**2-1 Definition of terms and scale conversion:**

1. **Air pollution**: - Concentration of foreign matter in air in excessive quantity which is harmful to the health of man.
2. **Indoor air pollutions**: - Pollutions from the housing made materials and living and working activities of the house, such as: natural radiation-radon, domestic combustion-coal gas, and human habitstobacco smoking.
3. **Outdoor air pollution**: - Pollutions from outdoor services and environmental mixings, such as: transportation-automobiles, industries-refineries, atomic energy plant-nuclear, and community activities-cleaning of streets.
4. **Acute effects**: - With in twenty-four hours of sudden exposure to polluted air illness would occur.
5. **Delayed effect**: - The cause-and-effect relationship of air pollution and chronic effects on health is in a way difficult to prove due to long time contact and accumulation effect.
6. **Aerosols:** - Small solid or liquid particles (fine drops or droplets) that are suspended in air.
7. **Dust:** - Aerosols consist of particles in the solid phase.
8. **Smoke**: - Aerosols consist of particles in the solidand sometimes also liquid-phase and the associated gases that result from combustion.
9. **Ash:** - Aerosols of the solid phase of smoke, particularly after it settles into a fine dust.
10. **Particulates**: - Small particles, that travel in air and settles or lands on something.
11. **Fumes:** - Are polydisperse fine aerosols consisting of solid particles that often aggregate together, so that many little particulates may form one big particle.
12. **Inhalable fraction**: - Particles less than 100 μm that can be inhaled into the respiratory throat (trachea).
13. **Thoracic fraction:** - Those particles below 20 μm, that can penetrate into the lungs.
14. **Respirable range:** - The greatest penetration and retention of particles is in the range 10.0 to 0.1 μm.
15. **Mist:** - A cloud or dense collection of droplets suspended in air.
16. **Vapor:** - The evaporated compound in the gas phase.

**2-2 Unit of measurement**:

 Concentrations of air pollutants are commonly expressed as the mass of pollutant per Unit volume of air mixture, as mg/m3 - μg/m3 - ng /m3.

Concentration of gaseous pollutants may also be expressed as volume of pollutant per million volumes of the air plus pollutant mixture (ppm) where 1ppm= 0.0001 % by volume. It is sometimes necessary to convert from volumetric units to mass per unit volume and vice versa.

The relationship between ppm and mg/m3 depends on the gas density, which in turn depends on:

* Temperature
* Pressure
* Molecular weight of the pollutant

The following expression can be uses to convert of between ppm and mg/m3 at any temperature or pressure.

 mg/m3 = $\frac{273\*PPm\*molecular wt. \*pressure}{22.4 \*temperature}$

Simply multiply the calculated value of mg/m3 by 1000 to obtain μg/m3.

The constant 22.4 is the volume in liter occupied by 1 mole of an ideal gas at standard concentration (0 0 c and 1 atm.). One mole of any substance is a quantity of that substance whose mass in grams numerically equals its molecular weight.

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**Major air pollutants**: Sox, NOx, CO, HC and Pb

**Pollution is function of**: concentration and exposure time

**Units used for concentration measurements**

* V/V: ppm or ppb.
* m/V: mg/m3 or µg/m3

At standard temperature and pressure (STP) [0 C & 101 kpa]: 1 mole of IG occupies a volume of (22.4) l. otherwise:

Volume of 1 mole = 22.4\* T [Kelvin]\* 101/ (273\* P[kpa])

**Conc. [ppm] = conc.[µg/m3] \*volume [l/mol] \*10-3/MW [g/mole]**

**Example**

A sample of air analyzed at 0 C and 1 atm. Pressure is reported to contain 9 ppm of CO. determine the equivalent CO concentration in micrograms per cubic meter.

**Answer**

A gram molecular mass of CO is:

 12+16= 28 g/mol

At 0 C and 1 atm of pressure, the volume of the gas is 22.4 l/mol.

Conc. of CO in micrograms= 9\* 28\*103/22.4

 =11250 µg**/**m3

