

Exh#	Project Name	Please describe your project.	Type of Project	Project Category	Grade	Classification
10	Self-driving car	As the innovation of the technology, the development of self-driving cars has made a great progress. We do have self-driving functionality in some of the cars, but it is currently illegal to use this functionality due to safety consideration. However, I believe self-driving cars would benefit people to have a better life. In my project, I research and describe some background information of self-driving cars including its development milestone and demonstrate how current technology helps to enhance the capability and performance of the self-driving function for people to use safely.	Study/Discovery	Engineering and Computer Sciences	5	Elementary
12	From Rail To Maglev Train	My project was to build a train with monopolar magnets underneath the train and on the trail to make the train float. The magnets have to be facing the same pole to repel.	Study/Discovery	Engineering and Computer Sciences	4	Elementary
11	Maglev Trains	Maglev Trains and how they work. A system of train transportation that is levitated along a guide way, through the use of magnetic forces. Plus they are fast. Are they better for the earth than diesel trains? We are trying to study/figure out what is best. Lithium mining and fossil fuels are bad for the environment. Which is best? What is less harmful for the environment.	Study/Discovery	Engineering and Computer Sciences; Environmental Sciences	5   5	Elementary
1	What is the most ideal fossil fuel for humans and the environment	We will be researching types of car fuels and which one is best for humans and the environment.	Study/Discovery	Environmental Sciences	4	Elementary
2	Renewable Energy VS Non-Renewable Energy	For my project I will be researching which is better in terms of environmentally friendly, how much of it and which will last longer?	Study/Discovery	Environmental Sciences	5	Elementary
3	Renewable vs Non Renewable Energy	Renewable energy is energy that has been extracted from natural resources such as the wind, water and sun. Nonrenewable energy is energy that comes from fossil fuels, fossil fuels are the bodies of animals and plants that lived millions of years ago and were exposed to heat and pressure in the earth's crust for millions of years. My big question is: Does renewable energy work just as well as non-renewable energy? My Hypothesis is: I think that renewable energy will work just as well as non-renewable energy because it releases equally the same amount of energy. My experiment is about finding out which type of energy would work better. My conclusion is that My Hypothesis was correct because renewable energy worked just as well as non-renewable energy.	Experiment	Environmental Sciences	5	Elementary
4	Do your clothes decompose?	Which fabrics decompose quicker; natural or synthetic? I compared four natural textiles against four types of synthetic textiles. I used two different types of composting methods. Method 1 - I used a stainless bin with a lid, with a homemade composting dirt and used smaller scraps of fabrics. Method 2 - I used a larger sized planter bin, the same homemade composting soil, larger pieces of fabrics but frayed them and left this bin uncovered. I watered it every other day. I left both bins near my fireplace for 6 weeks. I chose to include this second method because it was more similar how clothes would decompose if clothes were thorn out and put in a landfill. Watering equals the rain and the heat equals the sun.	Experiment	Environmental Sciences	5	Elementary

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5	Are You Cold Yet?	The aim of my experiment was to see which natural material is the most weather resistant for clothing. To do this experiment I used three materials and did three tests. My three materials were cotton balls, duck down and sheep wool and my three tests were water, heat and wind. My experiment is useful because if you want to know what material is the most water resistant I will tell you my water test results and if you want to know what material will insulate the best I will tell you my heat results. I could also show you my water results if you want to know what material is the most water resistant. My wind test is testing to see how far a feather will blow and the heat test is testing to see how long it will take for an ice cube to melt. The water test is testing to see how much water the pockets will absorb.	Experiment	Environmental Sciences	5	Elementary
13	Farting Fruits: Fruits That Give Off Ethylene Gas	Hello, my name is Theo and I am going to tell you about my science fair project. My experiment is about the effects of ethylene gas on the ripening of bananas. For this experiment I wanted to figure out how ethylene gas impacts how quickly bananas ripen. I also wanted to figure out which fruits and veggies give off a lot of ethylene gas so that I would know which fruits and veggies to not store the bananas with so that the bananas don't ripen too quickly.	Experiment	Environmental Sciences	5	Elementary
15	Save The Glaciers	I will be testing my predictions on several different materials, wrapped around the common Ice Cube. I will be testing to see which material melts the ice cubes the fastest, in the following materials: Plastic bag (zip-lock), Foil, Paper towel (bounty), and Generic Terricloth. I will then relate it back to the glaciers and how we can prevent them from melting.	Experiment	Environmental Sciences	6	Elementary
19	Can invasive species be used as fertilizer for vegetables, and if so, which works best?	This project is to explore whether invasive species can be useful for fertilizing vegetables. I used a Korean Natural Farming process and fermented two invasive species. I then used the liquid on parsley to see which would grow faster.	Experiment	Environmental Sciences	5	Elementary
6	What slime deactivates the fastest?	Our project is multiple tests on slime. We used 3 different activators. The activators we used are Elmers magic liquid, contact lens solution (and baking soda), and borax mixed with warm water. Our tests are which slime stretches the best, which one is the stickiest and which one deactivates the fastest.	Experiment	Environmental Sciences; Engineering and Computer Sciences	5   5	Elementary
22	Is Rain Water Safe to Drink?	This project will use commercial off-the-shelf test kits to determine whether rain water in various forms (direct collection, snow, runoff, puddles) is drinkable, and perform other tests (appearance, etc) as appropriate.	Experiment	Health Sciences	4	Elementary
23	Cookies for All!	What substitutions can you use to make the best allergy-friendly Chocolate Chip cookies? The cookies tested were either egg-free, dairy-free, or gluten-free as these are priority common allergies in Canada.	Experiment	Health Sciences	5	Elementary

