**Study Guide: Unit 7 Atmospheric Pollution**

Hints: Look over notes and/or handouts 10 minutes EVERY night. If you feel insecure about a topic, look for self-help videos online. Come see me in the morning, bear time, or afternoon! Play the Kahoots I send to you. Check out the website hchscollier.weebly.com! Most of all, if you believe in yourself as much as I do, you will be AMAZING!

*Big Idea: Air pollution has many sources and effects, both indoors and outdoors. Air is a natural resource that covers the Earth and crosses many system boundaries. Human activities affect the quality of the air both indoors and outdoors. Through legislation, the Clean Air Act regulates the emission of air pollutants that affect human health. The gases and particulates in the atmosphere come from both natural and human sources; once air pollution sources are identified, methods can be used to reduce it.*

**7.1 Introduction to Air Pollution**: “I can” **describe** the sources and effects of air pollutants.

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| In class | I can | Priority Standards |
|  |  | Coal combustion releases air pollutants including carbon dioxide, sulfur dioxide, toxic metals, and particulates. |
|  |  | The combustion of fossil fuels releases nitrogen oxides into the atmosphere. They lead to the production of ozone, formation of photochemical smog, and convert to nitric acid in the atmosphere, causing acid rain. Other pollutants produced by fossil fuel combustion include carbon monoxide, hydrocarbons, and particulate matter. |
|  |  | Air quality can be affected through the release of sulfur dioxide during the burning of fossil fuels, mainly diesel fuels. |
|  |  | Through the Clean Air Act, the Environmental Protection Agency (EPA) regulated the use of lead, particularly in fuels, which dramatically decreased the amount of lead in the atmosphere. |
|  |  | Air pollutants can be primary or secondary pollutants. |

**7.2 Photochemical Smog:** “I can”  **explain** the causes and effects of photochemical smog and methods to reduce it AND **explain** the causes and effects of photochemical smog and methods to reduce it.

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| In class | I can | Priority Standards |
|  |  | Photochemical smog is formed when nitrogen oxides and volatile organic hydrocarbons react with heat and sunlight to produce a variety of pollutants. |
|  |  | Many environmental factors affect the formation of photochemical smog. |
|  |  | Nitrogen oxide is produced early in the day. Ozone concentrations peak in the afternoon and are higher in the summer because ozone is produced by chemical reactions between oxygen and sunlight. |
|  |  | Volatile Organic Compounds (VOCs), such as formaldehyde and gasoline, evaporate or sublimate at room temperature. Trees are a natural source of VOCs. |
|  |  | Photochemical smog often forms in urban areas because of the large number of motor vehicles there. |
|  |  | Photochemical smog can be reduced through the reduction of nitrogen oxide and VOCs. |
|  |  | Photochemical smog can harm human health in several ways, including causing respiratory problems and eye irritation. |

**7.3 Thermal Inversion:** “I can” **describe** thermal inversion and its relationship with pollution.

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| In class | I can | Priority Standards |
|  |  | During a thermal inversion, the normal temperature gradient in the atmosphere is altered as the air temperature at the Earth’s surface is cooler than the air at higher altitudes. |
|  |  | Thermal inversion traps pollution close to the ground, especially smog and particulates. |

**7.4 Atmospheric CO2 & Particulates:** “I can”  **describe** natural sources of CO2 and particulates.

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| In class | I can | Priority Standards |
|  |  | Carbon dioxide appears naturally in the atmosphere from sources such as respiration, decomposition, and volcanic eruptions. |
|  |  | There are a variety of natural sources of particulate matter. |

**7.5 Indoor Air Pollutants:** “I can” **identify** indoor air pollutants AND describe the effects of indoor air pollutants.

