

## Air Pollution Chapter 12-1

- IN your group discuss and record your thoughts on the following
1. What is air pollution?
  2. How many different air pollution types can you name?
  3. What are some of the effects of air pollution?



### Air Pollution

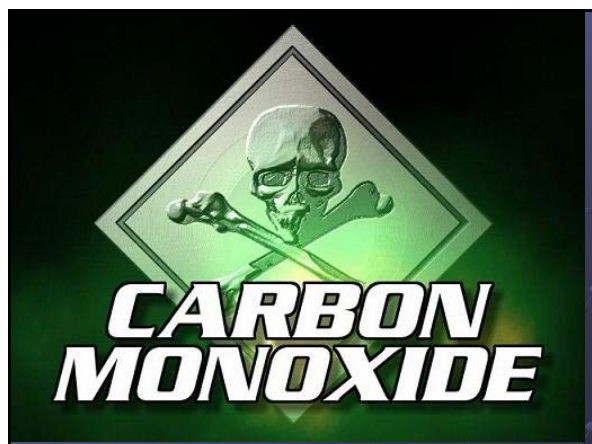
- Clean Air consists of nitrogen, oxygen and other gases .
- Air Pollution is when harmful substances build up in the air to unhealthy levels.
  - Can be solid, liquid or gas. (Examples)
- Sources
  - Human Activities
    - Factories, industry, powerplants, cars, etc..
  - Natural activities
    - Volcanoes, fires, Duststorms, etc..

### Air Pollution

- Primary Pollutant is pollution put directly into the air by human activity.
  - Examples: soot from smoke, carbon monoxide, particulate matter
- Secondary Pollutant: form when primary pollutants have chemical reactions with other pollutants or naturally occurring substances.
  - Example: Ground level Ozone forms when auto emissions react with UV light and mix with oxygen in the atmosphere.
  - Acid Rain

### Primary Air Pollutants

- Carbon Monoxide (CO)
  - Description: Colorless, odorless, poisonous gas produced by the incomplete burning of fossil fuels
  - Sources: Vehicle engines and industrial processes
  - Effects: Interferes with the blood's ability to carry oxygen, slowing reflexes and causing drowsiness. In high concentrations it can cause death.



#### • Nitrogen Oxides (NO<sub>x</sub>)

- Description: Gas produced when burning temperatures are high and nitrogen and oxygen combine.
- Sources: Burning fuels in vehicles, power plants and industry
- Effects: Damages the respiratory system causing infection, diseases and cancer. Contributes to brownish haze over cities and to acid rain.

#### Sulfur Dioxides



#### • Sulfur Dioxide (SO<sub>2</sub>)

- Description: Gas produced by chemical reactions between sulfur and oxygen.
- Sources: burning fossil fuels
- Effects: Contributes to acid rain as sulfuric acid. Secondary pollutants that form from SO<sub>2</sub> can harm plants, and irritate respiratory systems of humans.

#### Primary Air Pollutants

##### • Volatile Organic Compounds (VOCs)

- Description: Organic chemicals that vaporize readily and form toxic fumes.
- Sources: Burning fuels in vehicles, power plants industry and household products
- Effects: Damages the respiratory system causing infection, diseases and cancer.

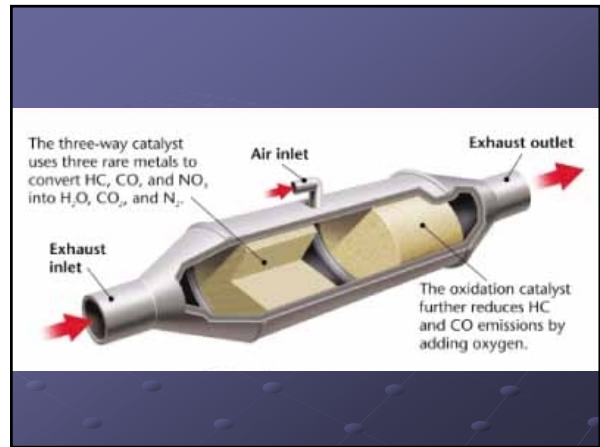


### Primary Air Pollutants

- Particulate Matter
  - Description: tiny particles of liquid or solid matter
  - Sources: construction, agriculture, forestry and fires. Vehicles and industrial processes also contribute
  - Effects: Can form clouds that reduce visibility and cause respiratory problems. Have been linked to cancer. Can also corrode metals and erode buildings and structures

### Motor Vehicle Emissions

- Almost one third of air pollution comes from gasoline burned by vehicles.
- The Clean Air Act (1970 and 1990) regulates vehicle emissions.
  - Reduced lead in gasoline
  - Required catalytic converters in cars to clean exhaust gases (Diagram on page 306)
- California Zero-Emission vehicle program
  - No tailpipe emissions
  - By 2016 16% of vehicles in Ca are required to be zero emission



### Industrial Air Pollution

- Industrial plants burn fossil fuels for energy and release SO<sub>2</sub> and NO.
- Some industries also emit VOCs
  - Dry cleaning chemicals, furniture, furniture refinishing
- Clean Air Act
  - Requires scrubbers to remove pollutants like ammonia gas
  - Electrostatic precipitator removes particulate matter using electric charge.



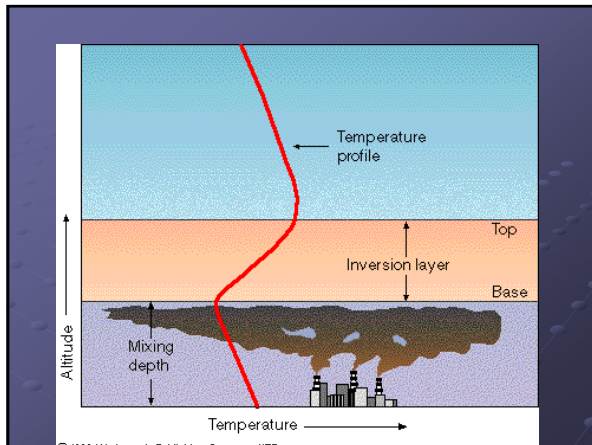


## Industrial Air Pollution

- **Smog:** When air pollution hangs over areas and reduces visibility
  - Results from chemical reactions involving air, sunlight, and automobile exhaust and ozone
  - Cities that have smog: Los Angeles, Phoenix, Denver

## Temperature Inversion

- Air circulation keeps air pollution levels safe.
- Warm air rises and carries pollutants away from the ground into the atmosphere
- Pollution gets trapped at ground level by temperature inversion.
- Temperature Inversion: when air above is warmer than air below keeping pollutants down near the surface.



Warm air will not rise in warm air



## ● Donora Smog

