mixed with borax and copper sulfate. Piece C showed the best results in experiment 3, losing an average of 1 gram. Experiment 4 compared the winners of experiment 2 and 3 to barricade gel (commercial fire retardant). Piece A was untreated wood, piece B was wood soaked in a mixture of borax and copper sulfate. Piece C was wood dipped in paint mixed with copper sulfate, and piece D was wood coated in barricade gel fire retardant. Barricade gel showed the best results with losing an average of 0 grams.

Conclusions/Discussion

The experimental hypothesis stated that the combination of borax as a fire retardant and copper sulfate as a wood preservative in both the soaked wood and paint will provide 2 times more resistance than if either chemical is used alone. The experimental results proved the hypothesis when comparing the test articles using soaked wood, because the mixture provided roughly 2 times greater fire resistance than the other test articles, as stated in the hypothesis. In experiment 4, wood soaked in the 1:1 mixture of borax and copper sulfate protected the wood approximately 10 times better than the negative control, untreated wood, and 7 times better than the wood painted with the copper sulfate solution.

Summary Statement

This project compared the fire resistant characteristics of borax and copper sulfate when applied to wood either by soaking or by adding it to paint.

Help Received

Mr. Craig McIntyre gave the idea to use these chemicals. My Parents drove to get materials, proof read my work, and assisted me through experimentation. My science teacher guided me through science fair.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Jett D. Liu

Project Number

J1312

Project Title

Investigating the Properties of Iridescence and Structural Color

Abstract

Objectives/Goals

Iridescence occurs in many natural objects that have "thin film", which create effects of shimmering color not through the use of pigment, but through refraction of light in the thin molecular layers at the object's surface. This phenomenon is called "structural color". Although they produce a similar iridescence, there are significant differences in the structure of the natural thin films and artificial diffraction surfaces. I wanted to explore the different properties of thin films and artificial diffractions, regarding the surface of the object, and the angle of reflection.

Methods/Materials

I performed multiple tests on a variety of iridescent objects. I tested iridescent minerals such as feathers, shells and insects. I used a rotating apparatus to measure the angle at which the iridescence is visible and at what angle the color of the object changes. I also tested several diffraction gratings by reflecting the laser off the surface of the grating. I measured the distance between the dots that were projected by the diffraction grating, following the grating equation (m)lambda=Dsin(theta), I was able to calculate the number of ridges or grooves on the diffraction grating, as well as establish that the angle of reflection was related to the incident wavelength and the grating spacing.

Results

There was a significant difference in the way that iridescence is viewed between the natural and artificial thin film. Artificial objects change color approximately every three degrees. Iridescence is visible no matter what the angle of light is. Natural thin films have a range at which the iridescence can be viewed.

Conclusions/Discussion

I was also able to calculate the number of ridges in a diffraction grating using the grating equation: M(lambda)=Dsin(theta). The number of ridges came to an average of two thousand eight hundred ridges per centimeter. I was unable to use the laser to test the natural thin films, because the structure of the thin film is so complex that the light waves bounce in random directions, forming a speckled pattern of interference.

Summary Statement

I tested the difference between artificial diffractions and thin film refractions, regarding the angle of iridescence and the way light interacts with the geometric surface.

Help Received

I used lab equipment at the University of California San Diego under the supervision of Dr. Radic.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Alyssa R. LoGalbo

Project Number

J1313

Project Title

Does the Density of Drywall Correlate to Its Radiation Shielding Potential?

Abstract

Objectives/Goals

There are many different types of drywall that are used all around an average, well made home. I want to find out if there is a correlation between the density of the drywall and its radiation shielding potential so I will know if one should use denser drywall to build walls that protect from radiation.

Methods/Materials

Calibrate the survey meter. Measure and weigh various samples of drywall, calculate density. Put the radiation source(Tecnicium 99-m) into one end of a caliper and the Scillination probe of the survey meter in the other. Record the change in attenuation in CPM (counts per minute) with and without the drywall for each sample and type of drywall. Calculate the transmission ratio factor, percent of change and HVL (Half Value Layer) for each sample. Compare and analyze the results.

Results

As the density of drywall increases, the half value layer (HVL) gets smaller. There is a negative correlation of .70; density and HVL move in opposite directions. When density goes up up, HVL goes down. This indicates that denser drywall is more effective in protecting from gamma radiation.

