Save Smog City 2 from Ozone
Student Worksheet

1. Access the Smog City 2 web site at www.smogcity2.org.

2. Select "Save Smog City 2 from Ozone."

3. Once Smog City 2 loads to your computer, take note of the areas of Smog City 2, including *Weather Condition*s, *Emissions Levels* and *Population*. All areas have "clickable" choices. Mouse-over or click on the choices.
- NOTE: in the information box at the bottom of the screen, there is information about each choice.

4. Notice how each of the choices are pre-set to a certain level. These are called the *default settings*. You can use the reset button at any time to return to the default settings. In the chart below, **circle** or **highlight** the default setting for each choice. The first setting, *Sunlight*, has already been completed for you.

Weather Conditions	Choices Included in the Area:
Sunlight :	Clear -Partly Cloudy - Cloudy
Inversion Layer:	No inversion - Low inversion - High inversion
Wind Speed:	Calm - Light Breeze - Breezy - Windy
Maximum Daily Temperature:	30ºF **-** 40 ºF - 50ºF - 80ºF - 90ºF - 100 ºF - 110 ºF

Emission	Choices Included in the Area:
Energy Sources –	Some energy sources produce more smog-producing emissions than others.(level 1 is cleaner sources like a wind or solar technology, level 3 produces more smog like a coal-fired power plant) Levels: 1 2 3
Cars and Trucks –	This includes Passenger vehicles (all sizes), large and medium trucks, motorcycles Levels: 1 2 3 4 5
Off Road Vehicles –	This includes airplanes, trains, power boats, earth movers, tractors, harvesters, forklifts, bulldozers, backhoes Levels: 1 2 3 4 5

Consumer Products-	This includes paint thinner, charcoal lighter fluid, glue or other adhesives, gasoline Levels: 1 2 3 4 5
Industry –	This includes manufacturing facilities, power plants, oil refineries/storage/distribution centers, food and agricultural processing Levels: 1 2 3 4 5

Area Name:	Choices Included in the Area:
Population – Population in Smog City 2 affects air quality. Changing population, as shown by the "total emissions" chart and the emission sources in the cityscape, affects VOCs, NO_x and SO_2. The compounds react to form ground-level ozone and particle pollution. When temperatures are cool, changing population also changes the usage of wood-burning stoves, which emit particle pollution	In Smog City 2, you can increase the population from near-zero to about two million people. Levels: 1 2 3 4 5

5. Observe the AQI (Air Quality Index) box in the lower right corner. The default settings, which are circled above, result in a "red", or "Unhealthy" AQI for ground-level ozone. The health message is: "Active children and adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion; everyone else, especially children, should limit prolonged outdoor exertion."

Scenario 1: Emission Sources

1. Minimize the "Save Smog City 2 from Ozone!" instructions at the top of the screen.

2. Turn only Cars and Trucks control to 1. Leave all other choices at the default settings. Record what happens on the Student Worksheet in the table below. Use the reset button to return the Cars and Trucks control to 4, so all controls are in default position.

3. Turn only Off Road down to 1. Leave all other settings alone. Record what happens on the Student Worksheet. Use the reset button to return the Off Road control to the middle setting, so all controls are in default position.

Student Worksheet

Energy Sources	Cars & Trucks	Off Road	Consumer Products	Industry	Air Quality Index (AQI) Color | message | value
Default					Red – Unhealthy – 175??
2	**1**	3	3	3	
2	4	**1**	3	3	

4. Using the worksheet below, adjust each of the remaining controls noted in red and record the result in the worksheet.

Student Worksheet

Energy Sources	Cars & Trucks	Off Road	Consumer Products	Industry	Air Quality Index (AQI) Color | message | value
2	4	3	**1**	3	
2	4	3	3	**1**	
1	4	3	3	3	

5. Turn all Emission controls to level 1. What is the AQI? Why?

6. Using the reset button, return all Emission controls to the middle setting. Turn the Population control to level 1. What is the AQI? Why?
(Hint: Click the Population icon and read the information under "What Is This?" in the "Information" box.)

Scenario 2: Weather

1. Reset all Emission controls to the middle setting. What is the AQI level?

2. Increase only the temperature control to 110 ºF. Check the black sign in the cityscape for the temperature. How does this affect the AQI? Why?

3. Now move the cloud cover to Cloudy (level 3). How does sunlight affect ozone formation? Why?

CLASS / GROUP DISCUSSION

In a Class or Group Discussion based on all the data collected, answer the following questions on the Student Worksheet:

1. Was there any one variable that seemed to have a greater increase in ozone than others tested? Which one?

2. What steps could be taken to control emissions levels?

3. Can you think of ways to reduce ozone levels?