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20	Improving Plant Growth Using Homemade Volcanic Soil	My science fair experiment is about creating and simulating volcanic soil using ingredients that you can usually find at home. Volcanic soil helps plants grow better. I am performing this experiment by putting in calcium from crushed egg shells, silica from silica gel packets, and activated carbon from water filters because those elements are found in volcanic soil. I will be growing Fava bean seeds to test if my version of volcanic soil will help plants grow better by measuring characteristics like height, number of leaves, root mass, and root length. I am hoping to find that it is possible to create volcanic soil because is so fertile and this can help many plant lovers and farmers with their plants and crops.	Experiment	Life Sciences	5	Elementary
21	Never water plants again!	My project is about using gels to water plants. This gel is a very special gel that can take moisture from the air, and when heated loses its water. This gel can be used to water your plants.	Innovation	Life Sciences	5	Elementary
24	Spiraling into Illusions	We have planned to test various illusions (size, colour) on students of different ages, and understand whether there is a difference between ages in figuring out the illusion they are shown.  This project will help find which age group between 5 -11 is sharper in finding the illusion secret .	Experiment	Life Sciences, Math and Physics	4   5	Elementary
7	How do magnets work?	Looking into magnets is much more then just looking into north and south poles but much more. Me and Zan will make slime with iron filings and use a magnet to demonstrate the magnetic properties. We will also research and present how magnets work.	Study/Discovery	Math and Physics	5   5	Elementary
8	Blast Off!	My experiment will look to see which rocket nose cone design gives the best performance in flight time. I will compare 5 designs made with 3D printing technology and powered by a stomp rocket launcher.	Experiment	Math and Physics	5	Elementary
9	Newton's Cradle	Homemade newtons cradle and research to learn about how a newtons cradle works, how energy transfers and conservation of energy.	Experiment	Math and Physics	5   5	Elementary
18	Optimizing Home-Friendly Wind Turbine Efficiency through Varied Turbine Height, Blade Design, and Local Wind Speed	Title: Optimizing Home-Friendly Wind Turbine Efficiency through Varied Turbine Height, Blade Design, and Local Wind Speed. Objective: This project aims to conduct a comprehensive analysis of the relationships between home-friendly wind turbine blade design, variable wind speeds, and turbine height to understand their collective impact on electricity production efficiency. Scope of the Study: The study will involve constructing and testing a home-friendly wind turbine, emphasizing the aerodynamic properties of custom-made blades. Factors such as blade length, shape, pitch, and turbine height will be scrutinized. Additionally, the influence of turbine height and diverse wind speeds on blade performance will be investigated to determine optimal conditions for maximizing electricity generation. Expected Outcomes: By experimenting with different wind turbine blade shapes, heights, and local wind speeds, this project anticipates enhancing the efficiency of electricity generation in home-friendly wind turbines.	Experiment	Engineering and Computer Sciences	7	Intermediate

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50	SmartSipper: The Digital Water Bottle	Water is vital for maintaining human health. Adequate hydration is crucial for optimal bodily function, yet many people do not prioritize water intake. Dehydration impacts memory, concentration, and overall health and performance. According to the CDC, "1 in 5 children and adolescents do not drink any plain water during the day, and about half of school-aged children are under hydrated." I wanted to try and create a water bottle that tracks the consumption of water and displays it in a fun way—digitally on the water bottle itself. There are water bottles on the market that track consumption using a mobile device, but there aren't any that display the actual volume on the bottle itself. This ended up requiring the use of various components including a turbine sensor, triple-axis gyroscope, e-Ink display, 3D-printed components, and an Arduino Uno.	Innovation	Engineering and Computer Sciences	6	Intermediate
37	Beans Beans the Musical Fruit	This is an original experiment to investigate the which type of bean (canned, fresh, and many varieties) produces the most methane gas under simulated landfill conditions.	Experiment	Environmental Sciences	6	Intermediate
38	Using Natural Sorbents to Absorb Oil From Our Oceans	This project will be investigating the best way to clean oil out of our oceans using natural sorbents such as peat moss, cotton and vermiculate clay.	Experiment	Environmental Sciences	6	Intermediate
39	How Can Fungi Help us Lead a More Sustainable Life?	We will research different methods of living more sustainably with help from fungi. We will be looking at many different ways that fungi can help us live more sustainably through innovations in fashion, building materials, and meat alternatives!  Can fungi help us live more sustainably? For this project we wanted to study how mushrooms and fungi may help us lead more environmentally sustainable lives. From fashion to burials, construction to food we are discovering the many new and exciting uses of fungi and fungus based products in our lives. Our goal is to share these findings and teach people about alternatives for the materials and goods that are in our daily lives.	Study/Discovery	Environmental Sciences	7   7	Intermediate
40	Feasibility of Bioluminescent Fungi as Night Lights	Are certain types of glowing mushrooms bright enough to be used as a replacement for night lighting? Three mushrooms will be evaluated for lighting: 1) Bitter oyster ( <i>Panellus stipticus</i> ); 2) Honey mushroom ( <i>Armillaria mellea</i> ); and, 3) Lilac bonnet ( <i>Mycena pura</i> ). Because different parts of each species mycellia or fruiting bodies luminesce, ways to help them survive in small, enclosed areas with minimal maintenance will be presented.	Innovation	Environmental Sciences	7	Intermediate

