

Volumetric Glassware

Depending on the nature of the work that one is doing in a lab there is a variety of volumetric glassware available for measuring liquids. The choice of which to use is often simply based on the type of accuracy, precision, or both accuracy and precision that you are after. Sometimes one is not concerned with this, and in that case the graduated cylinder, which has a quite limited precision is the vessel of choice.

Several kinds of volumetric glassware are available for measuring liquids. Some glassware, such as the graduated cylinder, has a scale that provides quite limited precision. A **graduated cylinder** is easy to use and is the device of choice when an exact volume of solution is not crucial. When accuracy and precision are important, chemists use a **pipet**. Graduated pipets (those with multiple markings) are available but are not as precise as **volumetric pipets**, each of which is calibrated for a specific volume. Volumetric pipets are generally the most precise means of delivering accurately known volumes of solutions. The volume of a 10 mL pipet has an uncertainty of 0.02 mL; that is, it delivers between 9.98 and 10.02 mL of solution.

A pipet is labeled either "TD" or "TC." TD pipets are calibrated to deliver a precise volume of solution and are used most often for aqueous solutions. After the solution is delivered, a small quantity remains in the tip of the pipet. The manufacturer takes this remaining volume into account in the calibration. In contrast, a TC pipet is calibrated to contain a specific volume of solution. This type is designed to be blown out with air or rinsed with solvent; it is most often used with nonaqueous solutions.

A **buret** is similar to a graduated pipet, but a stopcock near the bottom of the cylinder controls the volume of solution delivered. By careful use of the stopcock, one can accurately deliver any desired volume of reactant solution to a reaction mixture.

A **volumetric flask** is designed to contain a specific volume of solution. It is used to prepare a given volume of solution of known concentration, starting from either a mass of a solute (usually a solid) or an accurately measured volume of a concentrated solution.



Volumetric glassware: a buret, a volumetric flask, a graduated cylinder and a pipet.
(C. D. Winters)