

Glossary of Chemical Terms:

analytical technique: an analytical technique is a method that is used to determine the concentration of a chemical compound or element. There are a wide variety of techniques used for analysis, from simple weighing (gravimetric) to titrations (titrimetric) to very advanced techniques using highly specialized instrumentation.¹

assay: an examination and determination as to characteristics (as weight, measure, or quality), or analysis (as of an ore or drug) to determine the presence, absence, or quantity of one or more components or a substance to be assayed; also : the tabulated result of assaying². An assay is a procedure where the concentration of a component part of a mixture is determined¹.

azeotrope: An azeotrope is a liquid mixture of two or more components which has a unique constant boiling point. An azeotrope is said to be positive if the constant boiling point is at a temperature maximum, and negative when the boiling point is at a temperature minimum. The vast majority of azeotropes are minimum boiling¹.

concentration: the amount of a component in a given area or volume², for solutions this is described as the amount of **solute** per unit of **solvent** (or unit volume of **solution**)¹.

density (symbol: ρ - Greek: rho): a measure of mass per unit of volume. The higher an object's density, the higher its mass per volume. The average density of an object equals its total mass divided by its total volume. The SI unit of density is the kilogram per cubic metre (kg/m³)

$$\rho = \frac{m}{V}$$

where: ρ is the object's density (measured in kilograms per cubic metre)
 m is the object's total mass (measured in kilograms)
 V is the object's total volume (measured in cubic metres)¹

relative density (also known as specific gravity): is a measure of the density of a material. It is dimensionless, equal to the density of the material divided by the density of water (or, sometimes used for gases, of air)¹.

solute: a dissolved substance²

solvent: that dissolves or can dissolve²

solution: an act or the process by which a solid, liquid, or gaseous substance is homogeneously mixed with a liquid or sometimes a gas or solid².

molarity: Molarity (M) is defined as the number of moles of solute per liter of solution. molarity = moles of solute / liters of solution¹.

molality: Molality (m) is defined as the number of moles of solute per kilogram of solvent. molality = moles of solute / kilograms of solvent¹.

molarity and molality: although their spellings are similar, molarity and molality cannot be interchanged. Compare the molar and molal volumes of 1 mol of solute dissolved in CCl₄ (d = 1.59 g / mL). By definition, a 1 M solution would contain 1 mol of solute in exactly 1.00 L of CCl₄, and a 1 m solution would contain 1 mol of solute in 629 mL of CCl₄. Density calculation: 1 kg of CCl₄ x (1000 g / 1 kg) x (mL / 1.59 g) = 629 mL CCl₄¹.

normality (N): is another ratio that relates the amount of solute to the total volume of solution. It is defined as the number of equivalents per liter of solution: $\text{normality} = \text{number of equivalents} / 1 \text{ L of solution}$. There is a very simple relationship between normality and molarity: $N = n \times M$ (where n is an integer). For an acid solution, n is the number of H^+ provided by a formula unit of acid. example: A 3 M H_2SO_4 solution is the same as a 6 N H_2SO_4 solution. For a basic solution, n is the number of OH^- provided by a formula unit of base. example: A 1 M $\text{Ca}(\text{OH})_2$ solution is the same as a 2N $\text{Ca}(\text{OH})_2$ solution¹.

mole: is the SI base unit of the amount of particulate substance. The Definition: the mole is the amount of substance of a system, which contains as many elementary entities as there are atoms in 12 grams of carbon 12. 2. Explanation: The number of atoms in 0.012 kilogram of carbon 12 is known as Avogadro's number. It is approximately 6.0221415×10^{23} (2002 CODATA Value)¹.

titration is a standard laboratory method of chemical analysis which can be used to determine the concentration of a known reactant. A reagent, called the titrant, of known concentration (standard solution) and volume is used to react with a measured volume of reactant. Using a calibrated burette to add the titrant, it is possible to determine the exact amount that has been consumed when the endpoint is reached. The endpoint is the point at which the titration is stopped. In the classic strong acid-strong base titration the endpoint of a titration is when the pH of the reactant is just about equal to 7, and often when the solution permanently changes color due to an indicator¹.

weight percent is the ratio of the weight of component, analyte or solute being measured to the weight of the entire solution ($\times 100\%$)¹. SEASTAR's assay's are expressed in terms of weight percent unless otherwise stated. For example: an assay of 67% **BASELINE** Nitric Acid, means in 100g there is 67g of HNO_3 in the solution, the remaining weight composed of H_2O and almost no weight of trace impurities. PLEASE NOTE: Confusion comes with mixtures of Concentrated Nitric Acid (SEASTAR's 67 – 70% by weight or w/w%, typically referred to as 68% w/w). A 50% solution, by volume, of Nitric Acid is typically 50% Concentrated Nitric Acid (68% w/w) & 50% Water. The actual percentage of this solution, by weight, is: 500mL of 68% Nitric Acid by weight, which has a density of approximately 1.42g/mL resulting in 710g of solution. This means that the total weight of Nitric Acid is 482.8g, within the 500mL of solution ($0.68 \times 710\text{g} = 482.8\text{g}$). 500mL of water weighs approximately 500g. The weight percent of the solution is $482.8\text{g} / (710\text{g} + 500\text{g}) \times 100\% = 39.9\%$ Nitric Acid by weight, which is usually referred to as a 50% Solution of Nitric Acid (by volume of course).

¹ Wikipedia, the free encyclopedia (<http://en.wikipedia.org>)

² Merriam-Webster Online (<http://www.m-w.com>)