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16	Background Noise and Memory Retention	<p>We were curious: Does noise affect your brain? We tested memory while sound was in the background and without to see how the test subject was affected. This experiment explores how your memory works while listening to background noise and without. This is a neuroscience/psychology experiment. The experiment consists of a memory test in quiet and with background noise. It is a test using short term, recognition memory. The part of the brain that is important in this experiment is the prefrontal cortex as well as the auditory cortex. The brain is very complex and we are investigating that in this experiment. Understanding how the brain works in these conditions could help people study and learn.</p> <p>The basis of our project is to investigate whether the presence of background noise impacts memory retention. As our daily environments become increasingly noisy, understanding how these auditory distractions influence cognitive processes such as memory is crucial for optimizing learning and information retention. As part of this project, we investigate the impact of varying levels of background noise on memory retention by conducting controlled experiments with participants exposed to different noise environments while engaging in memory tasks. We include standardized memory tests to collect comprehensive data on memory performance.</p>	Experiment	Health Sciences	6   6	Intermediate
44	Visualizing Speed: Instructed Imagery in Competitive Sports	<p>The experiment is designed to test whether or not visualizing a swimming race before race day helps performance and well-being in competitive swimmers ages 9-14. Participants will take a survey about how they felt about their performance in the week leading up to, and at, Swim meet #1. Next, participants may be assigned to listen to an audio recording of a guided imagery of a swimming race. A control group will not listen to this visualization. Participants will listen to the audio recording every day for one week leading up to Swim meet #2. Lastly, participants will fill out the same survey following Swim meet #2. Participants' results will be kept anonymous. Performance, perceived performance and well-being will be compared between the visualization and control groups, at Swim meet #1 and #2.</p>	Experiment	Health Sciences	7   7	Intermediate
45	The Scoop on the Stroop	<p>The Stroop Effect is a visual test where there are colour words (blue, red, yellow etc) on a sheet, coloured with another colour. For example, if the word 'blue' was in red font, you would say 'red' not 'blue'. For our test, we used one colour stroop effect and one shape stroop effect. The shape Stroop had shapes instead of colours and 'shape words' instead of 'colour words'. We collected nine participants and safely timed them to see which type of Stroop test could be completed faster. Our question was, "Does changing the type of Stroop Effect influence the completion time of the Stroop test?"</p> <p>The Stroop Effect is a visual test which consists of 'colour words' (such as blue or red) printed in non-corresponding colours. For example, if the word 'red' was printed in blue, then you would say blue not red. We also used a shape version of the Stroop Effect, which had a shape (such as a square or a triangle) with a 'shape word' inside the shape. For example, if there was a circle with the word 'square' inside, you would say square. We tested to see which version could be completed faster. Our question was, "Does changing the type of Stroop Effect influence the completion time of the Stroop test?"</p>	Experiment	Health Sciences	7   7	Intermediate
46	Exploring Electrolyte Drink Conductivity	<p>Our Project was about measuring and comparing the different amount of electrolytes in sports drinks (Gatorade, PRIME Hydration, Biosteel, and Powerade), and what it does to help your body.</p>	Experiment	Health Sciences	6	Intermediate

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41	Let's Face it	<p>For my project we experimented with the question which food makes the most dissolvable face mask.</p> <p>Our interest in the beauty industry led us to create biodegradable, fruit-based face masks that dissolve when placed in water and are great for your skin.</p>	Experiment	Health Sciences, Environmental Sciences	7   7	Intermediate
17	Gaming Minds	<p>Testing peoples minds to see if they react faster on screens or off.</p> <p>We did a report on the effects of gaming</p>	Study/Discovery	Health Sciences, Life Sciences	6   6	Intermediate
48	Colouring your feelings.	I tested what people associated with colours. My question was: what do people associate with different colours and why? I got 7 clear cups and filled them with different colours of food colouring. I got 16 people and asked them one at a time what colour was their favourite and what they associate it with. I did this with everyone and all of the colours. The most picked colours were green and clear with 9 people picking them as their favourite.	Experiment	Life Sciences	7	Intermediate
49	Taking Notes	<p>As middle school students, we struggle with studying for tests all the time. We conducted a small memory test to prove whether studying with music on benefited our ability to retain information. We gave nine students a small memory test and over the course of three days had them take the same test with no music, upbeat music with lyrics, and instrumental music.</p> <p>As middle school students, we struggle with taking tests all the time. We thought that if we figured out what music works best for retaining information, we wouldn't struggle with it so much. We did this over three trials. The first trial was music that included lyrics, the second was instrumental music, and the third was no music. We gave nine participants a small memory test, and let them study and take the test three times with different music in each.</p>	Experiment	Life Sciences	7   7	Intermediate
47	Think Personality	This experiment's main goal was to try to find if personality affected short-term memory. Our hypothesis is that if the different personalities take a memory test, then the different personalities will have different results because some of the different personalities are introverted, some are extroverted, and some are even ambiverts, which plays a large role in short-term memory, according to the National Library of Medicine. In the experiment, there were eighteen participants categorized into groups of three with the same personality type. These personality types were determined by an online test from a website called 16Personalities. For the memory test, the participants were given fifteen seconds to try to memorize twenty-four objects. After that, participants turned around for thirty seconds as one of the random objects was taken away. Participants were then given two minutes to attempt to identify the missing object. If they were unable to identify the missing object within the period of time, then we would mark them as 'Unable to'.	Experiment	Life Sciences; Health Sciences	7   7	Intermediate
25	Testing Soundproofing Materials	Testing the soundproofing qualities of common materials	Experiment	Engineering and Computer Sciences	8	Junior
26	Soccer Vision	Soccer Vision is a device using Python code and Raspberry Pi hardware that detects when a soccer ball is in or out of a simulated field. Some features include LED lights to indicate ball status, freeze frame to capture the moment the ball transitions from in to out, and a manual reset button to resume play.	Innovation	Engineering and Computer Sciences	9	Junior