Conclusions/Discussion

When building a wall with the intention of shielding radiation, use drywall with the highest density - it will most likely yield the best results. From the types studied in this investigation, the drywall with concrete board would be the most effective type of material to use when shielding radiation.

Summary Statement

This project determined that there is a correlation between drywall density and its ability to protect us from gamma radiation.

Help Received

Acquired and used radiation source under supervision of Dr. LoGalbo, Mother helped set up board, Home Depot provided drywall samples.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Mary N. Maillard

Project Number

J1314

Project Title

The Best Way to Beat Heat

Abstract

Objectives/Goals

My objective was to learn which type of construction material, among iron, wood, clay, glass and rigid foam, prevents heat transfer from the outside to the inside of the building.

Methods/Materials

Materials used were: Iron/ metal, Wood, Clay, Glass, Rigid foam, Fiber glass bat, Thermometer, Timer, Heater, Insulated box built by myself. To be able to test each material, I built a large box of wood insulated with expanding spray foam from a smaller box placed inside. One side of the two boxes remain open.

1. I place a thermometer in the small box and turn the box on its side so that it faces the heater. 2. I place a piece of fiber glass bat with a hole cut in the middle in the front of the smaller box to guarantee a constant insulation for each material that will be tested. 3. I grab a time and remote display.

4. I track a starting degree for my control. 5. At the same time, I start the heater at 1500 watts and the starter set for five minutes. 6. When the timer rings, I track the temperature and reset the timer for another five minutes.

7. I would repeat step 5 until I reach 30 minutes. 8. When I have tracked the last temperature, I stop the heater and place the box outside until it reaches room temperature. 9. I repeat steps 1 to 8 four more times for the control. 10. When the temperature is the same as room temperature, I grab a square of the first material I want to test and duck tape it in front of the smaller box's opening with the thermometer inside. 11. I track the temperature. 12. At the same time, I start the timer set for 5 minutes and the heater at 1500 watts. 13. I track the temperature every 5 minutes. 14. I repeat step 8. 15. I repeat steps 10 to 13 four more times with each material.

Results

Foam was the best insulator, then metal, then wood, then clay and the last was glass.

Conclusions/Discussion

The best type of construction material would be metal. Even though it wasn#t as good as rigid foam, it also wasn#t as thick. This means that if you have a house made out of metal, the metal will heat up but it will block the heat from actually affecting the inside of the house. I would like to test how standing air affect the materials or how the radiation of the sun affects the insulating material. Some other variables to test are the thickness of the material and how it affects the heat transfer. To see if metal is as effective with cold air as it is with hot air would also be interesting.

Summary Statement

Comparing different thermal insulation materials.

Help Received

Father helped to build the box.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Cameron S. Ostroot

Project Number

J1315

Project Title

A Study of Decibel Reduction as Sound Passes through Common Materials

Abstract

Objectives/Goals

My objectives and goals for my project was to find out which practical material would soundproof a room the best. Another goal that I was testing was to see if certain materials can soundproof better at certain frequencies. My hypothesis is based on the fact that absorption materials are most commonly used by building contractors, also insulation is used in walls, and some insulation is specifically used to soundproof a room. This led me to my prediction that fiberglass insulation will soundproof a room the best in my project.

Methods/Materials

My materials used were as follows: a computer w/internet and Bluetooth, an iPad, microphone, Bluetooth speaker, carpet tape, power saw, power drill, 24 screws, eight 11x11 ½ in. wood (for boxes), and all of my testing materials ½ in. depth, 12x12 in.: Particle board, Plywood, Sheet rock, Carpet pad, Fiberglass insulation, and glass.

My methods: I first made two boxes closed on all sides except one side for each box. Then I downloaded an app on my computer which would allow me to connect a microphone to my computer and find how many decibels are being read at that point for each frequency. I also downloaded test tone files on my iPad. With my Bluetooth speaker in one box and the microphone in the other box, I started my testing. I tested each material five time each for the following frequencies: 100 Hz, 250 Hz, 1kHz, and 10kHz. Additionally, I tested each without any material for my control.

Results

Glass performed best at all frequencies except 10 kHz where particle board performed the best. Insulation did the worse at all frequencies except 100 Hz where plywood blocked the least amount of sound. Although glass performed the best all-around particle board and sheet rock also did well at soundproofing a room.

