SUBSTANCE DATA SHEET – CONVERSIONS

Conversions	*Link(s)*
TEMPERATURE CONVERSION *– Mechanical Engineering Reference Manual for the PE Exam, Tenth Edition, Thermodynamic Properties of Substances - The scales most commonly used for measuring temperature are the Fahrenheit and Celsius scales. The relationship between these two scales is* $T_{°F} = 32° + (9/5)T_{°C}$. *The absolute temperature scale defines temperature independently of the properties of any particular substance. This is unlike the Celsius and Fahrenheit scales, which are based on the freezing point of water. The absolute temperature scale should be used for all calculations.* *In the customary U.S. System, the absolute scale is the Rankine scale:* $T_{°R} = T_{°F} + 459.67°$. *The absolute temperature scale in the SI system is the Kelvin scale:* $T_K = T_{°C} + 273.15°$.	
CANADIAN CENTRE FOR OCCUPATIONAL HEALTH AND SAFETY (CCOHS) – ***When can I convert mg/m³ to ppm?*** *Occupational exposure limits (OELs, TLVs, PELs, etc.) can be expressed in parts per million (ppm) only if the substance exists as a gas or vapour at normal room temperature and pressure. This is why exposure limits are usually expressed in mg/m³. However, some OELs may be expressed in units such as fibres/cc (e.g., for asbestos). OELs for metals, salts and other compounds that do not form vapours at room temperature and pressure are expressed in mg/m³ only.* ***What is the usual way of converting mg/m³ to ppm?*** *The ACGIH booklet "Threshold Limit Values (TLVs™) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs™)" uses the formulas:* $\text{TLV in mg/m}^3 = [(\text{gram molecular weight of substance}) \times (\text{TLV in ppm})]/(24.45)$ $\text{TLV in ppm} = [24.45 \times (\text{TLV in mg/m}^3)]/(\text{gram molecular weight of substance})$ *These formulas can be used when measurements are taken at 25°C and the air pressure is 760 torr (= 1 atmosphere or 760 mm Hg). Where 24.45 = molar volume of air in liters at NTP conditions (25°C and 760 torr).* ***What is gram molecular weight?*** *Gram molecular weight is the molecular weight (MW) expressed in grams. For example, the gram molecular weight for toluene is 92.13 g. since the molecular weight is 92.13. A gram molecular weight is also called a gram mole.* ***How do I convert mg/m3 to ppm at different temperatures and pressures?*** *The number 24.45 in the equations above is the volume (liters) of a mole (gram molecular weight) of a gas or vapour when the pressure is at 1 atmosphere (760 torr or 760 mm Hg) and at 25°C.* *To convert mg/m³ to ppm at other temperatures and pressures, one must calculate the volume of 1 gram molecular weight of an airborne contaminant (e.g. 92.13 grams of toluene) by using the formula:* $V = (RT/P)$ *where R is the ideal gas constant; T, the temperature in kelvins (273.16 + T°C); and P, the pressure in mm Hg. This information can be substituted in the formulas for converting between mg/m³ and ppm.* $\text{TLV in mg/m}^3 = (P/RT) \times MW \times (\text{TLV in ppm})$ $\text{TLV in mg/m}^3 = [P \times MW \times (\text{TLV in ppm})]/[62.4 \times (273.2 + T°C)]$ *and* $\text{TLV in ppm} = [62.4 \times (273.2 + T°C) \times (\text{TLV in mg/m}^3)]/(P \times MW)$ *where the value of R is 62.4 when the temperature (T) is in kelvins, K (=273.16 + T°C), the pressure is expressed in units of mm Hg and the volume is in liters. There are different values for the gas constant R if the temperature is expressed degrees Fahrenheit (°F) or if other units of pressure (e.g., atmospheres, kilopascals) are used.*	***www.ccohs.ca/oshanswers/ chemicals/convert.html***