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27	Optimisation of ionic thruster	I am trying to optimize the output of an ion engine in air. I am comparing different grid designs as well as grid separation distances I have also compared multiple grids in sequence to single grid efficiency. I have designed and built a number of ion grid patterns and tested them by measuring the speed of the air output.	Experiment	Engineering and Computer Sciences	9	Junior
66	DALL-E vs. Midjourney: Which One Wins?	Participants are shown a set of six images. One of these images is generated by DALL-E, and participants are asked to identify which one it is. This is then repeated with a new set of images, but one of them is generated by Midjourney AI.	Experiment	Engineering and Computer Sciences	8	Junior
67	The Future of Composites	Composite materials are generally made with fiber and resin, in which the fiber is often glass or carbon-based due to their good mechanical properties. However, these types of fibers are not biodegradable. The use of natural fibers to make composite materials in replacement of fiberglass could be more environmentally friendly, since the fibers are biodegradable and have less health risks. The aim of this project is to engineer and evaluate composites that are based with natural fibers against fiberglass composites. The composites were made with polyester resin and three layers of fiber following these measurements, 25mm wide by 180 long. The natural fibers used in this project were, 100% hemp, 25% hemp and 75% cotton, 25% flax and 75% cotton, and 100% wood fiber, and the fiber glass used was chopped strand mat fiberglass. In order to evaluate the composites the following tests were done, density and tensile strength. For the tensile strength the composites were measured until their load at failure. The natural fiber composites generally had low density and lower tensile strength than the fiberglass composite, which for some applications can be desirable properties.	Innovation	Engineering and Computer Sciences	9	Junior
68	Hydroelectric energy	For my experiment I tested how changing the slope leading the water into a hydroelectric turbine affected the weather the voltage increased or decreased. My IV was the change in the slope height (0°, 10°, 30°, 60°, 90°) and my DV was the voltage (v). In total I had 15 trials and 3 trials per value.	Experiment	Engineering and Computer Sciences	9	Junior
30	discarded drywall as an additive to improve plant growth in low pH environments and in degraded soils	Our project has 3 steps. In our first step, we are using discarded drywall (no asbestos) as an additive to simulated aquatic ponds of varying pH in an attempt to improve plant growth (duckweed). Given that wallboard has a high concentration of gypsum (CaSO <sub>4</sub> ), we are hoping that the added calcium will counteract the reduced availability of calcium ions in lower pH water without altering pH. In a tangent step we are adding crushed drywall to poor quality soils (low organic content and high sand content) that have been previously saturated with seawater. Given that wallboard has a high concentration of gypsum, we are hoping that its calcium ions will displace residual sodium ions in an attempt to rehabilitate the soil. We are using the growth of Kentucky Bluegrass (a salt sensitive plant) to assess the effect, if any. Our proposed final step is to blend the two previous steps together.	Experiment	Environmental Sciences	9   10	Junior

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63	Fantastic Bioplastic: Using Seaweed Bioplastic to Create Biodegradable Toothbrushes	Plastic waste is a big problem. One area not focused on is toothbrushes - made of indestructible, non-biodegradable plastic materials. The Canadian Dental Association recommends using a new toothbrush every three months. The average toothbrush has 10 grams of plastic; the total plastic used and thrown away for toothbrushes for a single person over a lifetime (80 years) is 3.2 kg. For the population of Canada that is 124,800,000 kg of plastic waste! Biodegradable plastics ("bioplastics") are becoming popular, mostly forming food packaging or films. Seaweed bioplastic is in the spotlight, highlighted for sustainable sourcing and fast growth. In the toothbrush market, it seems only bamboo alternatives are produced as a biodegradable toothbrush option. While compostable, many bamboo toothbrushes do not have antimicrobial properties and the wood can grow mold. For my project, I looked at local seaweed bioplastic as a sustainable option for toothbrushes. Seaweed has antibacterial properties, important for a product touching the mouth. Research shows that seaweed bioplastics are promising, but they have not been explored this way. Glycerin is a key ingredient of bioplastics, giving the bioplastic flexibility. My experiment examines the level of glycerin needed to make a solid, usable toothbrush from seaweed bioplastic. My hypothesis is that using a lower level of glycerin, for less flexibility and more strength, will produce a viable seaweed bioplastic biodegradable toothbrush.	Experiment	Environmental Sciences	8	Junior
64	Can creating a plant-powered LED light help solve energy efficiency, improve the impact on the environment, and provide accessibility to everyone?	I developed an innovation concept that used Aloe Vera to generate electricity. I wanted to make an eco-friendly and accessible way of generating electricity. I used copper wiring and zinc pins to create a reaction with the electrolytes in the gel inside of the Aloe Vera plants. I measured my success by calculating the volts of each circuit using a multimeter. By changing the amount of copper and zinc in each plant, I dramatically increased my results from mV to V. I achieved about half of my success criteria, as I improved the current innovation, and measured the voltage of my circuit. However, I couldn't use the lowest number of plants and power my LED light. But I collected enough data to analyze and determine the next steps for my innovation concept. Ultimately, although it would take more work to turn my innovation concept into a proper innovation, I was able to come up with a concrete concept with solid data and calculations, that would guide me toward creating a new eco-friendly, accessible, and energy-efficient way of generating electricity.	Innovation	Environmental Sciences	9	Junior
65	Bee Safari; Bees on the Hunt for a Perfect Treat	Each winter in Canada eliminates roughly 60 percent of all bees. Each hive is left with around 30 percent or 20,000 bees when spring comes. This is due do to the wind driving colds and starvation. I found the best sugar solution for bees so that they could obtain some food to keep them alive without them leaving the hive therefore simply less death.	Experiment	Environmental Sciences	9	Junior
42	Skin Microflora Cultivation	For my project I tested different surfaces of the human skin to see which contained the most bacteria, and the fastest growing. I chose this experiment because of common misunderstandings around bacteria especially after COVID.	Experiment	Health Sciences	8	Junior
43	Made-Up Make-Up	My project is going to test how bad different types of make-up are for your skin. I will use oranges as testers, put make-up on them and leave them for multiple days. I will use oranges because their peels resemble human skin better than any other fruit or vegetable.	Experiment	Health Sciences	8	Junior