Conclusions/Discussion

These results in fact were completely against my hypothesis and prediction which stated that insulation would block the most sound and in fact as a whole insulation seemed to do the worse at blocking sound. But also as a whole glass in fact did the best at soundproofing a room. However glass would not be used to fully make a room, mainly only windows, so the best way to cheaply make a house that would be moderately soundproof would probably be to make it out of particle board.

Summary Statement

A study of decibel reduction as sound passes through common materials.

Help Received

Dad helped me build materials like boxes; Step dad helped me find needed applications and was there during the actual experiment to give certain guidance and also helped me on my board; Teacher, Mr. Hobbs, helped me in the writing portion of the project.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Nicholas J. Peters

Project Number

J1316

Project Title

Radical Roofs

Abstract

Objectives/Goals

The purpose of this project was to determine the thermal conductivity of different roofing materials. I believe that slate will have the most drastic effect on water temperature because it is the densest material.

Methods/Materials

Four 2 foot x 2 foot roofs each using a different roofing material were constructed and placed on four 2 foot x 2 foot x 3.5 inch boxes filled with water three centimeters high. The roofing material used was slate, composite, and wood. On the fourth roof, no actual material was used except for what was used under the other three roofs (tar paper and plywood). Four thermometers measured the water temperature of each box over a period of eight days. Another thermometer measured air temperature.

Results

The experiment indicated that the amount of direct sunlight on the roofing material had a larger impact than a varying roof type.

Conclusions/Discussion

My conclusion is that slate had just the same effect on water temperature as wood and composite. All roofing materials had the same effect on the water temperature.

Summary Statement

My project is about determining the difference in thermal conductivity between roofing materials.

Help Received

Father used table saw to cut wood for boxes; Father setup computer monitoring and taught me how to use software; Mother helped type report

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Micah S. Rapelje

Project Number
J1317

Project Title
Sunscreen in Layers

Abstract

Objectives/Goals
This project was designed to discover the effect of sunscreen thickness on UV protection. The hypothesis was that more layers of sunscreen, would increase the protection from UV rays.

Methods/Materials
A UV meter was used to measure how much of the hurtful rays were going through. To apply the SPF 15 sunscreen evenly, sprayable sunscreen was applied. The bottle was stabilized by placing heavy objects on top. Sunscreen was sprayed onto plastic with the doors of the shed closed. The meter was stabilized by hammering a metal post into the ground and clipping the meter onto it, with the measuring window toward the sun. The plastic with sunscreen was held above the meter to block the UV rays. The meter measured the strength of the UV rays coming through, and the procedure was repeated until there were many layers. Then, the results were compared to find if layers increase protection.

Results
On March 3, from 1:15 PM to 2:30 PM, in the total of 12 layers of sunscreen, the change of UV index changed tremendously. With one layer, 2 UV index units were blocked by the sunscreen. With six layers, the average blockage was 6 units. With twelve layers, the average change was 12 units. As expressed in the results, when one more layer of sunscreen was applied, the UV index units decrease.

Conclusions/Discussion
The results of the experiment strongly agreed with the hypothesis. It would be interesting to try another SPF level.

Summary Statement
This project is about if layers of sunscreen improves the protection from the ultraviolet rays.

Help Received
Mother helped make poster; Father helped perform experiment; Ms. Amend helped type report.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Raymond Salcedo

Project Number

J1318

Project Title

What Building Materials Are Most Affected by Acid Rain Corrosion?

Abstract

Objectives/Goals

The objective is to determine which building material will be most resistant to corrosion from exposure to acetic acid, an acid similar in pH to acid rain. The experiment sampled fourteen different building materials including wood, clay brick, concrete, marble, granite, travertine, porcelain tile, ceramic tile, steel, tin, aluminum, asphalt roof shingle, copper, and glass.

Methods/Materials

Four sets of fourteen materials were used including wood, clay brick, concrete, marble, granite, travertine, porcelain tile, ceramic tile, steel, tin, aluminum, copper, asphalt roof shingle, and glass. Each material was dried, weighed, and reimmersed into acetic acid baths daily for five days. Corrosion was measured based on the percent decrease of weight over five days.

Results

Travertine had the highest percentage corrosion losing an average of 37% of its starting weight. Marble was next losing an average of 25% of its starting weight. The remaining materials' percent decreases are as follows: clay 8%; concrete 7%; tin <6%; copper <5%; steel and asphalt <4%; aluminum <2%; ceramic tile, wood, and glass about 1%; and granite and porcelain tile <1%.

