



Name: _____

Group: _____

Smog City

PART 1: SMOG CITY EXPERIMENT

1. Access the Smog City web site.
2. Select and click on "Run Smog City" from the left-side navigation bar.
 - NOTE: Smog City is a JAVA Applet that runs in your Microsoft Internet Explorer or Netscape Navigator browser. For offline use, follow the *Download link* for instructions on downloading Smog City to your computer.
3. Once Smog City loads to your computer, take note of the areas of Smog City, including *Weather Condition*, *Population Level*, and *Emissions Levels*. All areas have "clickable" choices. Mouse-over or click on the choices.
 - NOTE: in the status bar at the bottom of the screen, there is information about each choice.
4. Click the **Red "Reset"** button.
5. Look at all the choices again. Notice how each of the choices are pre-set to a certain level. These are called the *default settings*. In the chart below, **circle** or **highlight** the default setting for each choice. The first setting, *Maximum Daily Temperature*, has already been completed for you.

Smog City Choices

Area Name:	Choices Included in the Area:
Select Weather Conditions	Maximum Daily Temperature – 80°F 90°F 100°F 110°F 120°F Inversion Layer – Low inversion High inversion No inversion Wind Speed – Calm Light Breeze Breezy Windy Sunlight – Cloudy Partly Cloudy Clear

Select Population Level	Population – 0 ½ current current ½ x current 2x current
Select Emissions Levels	<p>Cars and Trucks – includes Passenger vehicles (all sizes), large and medium trucks, motorcycles Levels: 1 2 3 4 5</p> <p>Off Road Vehicles – Airplanes, trains, power boats, earth movers, tractors, harvesters, forklifts, bulldozers, backhoes Levels: 1 2 3 4 5</p> <p>Industry – Manufacturing facilities, power plants, oil refineries/storage/distribution centers, food and agricultural processing Levels: 1 2 3 4 5</p> <p>Consumer Products – Hair spray, oil-based paints, paint thinner, charcoal lighter fluid, glue or other adhesives, gasoline Levels: 1 2 3 4 5</p>

6. Click the **Red “Reset”** button to make sure that the defaults are set.
7. Click on the **Green “Start”** button. Record what happens in the table below:

Settings	Health Effects at Peak Ozone Level
<ul style="list-style-type: none"> ▪ Default 	

8. Turn all of the Emissions Levels dials down to 1. Leave all other choices at the default settings. Click the **Green “Start”** button. Record what happens in the table below.
9. Turn only the Cars and Trucks dial up to 2. Leave all other settings alone as illustrated in the table on the next page.

10. Click the **Green “Start”** button and record what happens in the table below. Continue to change the settings and record the results in the table below.

Cars & Trucks	Off Road	Industry	Consumer Products	Health Effects at Peak Ozone Level
1	1	1	1	
2	1	1	1	
3	1	1	1	
4	1	1	1	
5	1	1	1	

11. Click on the **Red “Reset”** button.

12. Again, turn all of the Emissions Levels dials down to 1. Now, turn up the Off Road dial up to 2, leave all other settings alone, and click on the **Green “Start”** button.

- What were the resulting Health Effects at Peak Ozone Level?

13. Continue the same procedure with the other dials, Industry and Consumer Products.

- What were the resulting Health Effects at Peak Ozone Level for ALL of the other settings?

- Which type of Emissions had the greatest affect on Ozone Levels?

14. Now that you are familiar with the basics of Smog City, you are going to design your own experiment. The experiment will involve changing the Population Level and Emissions Levels, choices that humans have control over. The experiment must be written in the Scientific Method format on the next page. The explanations below may help you with your experiment.

- **Hypothesis** – a question or idea that you might have about the relationship between Population Levels and Emissions Levels. For example; As Population Levels decrease, Consumer Products will increase, resulting in unhealthy levels of ozone.
- **Experiment** – select the appropriate choices described in your hypothesis and run the experiment by clicking on the green “Start” button. Make sure to write, in detail, the steps you took running your experiment. Also make sure to make write down any observations you might make while performing your experiment. Remember, the steps in the experiment must be written clearly and in enough detail that someone else could read and follow your instructions to duplicate your experiment.
- **Data** – collect and record the data from the experiment, including the Health Effects at Peak Ozone Levels resulting from your choices.
- **Conclusions** – reflect upon the choices you made and the resulting data and discuss (explain) if the data supports your hypothesis. If the data does not support your hypothesis, explain what you think may have occurred and how you would change your hypothesis.

SMOG CITY STUDENT EXPERIMENT

Name: _____

Hypothesis:

Experiment:

Data:

Conclusions:

15. Would you change any part of your experiment? If so, restate your hypothesis and run the experiment under the new conditions. Obtain another Smog City Student Experiment worksheet if necessary.

PART 2: CLASS / GROUP DISCUSSION

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

1. Was there any one variable that seemed to have a greater increase in smog 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?
4. How could a population increase occur without an increase of emissions?