

Name: \_\_\_\_\_ Teacher Version \_\_\_\_\_ Date: \_\_\_\_\_ Class/Period: \_\_\_\_\_

**Lesson 4.2: Smog City!****Directions:**

Go to <http://www.smogcity2.org>, then click on Create your own Smog City 2 experience found at the lower left hand part of the page.

Before beginning click on “How to use controls” which appears at the upper left hand part of the new page. Read through the directions and then you can continue.

The air particle levels and ground level ozone is low at the beginning of this simulation. Your objective is to predict what will happen when you move one of the ten controls for weather, emissions or population. Then try moving the control. Record what happened to the levels.

Reset the simulation and try this two more times with one different control each time.

<b>Control Moved</b>	<b>Prediction</b>	<b>Level Changes</b>
<i>There are 4 potential weather controls they can move:</i> 1. Cloud/sky cover 2. Inversion 3. Wind 4. Temperature	<i>Answers will vary</i>	<i>If they change any ONE weather characteristic, the health will always remain “GOOD” and the Air quality will stay “Good”</i>
<i>There are 5 emissions controls they can move:</i> 1. Energy Sources 2. Cars and trucks 3. Off Road 4. Consumer Products 5. Industry	<i>Answers will vary</i>	<i>If they change any ONE emission characteristic, the health will always remain “GOOD” and the Air quality will stay “Good”</i>
There is 1 population control they can move: 1. Population	<i>Answers will vary</i>	<i>If they only change the population size, the health will always remain “GOOD” and the Air quality will stay “Good”</i>

Now try it again but move two or three controls of your choice at one time. The important part is to first record the controls you will be moving and make a prediction before you move them.

Controls Moved	Prediction	Level Changes
<i>Answers will vary. Different combinations of two or more factors will result in unhealthy air quality.</i>		

**Conclusions:**

1. What do you think are the two most important factors in causing unhealthy air pollution levels to increase in a city? Explain why using what happened in the simulation.
2. What can cities do to lower air pollution? Use what happened in the simulation to support your response.

*Answers will vary, the basic ideas associated with this simulation are*

- *Sunlight accelerates the chemical reactions that form ozone. Clouds reduce sunlight and slow ozone formation. Particle pollution forms more quickly when there is moisture or*

*cloud droplets in the air and increasing cloud cover speeds up particle pollution formation.*

- *A temperature inversion is a layer of warm air above the ground that traps particle pollution and ground-level ozone below it. This ‘lid’ prevents air from mixing upward as it normally does.*
- *Winds blow emissions from the pollution source to other areas. Calm winds cause emission levels to build up, or increase.*
- *Heat increases the chemical conversion of emissions to ozone and particle pollution. Lower temperatures enable gaseous emissions to convert into particles.*
- *All forms of electricity production affect the environment. Most of the electricity in the US is generated from fossil fuels such as coal, natural gas, and oil. Emissions from burning of fossil fuels can lead to smog, acid rain and haze. Renewable energy like hydroelectric power, wind and solar technologies produce significantly fewer emissions than traditional power generation technologies.*
- *Most all modes of transportation also release emissions due to burning fossil fuels*
- *Some consumer products like hair spray, paints, paint thinner, charcoal lighter fluid, glue, adhesives and gasoline add VOCs to the environment.*
- *Manufacturing facilities power plants, oil refineries and distribution centers, and food and agricultural processing also add to emissions by burning fossil fuels.*

*Although the weather plays a major role in air pollution, it cannot be controlled therefore students should be discussing ways of limiting emissions that are realistic and is supported by the data they provided above.*