



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

Name(s) Esther H. Chung	Project Number J0905
Project Title The World: Hot n' Exhausted by Exhaust	
Objectives/Goals The objective is to determine if there is a difference in the amount of carbon dioxide in car exhaust emitted from the use of the 3 different gas grades to find which gas grade people should use to emit the least carbon dioxide possible as the problem of global warming becomes more severe.	
Abstract Methods/Materials Fifteen mL of water and 10 drops of bromothymol blue indicator solution were put in each of the test tubes. A nearly pure carbon dioxide sample in a balloon was made with vinegar & baking soda. Then, the car was filled with premium/mid-grade/regular gas (each of the gas grades separately tested). The engine was turned on and each balloon was inflated until it had a 6.5 inch diameter. After obtaining the samples from the tailpipe into the balloons, each of the balloons' necks was slipped over its respective test tube (BTB indicator + water solution). The color changes of the solution in the test tube were recorded and timed. Then each of the samples were titrated by diluted ammonia drops; the number of drops needed to turn the solution back to its original blue color were counted, as well. The car was taken for smog checks for accurate percentages of carbon dioxide in its exhaust.	
Results The order of the gas grades, producing the greatest to least amount of carbon dioxide in the exhaust, was premium, regular, and lastly mid-grade. The number of diluted ammonia drops required to turn the BTB indicator + water solution back to its blue color, the average time to change color (from blue to green or yellow when the gas samples are put into the test tubes), the changed color, and the smog check results were taken into account. Mid-grade needed the least ammonia drops, took the longest time to change color, turned a bluish dark green (closest color to control), and had the lowest percentages of CO ₂ in the smog check readings, signifying that the mid-grade samples had the least CO ₂ . The closest results to the mid-grade samples were that of mid-grade and then premium.	
Conclusions/Discussion My conclusion is that mid-grade is the gas grade that when used would emit the least amount of carbon dioxide in the exhaust. To slow down global warming, the application of mid-grade instead of premium and regular, would be extremely helpful.	
Summary Statement This project is centered on determining the car gas grade that when used would give off the least amount of carbon dioxide in the car's exhaust or tailpipe emission.	
Help Received Parents helped obtain exhaust gas samples; Mr. Terry Newell (US EPA National Vehicle and Fuel Emissions Laboratory) gave useful info for research; Mother helped with pasting items on board and getting materials; Mrs. Williams helped develop SF topic.	