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51	The Warm-Up Factor	<p>For our science project we decided to investigate whether warming up actually affects running performance. These warmups would need to enhance runners muscular flexibility, coordination, and cardiovascular system, preparing them for optimal efficiency and injury prevention during their runs. To measure our experiment, we used an Apple watch to track their heart rate, and timed them using a stopwatch. After thorough research we were able to put together a solid sequence of warmups. We required our test subjects to each run 1 lap of our school driveway 2 days in a row. The first day, each of them separately warmed up, put on the Apple watch, and run the lap of the driveway. The next day, we had the same test subjects do the same thing, except they did the sequence of warmups we prepared.</p> <p>In this project we are comparing the running time and heart rate of our test subjects with and without warming up. This experiment aims to answer the question of whether warming up actually affects running performance?</p>	Experiment	Health Sciences	8   8	Junior
52	Artificial vs. Natural Protein	Protein bars, as well as other synthetic protein-packed foods, are commonly consumed to gain power and fuel, but is artificial protein really the right choice? In this experiment, traditional, natural protein (chicken breast) and more modern synthetic protein (Quest Cookie Dough Protein Bars) were tested to see which gave one a higher amount of energy to fuel through two hours. This topic was chosen since before sports games, many feel drained from their busy everyday lifestyles, and need a boost of energy. Moreover, this test will help not only my teammates but many others do their best during big games.	Experiment	Health Sciences	8	Junior
54	Pizza Precision	This experiment looks at how fat affects blood sugar levels in people with type 1 diabetes, celiac disease, and gastroparesis. Over ten nights, the participant will eat high-fat (pizza and salad) and low-fat (chicken, rice and vegetables) meals with the same number of carbohydrates. A continuous glucose monitor will track the participant's blood sugar levels. Studies involving the digestion of fat in type 1 diabetics exclude those with celiac and gastroparesis, making this one unique. The author, who has these conditions, stresses how important the experiment is for understanding how fat influences blood sugar levels in individuals with these specific health conditions.	Experiment	Health Sciences	8	Junior
55	The Unappetizing Obstacles : Consuming Microplastic Particles	My project is about the consumption of microplastics for humans that come from fish. Many people enjoy eating fish but do they what may happen to be in the meat that they eat? What can happen when the human body consumes microplastics? I will present the basic information on microplastics as well as the health risks that come along with them. Where do they come from? How do they get into the fish? These are some questions I will be answering in my presentation. I chose this science fair topic so that the audience is aware and informed about microplastics. We as people need to be careful when it comes to small but big problems like this. They may be miniscule and sometimes barely visible . However, they are dangerous to the environment, animals, humans, and et cetera. There have been ways to filter them out of water but how about food such as fish? I will conclude that fish have many microplastics within them and it can effect our whole food pyramid and food chain.	Study/Discovery	Health Sciences	8	Junior

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56	Pain Science and the Peak-end Rule	In my project, I investigated how the brain evaluates past experiences and the difference between the experiencing and narrating selves. Specifically, I focused on the peak-end rule, which states that when reviewing prior stimulus, only the most intense moment (the peak) and the last moment (the end) are accounted for in the final consideration of the degree of the positivity of the experience. I provided context by looking at how the peak-end rule could be used to increase patient comfort in the medical system. In my experiment, I investigated how changing the duration of the removal of a bandage affected the intensity of the pain a participant felt upon retrospective evaluation. The data matched my prediction, that increasing the duration decreased the negativity of the experience, as increasing duration decreases the pain in any one moment (and thus the peak and end) while duration has negligible effect on the reflection. This was supported with a processed data trendline of -0.0271 PPA (a pain intensity unit) per second. Ultimately, I was able to show that medical professionals should not worry about increasing the length of the procedure as it will ultimately change little as to what the patient reflects upon.	Experiment	Health Sciences	9	Junior
57	Temperature shift correlation with the probability of Hereditary Angioedema (HAE) attacks	I am measuring the correlation between Hereditary Angioedema (HAE) attacks in relation to temperature shifts in HAE patients. This variable will be measured by if an HAE attack or symptoms occur when there is a temperature shift in HAE patients. I ask the patients to track their symptoms and temperature daily and then see if the shifts correlate with the symptoms. There are frequently temperature shifts in female HAE patients during ovulation and menstruation, two times of month when female HAE patients regularly have attacks. I believe that the patients' temperatures will shift when they have other HAE attacks apart from ovulation and menstruation because their temperature already shifts with two those attacks. This could help patients to know when they have to treat an attack, track when attacks happen and if there are any patterns relating to when they attack (which could help identify the patient's potentially unknown triggers and could help the patients to reduce the severity and frequency of their attacks).	Experiment	Health Sciences	9	Junior
58	Exploring Natural Remedies	In my experiment, I am exploring the antibacterial properties of different natural resources. Through this investigation, I have learned about the expectations regarding bacterial growth and the capabilities of microorganisms. By placing five different discs on a petri dish swabbed with bacteria, we can observe the differences in antibacterial properties among natural remedies. When a specific disc exhibits a larger zone of inhibition compared to others, it indicates that the natural remedy is more effective at killing bacteria and is stronger than the others. The independent variable in this experiment is the different natural remedies, while the dependent variable is the zone of inhibition, which represents the clear radius surrounding the disc and indicates the strength of the liquid. These two variables are related to the scientific concepts of microbiology and naturopathic medicine because they contribute to our understanding of bacterial growth and the antibacterial properties of natural remedies. I hope to gain further insights into the science of naturopathic medicine, which is important to me because finding alternative antibiotics can help reduce the risk of side effects for those in need of treatment. Additionally, I am interested in expanding my knowledge of microbiology and bacterial growth dynamics.	Experiment	Health Sciences	9	Junior

