General Information

A simple washing with soap and water will make most laboratory glassware clean enough for general use. Determine what sort of soap or detergent is available in the lab and whether the detergent must be diluted. Allow the glassware to soak in dilute detergent solution for 10–15 minutes (which should remove any grease or oil), and then scrub the glassware with a brush from your locker if there are any caked solids on the glass. Rinse the glassware well with tap water to remove all detergent.

Usually laboratory glassware is given a final rinse with distilled or deionized water to remove any contaminating substances that may be present in the local tap water. However, distilled/deionized water is very expensive to produce and cannot be used for rinsing in great quantities. Therefore, fill a plastic squeeze wash bottle from your locker with distilled water, and rinse the previously cleaned and rinsed glassware with two or three separate 5–10 mL portions of distilled water from the wash bottle. Discard the rinsings.

If wooden or plastic drying hooks are available in your lab, you may use them to dry much of your glassware. If hooks are not available, or items do not fit on the hooks, spread out glassware on paper towels to dry. Occasionally, drying ovens are provided in undergraduate laboratories. Only simple flasks and beakers should be dried in such ovens. Never dry finely calibrated glassware (burets, pipets, graduated cylinders) in an oven, because the heat may cause the calibrated volume of the container to change appreciably.

If simple soap and water will not clean the glassware, chemical reagents can be used to remove most stains or solid materials. These reagents are generally too dangerous for student use. Any glassware that cannot be cleaned well enough with soap and water should be turned in to a person who has more experience with chemical cleaning agents.

Special Cleaning Notes for Volumetric Glassware

Volumetric glassware is used when absolutely known volumes of solutions are required to a high level of precision and accuracy. For example, when solutions are prepared to be of a particular concentration, a volumetric flask whose volume is known to ± 0.01 mL may be used to contain the solution. The absolute volume a particular flask will contain is stamped on the flask by the manufacturer, and an exact **fill mark** is etched on the neck of the flask. The symbol "TC" on a volumetric flask means that the flask is intended "to contain" the specified volume. Generally, the temperature at which the flask was calibrated is also indicated on the flask, since the volumes of liquids vary with temperature.

If a solution sample of a particular precise size is needed, a **pipet** or **buret** may be used to deliver the sample (the precision of these instruments is also generally indicated to be to the nearest ± 0.01 mL). The normal sort of transfer volumetric pipet used in the laboratory delivers one specific size of sample, and a mark is etched on the upper barrel of the pipet indicating to what level the pipet should be filled. Such a pipet is generally also marked "TD," which means that the pipet is calibrated "to deliver" the specified volume. A buret can deliver any size sample very precisely, from zero milliliters up to the capacity of the buret. The normal Class A buret used in the laboratory can have its volume read precisely to the nearest 0.01 mL.

Obviously, when a piece of glassware has been calibrated by the manufacturer to be correct to the nearest 0.01 milliliter, the glassware must be *absolutely clean* before use. The standard test for cleanliness of volumetric glassware involves watching a film of distilled water run down the interior sides of the glassware. Water should flow in sheets (a continuous film) down the inside of volumetric glassware, without beading up anywhere on the inside surface.

If water beads up anywhere on the interior of volumetric glassware, the glassware must be soaked in dilute detergent solution, scrubbed with a brush (except for pipets), and rinsed thoroughly (both with tap water and distilled water). The process must be repeated until the glassware is absolutely clean. Narrow bristled brushes are available for reaching into the long, narrow necks of volumetric flasks, and special long-handled brushes are available for scrubbing burets. Since brushes cannot be fitted into the barrel of pipets, if it is not possible to clean the pipet completely on two or three attempts, the pipet should be exchanged for a new one (special pipet washers are probably available in the stockroom for cleaning pipets that have been turned in by students as uncleanable).

Volumetric glassware is generally used wet. Rather than drying the glassware (possibly allowing the glassware to become water-spotted, which may cause incorrect volumes during use), the user rinses the glassware with whatever is going to be used ultimately in the glassware. For example, if a buret is to be filled with standard acid solution, the buret still wet from cleaning is rinsed with small portions of the same acid (with the rinsings being discarded). Rinsing with the solution that is going to be used with the glassware insures that no excess water will dilute the solution to be measured. *Volumetric glassware is never heated in an oven,* since the heat may destroy the integrity of the glassware's calibration. If space in your locker permits, you might wish to leave volumetric glassware, especially burets, filled with distilled water between laboratory periods. A buret that has been left filled with water will require much less time to clean on subsequent use (consult with the instructor to see if this is possible).