# AP Environmental Science
# Review of Common Ambient Air Pollutants

| Name | Criteria | $1^o$ / $2^o$ | Source & Impact |
|---|---|---|---|
| 1. Carbon monoxide (CO) | Yes | $1^o$ | Sources: Incomplete combustion of fuel, combustion of waste. |
| | | | Impact: Out competes $O_2$ for hemoglobin, potentially suffocating. |
| 2. Lead (Pb) | Yes | $1^o$ | Sources: Exhaust fumes from leaded gasoline, metal smelting. |
| | | | Impact: A heavy metal that is toxic to nerve cells. |
| 3. Nitrogen dioxide ($NO_2$) | Yes | $1^o + 2^o$ | Sources: Transportation (cars, trucks, trains, boats & planes), electrical utilities and some factories. $N_2 + O_2 \rightarrow NO_2$ |
| | | | Impact: A component of photochemical smog and acid deposition. |
| 4. Particulate matter (suspended particulate matter / SPM) | Yes | $1^o + 2^o$ | Sources: Soot and $SO_2$ from coal combustion, dust from human activities, natural dust sources |
| | | | Impact: Inhalation causes respiratory diseases, ranging from asthma to respiratory distress and lung cancer |
| 5. Sulfur dioxide ($SO_2$) | Yes | $1^o$ | Sources: Combustion of coal and petroleum. |
| | | | Impact: Reacts in atmosphere to form $SO_3$ and $H_2SO_4$, components of acid deposition. (see reactions sheet) |
| 6. Tropospheric ozone ($O_3$) (aka: ground level ozone) | Yes | $2^o$ | Sources: Reaction of NO from motor vehicles with sunlight, heat and $O_2$ |
| | | | Impact: Damage to plants and respiratory system, traps heat, and contributes to thermal inversion |
| 7. Carbon dioxide ($CO_2$) | No | $1^o$ | Sources: Combustion of any organic material. Gasoline, petroleum, coal, natural gas, biomass. Also respiration. |
| | | | Impact A greenhouse gas, $CO_2$ absorbs thermal radiation and re-emits it at lower wavelengths. |
| 8. Mercury (Hg) | No | $1^o$ | Sources: Combustion of coal. |
| | | | Impact: A heavy metal that is toxic to nerve cells. Capable of bioaccumulation and biomagnification. |
| 9. Nitric Oxide (NO) | No | $1^o$ | Sources: Transportation (cars, trucks, trains, boats & planes). High heat of engine causes $O_2 + N_2 \rightarrow NO$ |
| | | | Impact: Poisonous. Reacts with $O_2$ to form $NO_2$, leading to ground-level ozone production. |
| 10. Nitric Acid ($HNO_3$) | No | $2^o$ | Source: Transportation (cars, trucks, trains, boats and planes). $NO_2 + H_20 \rightarrow NO + HNO_3$ |
| | | | Impact: Contributes to acid deposition. Harms respiratory system. |
| 11. Peroxacyl nitrates (PANs) | No | $2^o$ | Source: Transportation (cars, trucks, trains, boats and planes). $NO_2$ + hydrocarbons ("HC") $\rightarrow$ PANs |
| | | | Impact: A strong respiratory and eye irritant. Potentially mutagenic. Can damage vegetation. |
| 12. Sulfur trioxide ($SO_3$) | No | $2^o$ | Sources: Combustion of coal and petroleum. Coal has variable quantities of sulfur. |
| | | | Impact: Reacts with water in the atmosphere to form sulfuric acid ($H_2SO_4$). Contributes to acid deposition. |
| 13. Sulfuric acid ($H_2SO_4$) | No | $2^o$ | Sources: Combustion of coal and petroleum. Coal has variable quantities of sulfur. |
| | | | Impact Contributes to acid deposition. Harms respiratory system. |
| 14. Volatile Organic Compounds (VOCs) | No | $1^o + 2^o$ | Sources: Automobile exhaust, solvents, industrial processes, household chemicals. |
| | | | Impact: Contribute to climate change & ground level $O_3$. Some are carcinogenic, some harm respiratory system |

*Note: The category labeled "$1^o + 2^o$" indicates whether the pollutant is a "primary air pollutant", a "secondary air pollutant" or both.

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