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28	Save The Slice	<p>This topic was chosen because bread is one of many families' favourite foods but must be eaten quickly because it moulds too fast. On a much more extreme scale, much of the population in Canada lacks access to safe and nutritious food. Many families reported experiencing food shortages, including Indigenous communities according to a report from CTV News. However, nowadays our world has been accustomed to using artificial preservatives to preserve baked goods against mould. However, certain individuals can have side effects and health issues from them. Meanwhile, natural preservatives have a much smaller chance of risking health and can be easier to buy and prepare. For this experiment, the chosen preservatives were vinegar, honey, and saltwater to test the bread against mould growth. This experiment may lead to more practical and healthier alternatives for preserving bread, keeping in mind both the accessibility and health concerns of using artificial preservatives.</p> <p>Ever wondered why bread gets mouldy so quickly? It's a problem many of us face, especially when trying to keep our favourite snacks fresh. But what if there were natural alternatives to the artificial preservatives often used in store-bought bread? That's what our experiment, "Save the Slice," aims to explore. We're using homemade preservatives like vinegar, honey, and salt water to see if they can stop mould from growing on our bread slices. Beyond just keeping our sandwiches mould-free, we're also interested in finding healthier options for food preservation. With concerns about artificial preservatives and the accessibility of nutritious food in mind, we want to find simple and effective ways to make bread last longer. By testing these homemade methods, we hope to find practical solutions that could benefit both our health and the environment, while also considering the needs of communities with limited access to conventional preservatives.</p>	Experiment	Health Sciences; Life Sciences	8   8	Junior
59	Comparing Molecules in Food Coloring	I used gel electrophoresis to show how far different colors of food coloring traveled based on the sizes of molecules in each one.	Experiment	Life Sciences	8	Junior
60	The Five Second Rule: True or False?	Is it safe to eat dropped food? In this experiment, I investigated whether leaving watermelon on the middle school lunch floor for longer increases the amount of bacteria transferred. The results show that bacteria transferred onto watermelon very quickly, and the five second rule is false. This experiment is important because the CDC states that every year, 48 million people in the U.S. get sick from foodborne illnesses, 128,000 are hospitalized and 3,000 die. There are many contributing factors to foodborne illnesses, and surface contamination is the 6th most common factor.	Experiment	Life Sciences	8	Junior
61	Spray It Right!	Did you know that constant use of certain antibacterial all-purpose sprays may lead to the development of superbugs – bacteria that are resistant to the antibacterial solutions? Relying on such sprays with specific active ingredients could likely contribute to the growth of this bacteria, posing a negative impact on public health and cleanliness. In the pursuit of a safer and cleaner environment, the question of whether homemade antibacterial spray outperforms store bought counterparts came to mind. As we navigate in a world that has become more and more conscious of hygiene and the impact we have on the environment, this experiment holds significance in our lives today. Considering factors such as affordability, accessibility, and environmental outcomes, we tested four cleaners total, two homemade and two store bought. To see which killed the most germs, we used agar and petri dishes, swabbed uncleaned and cleaned counters, left the bacteria to grow, and compared our results. Our project aims to cast light on an important question that directly affects the wellbeing of individuals as well as the planet.	Experiment	Life Sciences	8	Junior

