

EQUIPMENT PRECISION

There is an inherent precision associated with each piece of equipment and instrumentation used in the laboratory. This precision is expressed as an uncertainty in the measured value and reflects the limitations in reading the instruments.

Typical uncertainties (tolerances) for some laboratory instruments are listed below:

<u>INSTRUMENT</u>	<u>TYPICAL UNCERTAINTY</u>
Analytical Balance	± 0.0001 g
Thermometer (10°C, graduated to 1°C)	$\pm 0.2^\circ$ C
Mercury barometer	± 0.1 mm

Reading Graduated Glassware:

Graduated glassware is used to measure liquid volumes. Most liquids, such as water, form a concave meniscus (see Figure 1). The bottom of the meniscus should be read at eye level. The correct reading for the level of the liquid in Figure 1 is 23.7 mL. In the graduated cylinder shown in Figure 1, the mL graduations are marked and can be read with certainty. All graduated glassware is read with one estimated digit, so this measurement is recorded correctly to the nearest 0.1 mL, with an understood uncertainty of ± 0.1 mL.

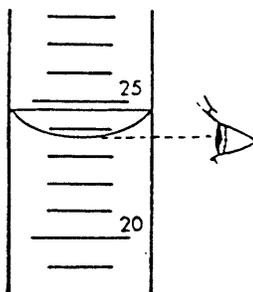


Figure 1 - Reading a Graduated Cylinder

In reading digital equipment, all the digits shown are recorded. It is understood that there is an uncertainty, usually of ± 1 , in the last digit shown.

Tolerances of Class A Volumetric Glassware:

<u>Capacity (mL)</u>	<u>Burets</u>	<u>Measuring pipets</u>	<u>Transfer pipets</u>	<u>Volumetric flasks</u>
2		± 0.01	± 0.006	
5	± 0.01	0.02	0.01	
10	0.02	0.03	0.02	
25	0.03	0.05	0.03	± 0.03
50	0.05	0.08	0.05	0.05
100	0.10	0.15	0.08	0.08
200			0.10	0.10
250				0.12
500				0.15
1000				0.30

Tolerances of Volumetric Glassware - non-Class A Glassware:

<u>Capacity (mL)</u>	<u>Graduated cylinders</u>	<u>Transfer pipets</u>	<u>Burets</u>	<u>Volumetric flasks</u>
5	± 0.10	± 0.025		
10	0.20	0.05	± 0.04	± 0.04
20		0.10		
25	0.35	0.10	0.06	0.06
50	0.52	0.10	0.10	0.10
100	1.0			0.16
200				0.20
250	1.6			0.24
500	3.0			0.40
1000	5.0			0.60

Class A glassware is calibrated to specifications established by ASTM (American Society for Testing and Materials). Class A glassware is indicated with an etched 'A' on the label. Other types of glassware have wider tolerance ranges.