

Name _____ Section _____

Activity 16: Consequences of Chemical Energy**16.1 What is Particulate Pollution?****1) Sources of Particulate Pollution**

- a) Light a candle and carefully hold a glass plate above the candle flame. What is the soot that appears on the glass made of? _____
- b) Your instructor will demonstrate the combustion of various materials. Predict which materials will produce the most and the least particulate pollution.

Which fuel sources produce high levels of soot? Which produce low levels?

	Prediction	Answer
Alcohol	_____	_____
Natural Gas	_____	_____
Oil	_____	_____
Lighter fluid	_____	_____
Wax candle	_____	_____

- c) Many filling stations sell gasohol as vehicle fuel. What is gasohol? What advantage does it have over straight gasoline as a vehicle fuel?
- d) Does an electric glow coil produce soot? _____ Does this mean there is no soot involved with the use of electrical energy? _____ Why or why not?

2) Detecting and Removing Particulate Pollution

- a) Your instructor will demonstrate a laser.
What is a laser beam?

How can a laser beam detect particulate pollution?
- b) What is the purpose of an electrostatic precipitator?
- c) How does the electrostatic precipitator work? Why does it require a high voltage?

16.2 How Do Combustion Gases Pollute?

3) Complete and Incomplete Combustion

- a) Which carbon-oxygen compound is produced in complete combustion reactions of hydrocarbons, such as the combustion of wood, oil, or gasoline?
- b) What is meant by an incomplete combustion reaction?
- c) In incomplete combustion reactions, which carbon-oxygen compound is produced?
- d) What can be done to correct incomplete combustion?

4) Dangers of Carbon Monoxide

- a) Why is carbon monoxide dangerous to your health?
- b) What are sources of carbon monoxide in a home?
- c) How can carbon monoxide be detected?
- d) What are the symptoms of carbon monoxide poisoning?
- e) What should you do if you suspect carbon monoxide poisoning?

5) Acid Rain

- a) What is acid rain?

- b) What is the source of the oxides of sulfur that produce acid rain?

- c) What is the source of oxides of nitrogen that produce acid rain?

- d) What damage can be done by acid rain?

6) Photochemical Smog

- a) What is photochemical smog?

- b) What is the primary source of the pollutants that cause smog?

- c) What harm can smog do?

- d) What can be done to reduce smog?

7) Inversions

- a) On a sunny day, how does the temperature of air near the ground compare with the temperature of air higher up? Why?

- b) What is the cause of convection currents?
- c) What role does the motion of convection currents play in the temperature structure of the atmosphere?
- d) What is an inversion?
- e) Why are inversions an important consideration in the study of pollution?

16.3 Depletion of the Ozone Layer

- a) Ozone in the lower atmosphere is produced during the formation of smog. What role does the ozone layer in the higher atmosphere (stratosphere) play?
- b) How is ozone formed in the upper atmosphere?
- c) How do ozone molecules absorb ultraviolet radiation?
- d) In recent decades, large holes in the ozone layer have been detected. How do jet plane engines contribute to the depletion of the ozone layer?
- e) What other class of chemicals can cause depletion of the ozone layer?
- f) What danger to human health is associated with the depletion of the ozone layer?
- g) Group Discussion Question: Is ozone harmful or helpful?

16.4 The Greenhouse Effect and Global Warming

8) The Greenhouse Effect

- a) What form of energy is absorbed by the Earth's surface?
- b) What form of energy is emitted by the Earth's surface?
- c) How does the amount of energy that reaches the Earth compare to the amount of energy that leaves the Earth?
- d) What can block the radiation emitted by the Earth from escaping into space?
- e) What is the Greenhouse Effect?
- f) Is the Greenhouse Effect helpful or harmful to life on Earth?

9) Global Warming

- a) What could happen to the energy balance of the Earth if the concentration of greenhouse gases in the atmosphere is increased?
- b) Which biological process helps to reduce carbon dioxide in the atmosphere?
- c) What human activities contribute to the concentration of greenhouse gases?
- d) What consequences could result if the average temperature of the Earth increases?

10) Thermal Pollution

- a) Electric generating plants heat water into steam to turn turbines. What waste product is emitted by all such heat engines?
- b) Why are most electric generating plants located along large bodies of water?
- c) What environmental damage can this thermal pollution cause?

11) Group Discussion Question: Fill in the summary of the types of pollution.

Type of pollution	Substances involved	Sources of Pollutants	Effect on environment
Ozone layer depletion			
Acid rain			
Particulate matter			
Smog			
Global Warming			
Thermal Pollution			