Exh#	Project Name	Please describe your project.	Type of Project	Project Category	Grade	Classification
62	The successfulness of Cannibalism	I fed two groups of Blepharisma different food to measure how cannibalism affects the success of their population. One group was fed Tetrahymena, a smaller ciliate and the other was fed Pseudomonas Putida, a bacteria. After 6 days I mixed some of the Blepharisma being fed Tetrahymena and the ones being fed Pseudomonas Putida to measure the success of cannibalism. I starved them for 4 days after the 6 day-growing period to aide in inducing cannibalism.	Experiment	Life Sciences	9	Junior
29	Safeguarding Human Health with Electromagnetic Radiation-Proof Phone Cases	As technology advances, electrical radiation becomes more prevalent. Everyday devices like phones and laptops emit electromagnetic radiation. When the amount of electromagnetic radiation in our bodies exceeds safe limits, it can greatly affect our health. To address this issue, I began my project by studying EMF (electromagnetic field) and methods to prevent its harmful effects. I conducted various experiments to test different materials and their ability to shield against EMF. Using the data from these experiments, I developed an innovative solution which is an electromagnetic radiation-proof phone case. By comparing different arrangements, analyzing results, and continuous testing, I refined the design of the phone case. The final product features a flip design on the screen side to maintain normal signal transmission. Copper, known for its ability to absorb and block signals, is used effectively in the case, supported by data from my experiments. Overall, this product efficiently protects against EMF exposure.	Innovation	Math and Physics	9	Junior
35	Robot Researchers	In my science fair project, I explore the use of Large Language Models (LLMs) for drug repurposing, focusing on interactions with the sigma-1 receptor related to neurological and psychiatric disorders. Traditionally, repurposing drugs is time-consuming, involving extensive literature reviews to identify new drug applications. My project introduces an innovative approach using LLMs, such as GPT-4, to automate this process by quickly analyzing scientific texts for drug-target interactions, potentially streamlining drug repurposing. I examine three Drug-Target Affinity Models to predict how well a drug binds to its target, using a dataset of psychotropic drugs. These models are then integrated with LLMs to assess their combined effectiveness in improving drug repurposing efforts. By converting complex affinity measurements into simpler binary classifications (high or low affinity), I aim to enhance the models' usability in real-world applications. This project not only demonstrates the potential of AI in pharmaceutical research but also aims to significantly reduce the time and cost associated with drug discovery, offering a novel approach to identifying new therapeutic uses for existing drugs.	Innovation	Engineering and Computer Sciences	10	Senior
36	Designing a More Efficient Wind Turbine	My project explores improving wind turbine efficiency by adding dimples, like those found on golf balls, to the turbine hub. Tests using 3D printed rotors in a homemade wind tunnel show promising results, with faster rotations at low wind speeds compared to standard wind turbines. Video analysis supports these findings. Further experimentation is ongoing to scale up the investigation, optimize the design and confirm the results.	Innovation	Engineering and Computer Sciences	10	Senior
71	Predicting Surgical Patient Outcomes	The project dives into the world of predictive analysis, proposing a data-driven approach to forecast surgical patient outcomes. Using the INSPIRE dataset, a publicly available dataset of perioperative medical records from a South Korean hospital over nine years, the project integrates statistics and coding into predictive models and analysis. The project aims to uncover hidden connections within the healthcare data, creating insights that can improve future medical decision-making.	Study/Discovery	Engineering and Computer Sciences	10	Senior

Exh#	Project Name	Please describe your project.	Type of Project	Project Category	Grade	Classification
77	Heat Energy From Braking - An 'Hot' New Source of Regenerative Energy?	This project will be an experiment to see how much energy can be regenerated through the heat caused by a braking system when used at certain speeds. This will be done by placing thermoelectric generators on a brake caliper of a traditional car braking system that will be recreated in a safe way that can be done safely. The energy will be measured by a voltmeter, and will be compared to how much energy that can be regenerated at a certain speed in a hybrid car that has regenerative braking.	Experiment	Engineering and Computer Sciences	10	Senior
75	Cleaner Sponges, Greener Planet	Sponges are the perfect breeding grounds for microbes and bacteria; according to a 2017 study published in the Nature Journal, a typical sponge can host more bacteria than a household toilet bowl. With 400 million sponges being thrown out each year in the US, it is imperative that we develop an empirically tested method to prolong their usage. Accessibility is key, so we are only experimenting with commonly available household materials to determine the best way to disinfect kitchen sponges. The best method is determined by its sanitizing efficacy, safety (food-safe), accessibility (of the materials), and environmental sustainability.	Experiment	Environmental Sciences	11	Senior
76	What Makes Cities Lose Their Cool?	Climate Change and Carbon Emissions have devastated our country. The Government of Canada pledged to reach net-zero greenhouse gas emissions by 2050, and there is a lot of information regarding what sectors Canada's carbon emissions come from. Less is known, however, about how socio-economic and environmental factors affect the emissions of Canadian Cities. Through statistical analysis, I aim to find the factors that keep Canada's emissions up and the best way to reduce them.	Study/Discovery	Environmental Sciences	12	Senior
78	Natural Dyes	My project is a study about natural dyes, the sustainability of them, and if they can be used as an alternative for synthetic dyes. My project focuses mainly on whether we can use natural dyes as a sustainable alternative, I dyed 6 different types of yarn (2 cellulose, 2 proteins, 2 synthetic) to 5 natural dyes. I tested each one to see how natural dye could uphold in the fashion industry. My project dives into the scientific aspect of how to dye bonds. Sustainability is the other key aspect in my project, I dive into the pollution of synthetic dyes and how sustainable dyes could be an alternative. In my project I show the process of how natural dye works and if that can be applied on a large scale. My project, with the support of my personal experiment, demonstrates the effects of synthetic dye on our planet and possible solutions.	Study/Discovery	Environmental Sciences	10	Senior
31	Electrically Shocked! Discovering the Electrical Neurological Responses to Unpredicted Feedback using Electroencephalography	Participants will wear a mobile electroencephalogram and answer a series of questions. They will then receive an unexpected response (low mark on the said quiz). In real-time this reaction will be recorded, and the EEG will indicate brain regions with increased electrical activity. The purpose is to discover brain regions linked with unexpected feedback (low-grade response) and track the entire system n how the brain processes it.	Study/Discovery	Health Sciences	10	Senior
69	Oral Health vs. Chewing Gum	Chewing gum with sugar or chewing gum without sugar, which one will increase the pH of the saliva.	Experiment	Health Sciences	10	Senior

