Vocabulary: Moles

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- 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 $6.02214076 \times 10^{23}$.
- 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 CO_2 is:

$$\frac{1 \text{ mol } CO_2}{44.01 \text{ g}}$$

    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 (Cu_2O) 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 H_2, O_2, H_2O, CO_2, and CH_4.
- 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 (O_2) is 32 u; therefore, its molar mass is 32 g/mol.

- Mole – the SI unit of amount of substance.
    - One mole contains $6.02214076 \times 10^{23}$ 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 4.16×10^{7}.

- 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 $\frac{1}{12}$ 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).