⟨31⟩ VOLUMETRIC APPARATUS

Most of the volumetric apparatus available in the United States are calibrated at 20°, and the National Institute of Standards and Technology (NIST) has adopted 20° as the reference temperature for the calibration of laboratory glassware, although the temperatures generally prevailing in laboratories are usually between 20° and 25°. To minimize volumetric error, the temperature should be the same for the volumetric apparatus, the material being prepared, the solvents being used to prepare the volumetric solutions, the area in which they are prepared, and the final volume adjustment. To attain the degree of precision required in many Pharmacopeial assays involving volumetric measurements and directing that a quantity be "accurately measured", the apparatus must be chosen and used with care.

Change to read:

STANDARDS OF ACCURACY

The capacity tolerances for volumetric flasks, transfer pipets, and burets are those accepted by NIST (Class A),[1] as indicated in *Table 1*, *Table 2*, and *Table 3*, respectively. [NOTE—The tables in this chapter list the tolerances for the most commonly used sizes. See the referenced ASTM standards for a complete list of tolerances and other applicable criteria.] Use Class A volumetric apparatus unless otherwise specified in the individual monograph. When a plastic volumetric apparatus is specified, the accepted capacity tolerances are equal to Class B glass.[2]

The capacity tolerances for measuring (i.e., "graduated") pipets of up to and including 10-mL capacity are somewhat larger than those for the corresponding sizes of transfer pipets, namely, 10, 20, and 30 µL for the 2-, 5-, and 10-mL sizes, respectively.[3]

Transfer and measuring pipets calibrated "to deliver" should be completely drained in a vertical position and then touched against the wall of the receiving vessel to drain the ▲pipet tip▲ (ERR 1-Nov-2020). Volume readings on burets should be estimated at least to the nearest one-half of a subdivision. Pipets calibrated "to contain" are called for in special cases, generally for measuring viscous fluids such as syrups; however, a volumetric flask may be substituted for a "to contain" pipet. In such cases, the pipet or flask should be washed clean after draining, and the washings should be added to the measured portion.

Table 1. Volumetric Flasks

Designated volume, mL	10	25	50	100	250	500	1000
Limit of error, mL	0.02	0.03	0.05	0.08	0.12	0.20	0.30
Limit of error, %	0.20	0.12	0.10	0.08	0.05	0.04	0.03

Table 2. Transfer Pipets

Designated volume, mL	1	2	5	10	25	50	100
Limit of error, mL	0.006	0.006	0.01	0.02	0.03	0.05	0.08
Limit of error, %	0.60	0.30	0.20	0.20	0.12	0.10	0.08

Table 3. Burets

Designated volume, mL	10 ("micro" type)	25	50
Subdivisions, mL	0.02	0.1	0.1
Limit of error, mL	0.02	0.03	0.05

[1] See ASTM E288-10, ASTM E287-02, ASTM E1189-00, and ASTM E969-02.
[2] See ASTM E288-10 and ISO 384:2015.
[3] See ASTM E1293-02.