Exh#	Project Name	Please describe your project.	Type of Project	Project Category	Grade	Classification
70	Unlocking the Mind's Eye: Exploring Vividness of Visual Imagery Questionnaire (VVIQ)'s Relationship with Sensory Processing Sensitivity (SPS)	This project investigates the relationship between the Vividness of Visual Imagery Questionnaire (VVIQ) and Sensory Processing Sensitivity (SPS), particularly in the context of aphantasia. The VVIQ measures the vividness of visual imagery, while SPS relates to an individual's heightened sensitivity to sensory stimuli. Aphantasia, the inability to visualize mental images, is explored as a potential factor influencing SPS. By analyzing existing literature and VVIQ scores, the study aims to uncover correlations between VVIQ scores and levels of sensory sensitivity. Understanding these connections can help understand how individuals process sensory information and the variability in their vivid imagery experiences.	Study/Discovery	Health Sciences	10	Senior
32	Ducks & Memory	My project is ongoing. There are multiple trials and mazes to test if my ducks have a working memory and can problem solve. I have made new discoveries.	Experiment	Life Sciences	10	Senior
73	High and Dry: Stress Hormones and the Survival of Plants in Space	In the coming years, as we return to the Moon and establish lunar bases, we'll be facing the prospect of farming in lunar habitats. With so much resources required to send plants to the Moon, it will be critical that the plants can survive—even in the mishap of a loss of pressure. In this experiment, I grew arabidopsis (Thale Cress) plants and subjected them to chemical treatments, then applied a deep-freeze and vacuum environment, much like a depressurization in space. The experiment looked at how chemically-treated plants fared in space-like conditions compared to a control group. The chemicals used in the experiment were Abscisic Acid, Salicylic Acid, and Ethylene Glycol, all of which trigger the release of regulatory proteins that protect plant cells against extreme drought.	Experiment	Life Sciences	11	Senior
74	A Comparative Analysis of Natural and Synthetic Antacids	Natural antacids are derived from substances such as calcium carbonate, commonly found in minerals or plant-based sources. In contrast, synthetic antacids are chemically engineered compounds that neutralize stomach acid to relieve heartburn or indigestion. In this project, titration is utilized to investigate the efficiency of natural and synthetic antacids in neutralizing hydrochloric acid and ultimately determine the optimal solution. Titration, a precise technique where a solution is used to determine the concentration of an analyte. In this project, it has been applied to measure the amount of hydrochloric acid consumed by each type of antacid, and their efficiency in neutralizing acid. This experiment involves adding a standardized solution of hydrochloric acid to a solution containing a known quantity of antacid until the solution is completely neutralized. By determining the volume of hydrochloric acid required for neutralization, the efficacy of each antacid in neutralizing acid can be evaluated. In this project, the comparative analysis on the relative effectiveness of natural and synthetic antacids aims to determine whether or not naturopathic antacids are more optimal than chemically engineered ones.	Experiment	Life Sciences	11	Senior
33	Measurement and determination of common sources of interference for radio astronomy	This study will be measuring (RFI) radio frequency interference through the usage of a spectrum analyzer in various locations. The overall goal of this project is to determine the extent to which human activity causes interference in radio astronomy equipment. This includes factors such as industrial activity, mobile device usage, and other artificial radio sources.	Study/Discovery	Math and Physics	10	Senior

Exh#	Project Name	Please describe your project.	Type of Project	Project Category	Grade	Classification
34	Joint Distribution Refrigerated Truck	Ordering food and groceries through delivery has become the norm in the past few years. However, the temperature regulation in refrigerated trucks today is still not maximized. When ordering food with different temperatures, they often come together in one basket, which results in the product getting ruined. For this reason, transporting all orders in one truck from a store is not effective. To transport food directly from the distribution centers would require separated refrigerated trucks with different temperature settings, which take a long time to reach the customer's location. Most companies often separate their food preservation into four different temperatures: Frozen ( $\leq -18^{\circ}\text{C}$ ), Cool ( $2-6^{\circ}\text{C}$ ), Fruits/Vegetables ( $8-10^{\circ}\text{C}$ ) and Room Temperature. To optimize the transportation time and temperature control, a truck should be able to store many temperatures at the same time while using only one reefer unit. Although companies had designed multi-compartments trucks that can store many types of product at the same time by separating the reefer units into different rooms, they are expensive and not environmentally-friendly. The distribution of cooling from the reefer unit could be shared between different temperature-controlled products by separating them with semiconductors that could divide the truck into four different sections with controlled temperature. Using partial differential equations along with GNU Octave, I can simplify the heat conduction model as a 1D rod. Then, the program can be further developed and modified to fit with different dimensions of trucks a company owns.	Innovation	Math and Physics	10	Senior
72	Reanalysis of Multi-Stellar Systems	When these multi-stellar systems were discovered, each star was modelled separately. This causes a few limitations. Firstly, this procedure does not account for uncertainty from the model of its partner star. When the data is deblended and the light received is separated between the stars, this ratio is simply a prediction generated by the program. The resulting error would in turn affect the amount of light predicted to be emitted from its partner. This feedback loop is not adequately accounted for, whereas when the stars are modelled concurrently, the uncertainty in the deblending automatically propagates to the uncertainty in the generated values. Secondly, we can assume that partner stars have the same age, composition, distance, and dust between them and Earth because of their proximity to one another currently and during their birth. If the stars are modelled separately, they will produce different values for these characteristics. However, using concurrent modelling, they can be constrained to be identical. Finally, the spectral energy distribution determines the stellar density. When the stars and planets are modelled separately, for the reasons above, it is difficult to take full advantage of this fact. Discrepancies such as this can have a large impact on predictions such as habitability, which rest on small changes in stellar surface temperature, distance from the star, and the mass of both objects. Following this setup, the data must be processed and formatted. First, the transit data can be downloaded from the NASA catalog. For most systems, we can completely rely on the transit observations from the Transiting Exoplanet Survey Satellite. However, due to limited observations of certain systems, this data may be insufficient. It is preferable to use an amount of data comparable to the discovery paper, so in some cases supplementary sectors of data must be sourced from other telescopes. Normally, when NASA reduces the planetary transit data into numerical values, they automatically remove the computed contribution from neighboring stars, or in other words, the background noise, as the observed transit depth is as we would see if it were undiluted. However, the	Study/Discovery	Math and Physics	11	Senior