



**CALIFORNIA STATE SCIENCE FAIR  
2005 PROJECT SUMMARY**

<b>Name(s)</b> <b>Shaheen Jeeawoody</b>	<b>Project Number</b> <b>J0920</b>
<b>Project Title</b> <b>The Photochemical Formation of Ozone at Ground Level and Its Effects on Some Plants</b>	
<b>Abstract</b> <b>Objectives/Goals</b> Airborne pollutants contribute to poor air quality and smog in many cities. The main cause of smog is ozone. I wanted to investigate how ozone is formed at ground level, measure the ozone concentrations at varying traffic locations during different weather conditions and test the effect of ozone on some plants. <b>Methods/Materials</b> I designed experiments using clear plastic bags filled with ambient air, car exhaust fumes(NOx) and paint thinner (VOC) to measure the level of ozone formed in the presence and absence of sunlight. I measured the ozone levels on sunny and cloudy days at 5 different sites. I compared the effect of ozone on marigold seedlings, radish seeds, and lichen and moss in an ozone chamber with controls over a 15-day period. <b>Results</b> After 7 hours, the ozone level was only 4 ppb in the bag containing ambient air without sunlight but the ozone levels increased by 3 times in the presence of sunlight, 6 times in the presence of VOC, 18 times in the presence of NOx, and 24 times in the presence of NOx and VOC. Ozone levels increased to reach a maximum between 12:30 and 1:30 pm on both sunny days and cloudy days. On sunny days, the highest ozone levels were measured at B (overpass Freeway) and D (south side gas station) with a peak of 49 ppb. After 15 days, the control marigold seedlings grew 200% in height while the ozone-exposed grew only 100%. After 7 days, 24% of the control radish seeds sprouted compared to 3% in the ozone chamber. After 5 days, the control lichen and moss was thriving and green while the ozone-exposed was shriveled with some brown patches. <b>Conclusions/Discussion</b> Ozone is formed in a photochemical reaction between sunlight, NOx, and VOC. The ground level ozone concentration increases due to high motor activity and gasoline fumes in the presence of sunlight. Ozone has a negative effect on plants as it stunts growth and hinders germination. Therefore, ground level ozone is a pollutant and not a friend to the environment. During the long hot days of summer, ground level ozone concentrations can increase dramatically, leading to poor air quality. Levels of above 125 ppb are considered unhealthy and can cause many health problems. Special steps need to be taken to reduce emissions of pollutants. These include carpooling, using public transportation, conserving energy, and using household and garden chemicals wisely.	
<b>Summary Statement</b> This project determined the impact of airborne pollutants (NOx and VOC) due to human activities on ozone formation at ground level and the effect of ozone on some plants.	
<b>Help Received</b> My mother helped me get the materials needed and drove me around to testing sites. My father helped me with the graphs and my sister marked the 250 testcards I used.	