Conclusions/Discussion

In this experiment, the corrosion of different building materials by acetic acid was measured. The data showed that over five days travertine lost an average of thirty-seven percent of its starting weight, and marble lost an average of twenty-five percent of its starting weight. Clay brick, concrete, tin, copper, steel, and asphalt roof shingle corroded much less. Aluminum and ceramic tile corroded even less. The amount of wood corrosion was difficult to determine because wood is porous. Glass, ceramic, granite, and porcelain tile proved to be the most resistant to corrosion by acetic acid as they lost the least percentage of weight over the time period. This differed from my hypothesis where the predicted softer material of wood would be damaged the most and the harder material of concrete would be corroded the least. The chemical makeup of building materials explain why they are broken down by acetic acid.

Summary Statement

Fourteen common building materials were exposed to corrosion by acetic acid, and travertine and marble corroded the most while glass, ceramic, granite, and porcelain corroded the least.

Help Received

Parents bought and helped prepare and cut building materials for project.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Akhil Pulianda

Project Number

J1398

Project Title

Strength of Cement Blocks

Abstract

Objectives/Goals

To determine if the percentage of sand in cement blocks affects its strength.

Methods/Materials

Different ratios of sand and cement samples were constructed in foil trays and then were left to set. After this step was done, weights were put on top of the cement blocks to see under what load the cement blocks would break. All the observations were recorded on a log sheet.

The experiment was conducted at home using five different ratios of cement and sand. Nine samples for each ratio were used which gave me a total of forty five samples for testing. Each cement block was 13.5 cm in width, 19.8 cm in length, and 1.0 cm in height.

Results

The experiment proved that the cement blocks of 60% cement and 40% sand were the strongest and these samples held an average weight of 174 pounds. The cement and sand ratios of 70 to 30, 50 to 50, and 40 to 60 were the next strongest, holding weights from 110 pounds to 170 pounds. The weakest was the block with 80% cement and 20% sand holding an average of 111 pounds.

Conclusions/Discussion

My hypothesis was that the ratio of 60% cement and 40% sand would be the strongest sample and that the 40% cement and 60% sand would be the weakest. After the experiment was done, I learned that the ratio of 60 to 40 was the strongest. The weakest however, was not the ratio of 40 to 60 that I had predicted, but was the 80% cement and 20% sand sample. These results helped me conclude that using the correct ratio of sand mixed with cement is a very important factor, impacting the strength of the cement blocks.

Summary Statement

My project proves that the ratio of sand mixed with cement affects the strength of cement blocks.

Help Received

My parents and sister helped me collect information, do the experiment and complete the notebook and poster. Ms. Nadeau from Prado View Elementary helped me with suggestions on improving my project.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Samuel H. Sooter

Project Number

J1399

Project Title

Accoustical Properties of a Musical Instrument

Abstract

Objectives/Goals

My objective was to determine what acoustical properties are employed in a musical instrument.

Methods/Materials

First, I measured the distance between the frets on a guitar string, calculated the percentage of decrease between each fret and recorded the results in a data table. Next I used a frequency analyzer to measure the frequency on the guitar string. I compared the two measurements to look for correlations between the length and the frequency. I used this process on a different string for comparison. Using my data, I cut PVC pipe in proportion to the lengths on the guitar fret (BP=L). Then, I measured the frequencies of the cut PVC pipe with a frequency analyzer and recorded the results. I compared the data from the guitar and the PVC instrument and looked for correlations. Lastly, I mounted the PVC pipes on wooden boards for display. Materials used on this project: Frequency analyzer, guitar, PVC pipe, chop saw, measuring tape, wood boards.

Results

I found that there is an inverse correlation between the lengths of the guitar strings and the frequencies that they give off.; the shorter the string, the higher the frequency. I also found that when comparing the two strings, if the length of string A is exactly half the length of string B, the frequency of A is exactly twice the frequency of string B. In musical terms, the perceived pitch sounds an octave higher.

Conclusions/Discussion

In doing my project, I discovered that frequency has a direct correlation to the length of an object. Also, you can make a musical instrument using these principals.

Summary Statement

Musical instruments can be designed using mathematic formulas to determine frequency.

Help Received

My father helped me cut the PVC pipes and mount them to the boards. My mother helped me format my report and project board. My uncle helped me build a stand.