**Smog City** Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_

Go to [www.smogcity.com](http://www.smogcity.com) and click on the link that says "run smog city". Be patient, it may take a little while to load. There are six variables you can manipulate in the simulation. You will be manipulating the variables to discover the answers to the following questions

Air speed (little windmill)  
Inversion level - height of air mass that traps pollution (looks like a black stripe)  
Temperature (thermometer)  
Cloud cover (clouds)  
Population (plain meter)  
Emissions (dials at the bottom)

1. 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.

|  |  |
| --- | --- |
| **Area Name:** | **Choices Included in the Area:** |
| **Select Weather Conditions** | **Maximum Daily Temperature** 80ºF - 90ºF **- 100ºF** - 110ºF - 120ºF  **Inversion Layer** Low inversion - High inversion - No inversion |

1. Click the **Red “Reset”** button to make sure that the defaults are set.
2. Click on the **Green “Start”** button. Record what happens in the box below.

|  |  |
| --- | --- |
| **Settings** | **Health Effects at Peak Ozone Level** |
| * + Default |  |

1. 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 on the in the box below.
2. Turn only the Cars and Trucks dial up to 2. Leave all other settings alone as illustrated in the chart below.
3. Click the **Green “Start”** button and record what happens on the Student Worksheet. Continue to change the settings according to the instructions below and record the results in the table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **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 |  |

2. Click on the **Red “Reset”** button.
3. 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. Record what happens on the box below.

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

1. Continue the same procedure with the other dials, Industry and Consumer Products. Answer the questions on the Student Worksheet.

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

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

1. 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. Use the outline below to design your experiment.
   * **Hypothesis** –
   * **Experiment** –
   * **Data** –

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Cars &  Trucks** | **Off Road** | **Industry** | **Consumer  Products** | **Health Effects at Peak Ozone Level** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

* + **Conclusions** –

1. Would you change any part of your experiment? If so, restate your hypothesis and run the experiment under the new conditions. Write a few sentences to update your conclusions based on your revised experiment.

**PART 2: Student Questions**

1. How does air speed and wind effect the level of smog in the city?

2. How does temperature affect the level of smog in the city?

3. Which type of emission has the greatest affect on air quality?

4. Would you expect there to be more smog on a cloudy day or a clear day?

5. Reset your simulator and try to create the WORST conditions for smog in your city - you should be able to get the air quality index up to unhealthy levels. What is the setting for each of your variables to produce the nastiest city?

6. What is AQI? What levels are there for air quality?

7. Why are children most at risk from ozone? What is a VOC?

8. What kinds of things can be done to improve air quality? List three things.

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

10. What steps could be taken to control Emissions Levels?

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

12.How could a population increase occur without an increase of emissions?