



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Kristen H. Mizutani	Project Number J2224
Project Title Automobile Window Tinting: Impacts on UV Penetration	
Abstract Objectives/Goals The goal of the project was to evaluate the relationship between the degree of tinting on a car window and transmission of harmful ultraviolet light (UVA or UVB). A secondary goal was to evaluate the effect of the location of the window (driver versus rear passenger) on the transmission of harmful UVA and UVB. My hypothesis was that tinted car windows would significantly reduce UVA transmission compared to ordinary windows. Methods/Materials I utilized two ways of measuring UVA and UVB light. UV beads (there are many sources for UV beads) can be used to estimate far UV light. These originally colorless beads change color with exposure to UV light. However, it is unknown the relationship between the color changes and the amount of UVA light or UVB light causing the change. Therefore, I employed a UVA meter (National Biological Corporation model #UVA-400C) and a UVB meter (National Biological Corporation model #UVB-500C) to measure UV transmission. Results All 112 windows in 28 automobiles had UVB meter readings of 0mW/cm ² . The mean direct sunlight UVB meter reading (control) was 0.13mW/cm ² . Results revealed that the driver's side window (tempered glass) allowed the highest transmission of UVA with a mean of 1.24 mW/cm ² (std. dev. = 0.45) compared to front laminated windshields with UVA meter readings of 0mW/cm ² in all 28 cars. Direct sunlight (control) had a mean UVA meter reading of 10.74 mW/cm ² . I found that different degrees of tint resulted in varying UVA transmissions. Light tint had a mean UVA transmission of 0.57mW/cm ² (std. dev.= 0.14). Medium tint had a mean UVA of 0.33 mW/cm ² (std. dev. = 0.14). The darkest tint had a mean UVA reading of 0.16 mW/cm ² (std. dev. = 0.08). Through performing this experiment, I also found a correlation between specific color changes of UV detecting beads and specific transmission of UVA. Conclusions/Discussion I documented an inverse relationship between UVA light transmission and the amount of tint in a car window. The darkest tint almost completely blocked UVA transmission. I found the least protective window was located on the driver's left side. A study I read said that photoaging of the skin and premalignant skin cancers are more common on the side of the face nearest the driver's left side window.	
Summary Statement The goal of my project was to evaluate the relationship between the degree of tinting on a car window and transmission of UVA or UVB light, and also to correlate UV detecting bead colors to specific transmission of UVA.	
Help Received Thanks to my parents, who drove me to automobile lots to perform my tests. Thanks to the Lexus dealership for allowing me to test their cars. Thanks to my science teacher for her guidance.	