

## Pipettes and Their Calibration

Pipettes are narrow glass tubes, open at both ends, used to transfer and measure liquids by drawing the liquid into the tube. Manual pipettes use separate bulbs or pumps to draw the liquid into the tube, while semi-automatic pipettes have similar devices built into the pipette. Mouth pipetting, aspirating the liquid into the pipette by mouth, is strictly forbidden. Since laboratory testing often relies on the accurate measurement of reagents or specimens, the proper use of pipettes is crucial in the operation of an efficient laboratory.

There are two basic types of pipettes--volumetric and graduated. Other types of pipettes include Oswald-Folin pipettes, a type of volumetric pipette, and semi-automatic pipetters.

**Volumetric pipettes** are designed to deliver a single, specific volume of liquid (see Figure 1). They are referred to as TD (to deliver) devices. Liquid is drawn through the tip of the pipette, filling a bulb in the body of pipette, until the liquid level reaches the calibration mark. The measured liquid is then drained for use. Volumetric pipettes are never to be blown out.



Figure 1--volumetric pipette

When purchasing a volumetric pipette look for:

- Markings of the agency certifying the accuracy of the pipette such as ASTM/NIST. (Older pipettes may be marked with NBS, for the National Bureau of Standards, NIST's previous name.)
- Markings indicating the temperature at which the pipette should be used.
- A certificate of calibration from the National Institute of Standards and Technology (NIST), stating that it is a Class A pipette.
- A calibration mark that is not too close to the top of the suction tube.
- A gradual taper to the tip.
- An appropriately sized orifice at the delivery tip. If an orifice is too large, the outflow of liquid may be too fast, causing drainage problems. Also, the reliability of a pipette's calibration decreases as the size of the orifice increases.

**Oswald-Folin pipettes** are a type of volumetric pipette with bulbs near the delivery tip (see Figure 2).

They are TD pipettes, but are designed for use with more viscous fluids such as blood or serum. Etched rings near the mouthpiece of Oswald-Folin pipettes signify that they are blow out pipettes, meaning that after the liquid has drained, the residual film on the wall of the pipette is blown out.



Figure 2--Oswald-Folin pipette

**Semi-automatic pipetters** are also considered TD pipettes. These pipettes are available in sizes ranging from 0.0005 to 20 ml, and dispense a pre-rated sample (usually adjusted with a set screw) when their plunger is fully depressed. The volume of semi-automatic pipetters can be checked by dispensing a sample into a graduated cylinder and reading the volume. Semi-automatic pipetters typically require periodic maintenance--see the manufacturer's instructions for details.

**Graduated pipettes**, also called serological pipettes, are used to measure a variety of volumes (see Figure 3). They are narrow tubes with graduated markings showing various volumes. They are not considered accurate enough to measure samples or standards, and are therefore normally used for reagents. An etched ring near the top of graduated pipettes signifies that they are blow out pipettes.



Figure 3--graduated or serological pipette

All semi-automated pipettes and diluters should be of certified accuracy, or checked for accuracy yearly by weighing the amount of water delivered by the pipette or diluter, checking the volume displacement, or by a colorimetric method. Kits are available from your laboratory supplier for these purposes, or you may send the pipettes and diluters to a hospital or reference laboratory for calibration (expect a fee for this). Disposable measuring devices should be of certified accuracy.

Pipettes can be an integral part of the instrument system. If they are used in conjunction with calibrators and controls then they do not require calibration but should be included in the instrument maintenance program for that particular instrument.

Requirements  
for good  
laboratory  
practice  
and COLA  
Laboratory  
Accreditation  
programs  
are underlined.