**Vocabulary: Moles**

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**Vocabulary**

* Atomic mass – the mass of an atom, expressed in *unified atomic mass units* (u).
* Avogadro constant – the number of atoms or molecules in a *mole* of a substance.
  + The Avogadro constant has a numerical value of 6.02214076 × 1023.
* Conversion factor – a ratio or fraction that is numerically equal to one, which is used to multiply or divide a quantity when converting from one unit to another.
  + For example, the conversion factor for moles to grams of CO2 is:



This conversion factor is equivalent to one because one mole of carbon dioxide has a mass of 44.01 grams.

* Dimensional analysis – a technique that is used to change the units of a quantity without changing the quantity’s value.
  + In dimensional analysis, a quantity is multiplied by one or more conversion factors.
* Dimensional analysis is also known as the factor-label method.
* Formula mass – the sum of the atomic masses of the atoms in one formula unit of a compound.
  + Formula mass is measured in unified atomic mass units (u).
  + For example the formula mass of sodium chloride (NaCl) is equal to the atomic mass of sodium (22.99 u) plus the atomic mass of chlorine (35.45 u), or 58.44 u.
* Formula unit – the smallest possible amount of a chemical compound.
  + For example, a formula unit of copper(I) oxide (Cu2O) consists of two copper (Cu) atoms and one oxygen (O) atom.
  + If the compound is held together with covalent bonds, a formula unit is known as a molecule. Examples of molecules include H2, O2, H2O, CO2, and CH4.
* Molar mass – the mass of one mole of a substance, measured in grams per mole (g/mol).
  + The molar mass of an element (or compound) in grams has the same numerical value as its atomic (or molecular) mass in unified atomic mass units.
  + For example, the molecular mass of an oxygen molecule (O2) is 32 u; therefore, its molar mass is 32 g/mol.
* Mole – the SI unit of amount of substance.
  + One mole contains 6.02214076 × 1023 particles.
  + The mass in grams of one mole of any substance is the same as its atomic (or molecular) mass in unified atomic mass units.
* Scientific notation – a convenient method of writing very large or very small numbers.
* A number expressed in scientific notation consists of a coefficient between 1 and 10 multiplied by a power of 10.
  + For example, in scientific notation 41,600,000 is written as 4.16 × 107.
* Significant figures – digits in a value that indicate the accuracy of an initial measurement, and express the confidence we have in that measurement.
* A measurement should be recorded with a number of significant figures that reflects the resolution of the instrument.
* Examples of significant figures include the following:
  + 345 has three significant digits because all non-zero digits are significant.
  + 5.300 has four significant digits because all zeroes that follow digits to the right of the decimal point are significant.
  + 0.0023 has two significant digits because zeros to the left of a non-zero digit are not significant.
  + In scientific notation, all digits in the coefficient are significant.
* When doing a calculation such as converting from moles to grams, the number of significant figures in the answer should match the lowest number of significant figures of the measured quantities.
  + For example, 3.45 moles of carbon (molar mass 12.011 g/mol) is equal to 41.4 grams. (The values for both moles and grams are expressed to three significant figures.)
* Unified atomic mass unit – (u) the SI unit of atomic mass.
  + An atomic mass unit is equal to 1.66 × 10-24 g, or the mass of a C-12 atom.
  + The mass of a proton or neutron is approximately 1 u.
  + The unified atomic mass unit is also known as the dalton (Da).