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| In class | I can | Priority Standards |
|  |  | Carbon monoxide is an indoor air pollutant that is classified as an asphyxiant. |
|  |  | Indoor air pollutants that are classified as particulates include asbestos, dust, and smoke. |
|  |  | Indoor air pollutants can come from natural sources, human-made sources, and combustion. |
|  |  | Common natural source indoor air pollutants include radon, mold, and dust. |
|  |  | Common human-made indoor air pollutants include insulation, Volatile Organic Compounds (VOCs) from furniture, paneling and carpets; formaldehyde from building materials, furniture, upholstery, and carpeting; and lead from paints. |
|  |  | Common combustion air pollutants include carbon monoxide, nitrogen oxides, sulfur dioxide, particulates, and tobacco smoke. |
|  |  | Radon-222 is a naturally occurring radioactive gas that is produced by the decay of uranium found in some rocks and soils. |
|  |  | Radon gas can infiltrate homes as it moves up through the soil and enters homes via the basement or cracks in the walls or foundation. It is also dissolved in groundwater that enters homes through a well. |
|  |  | Exposure to radon gas can lead to radon-induced lung cancer, which is the second leading cause of lung cancer in America. |

**7.6 Reduction of Air Pollutants:** “I can”  **explain** how air pollutants can be reduced at the source.

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| In class | I can | Priority Standards |
|  |  | Methods to reduce air pollutants include regulatory practices, conservation practices, and alternative fuels. |
|  |  | A vapor recovery nozzle is an air pollution control device on a gasoline pump that prevents fumes from escaping into the atmosphere when fueling a motor vehicle. |
|  |  | A catalytic converter is an air pollution control device for internal combustion engines that converts pollutants (CO, NOx, and hydrocarbons) in exhaust into less harmful molecules like CO2, N2, O2 and H2O |
|  |  | Wet and dry scrubbers are air pollution control devices that remove particulates and/or gases from industrial exhaust streams. |
|  |  | Methods to reduce air pollution from coal-burning power plants include scrubbers and electrostatic precipitators. |

**7.7 Acid Rain**: “I can”  **describe** acid deposition AND **describe** the effects of acid deposition on the environment.

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| In class | I can | Priority Standards |
|  |  | Acid rain and deposition is due to nitrogen oxides and sulfur oxides from anthropogenic and natural sources in the atmosphere. |
|  |  | Nitric oxides that cause acid deposition come from motor vehicles and coal-burning power plants. Sulfur dioxides that cause acid deposition come from coal-burning power plants. |
|  |  | Acid deposition mainly affects communities that are downwind from coal-burning power plants. |
|  |  | Acid rain and deposition can lead to the acidification of soils and bodies of water and corrosion of human-made structures. |
|  |  | Regional differences in soils and bedrock affect the impact that acid deposition has on the region—such as limestone bedrock’s ability to neutralize the effect of acid rain on lakes and ponds. |

**7.8 Noise Pollution:**  “I can”  **describe** human activities that result in noise pollution and its effects.

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| In class | I can | Priority Standards |
|  |  | Noise pollution is sound at levels high enough to cause physiological stress and hearing loss. |
|  |  | Sources of noise pollution in urban areas include transportation, construction, and domestic and industrial activity. |
|  |  | Some effects of noise pollution on animals in ecological systems include stress, the masking of sounds used to communicate or hunt, damaged hearing, and causing changes to migratory routes. |

**9.1 Stratospheric Ozone Depletion:**  “I can” **explain** the importance of stratospheric ozone to life on Earth.

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| In class | I can | Priority Standards |
|  |  | The stratospheric ozone layer is important to the evolution of life on Earth and the continued health and survival of life on Earth. |
|  |  | Stratospheric ozone depletion is caused by anthropogenic factors, such as chlorofluorocarbons (CFCs), and natural factors, such as the melting of ice crystals in the atmosphere at the beginning of the Antarctic spring. |
|  |  | A decrease in stratospheric ozone increases the UV rays that reach the Earth’s surface. Exposure to UV rays can lead to skin cancer and cataracts in humans. |

**9.2 Reducting Ozone Deplation:**  “I can”  **describe** chemicals used to substitute for chlorofluorocarbons (CFCs).

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| In class | I can | Priority Standards |
|  |  | Ozone depletion can be mitigated by replacing ozone-depleting chemicals with substitutes that do not deplete the ozone layer. Hydrofluorocarbons (HFCs) are one such replacement, but some are strong greenhouse gases. |