Chemistry 1104 Lab: Volumetric

Goals:
1. **Introduction to Volumetric Glassware.**
2. **Precision of Volumetric Glassware.**
3. **Introduction to Concentration Molarity**
4. **Preparation of a Solution of known Molarity from a) solid b) dilution.**

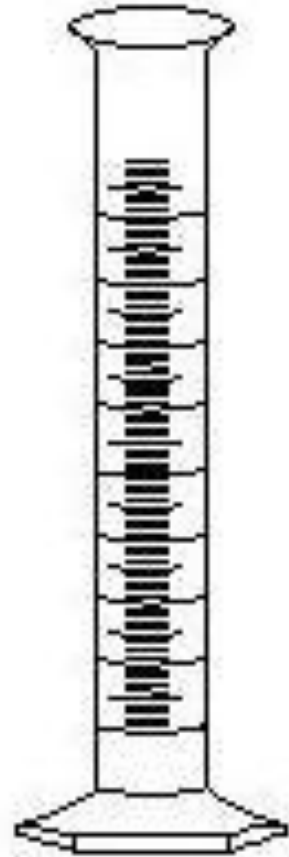# Volumetric Glassware: Graduated Cylinder

TC: To Contain
Least Precise

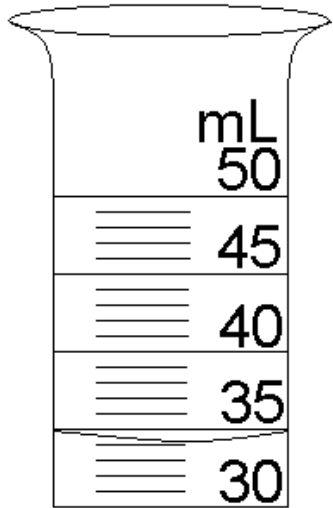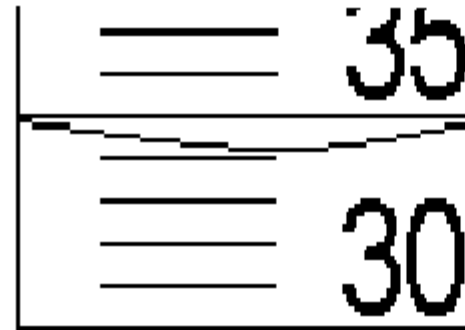| Sizes	Precision
10.0 mL	± 0.1 mL
25.0 mL	
50.0 mL	
100.0 mL	

Reading a Graduated Cylinder:

TC: To Contain

34.2 mL

34.2 mL

Volumetric Flask
TC: to contain

Used to prepare solutions of known concentration.

Sizes	Precision
25.00 mL	± 0.01 mL
50.00 mL	
100.00 mL	
250.00 mL	

Volumetric Pipet
TD: To Deliver

Used to dispense specific volumes of liquid.
Sizes:1.00 mL, 2.00 mL, 5.00 mL, 10.00 mL, 20.00 mL, 25.00 mL
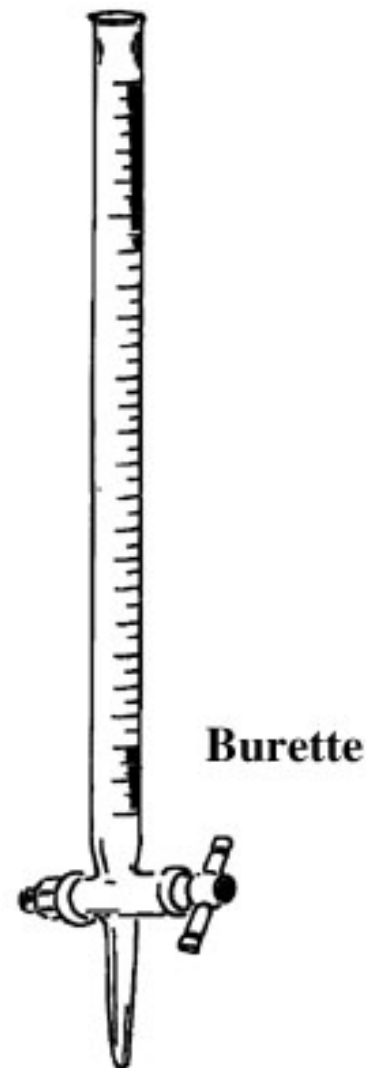
Precision
± 0.01 mL

25 ml
Ex
20 °C

Buret
TD: To Deliver

Used to dispense known amounts of liquid of various volume.

Size: 50 mL max capacity typically. Precision ± 0.01 mL
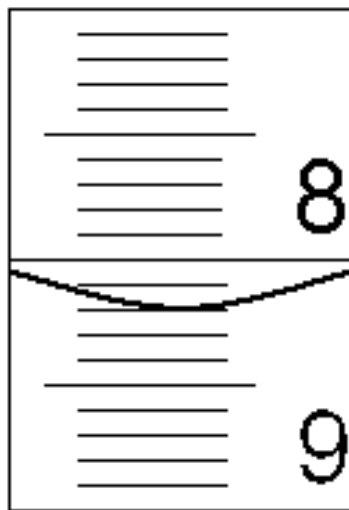
When Full Volume recorded 0.00 mL

Burette

Reading a Buret:

When full the volume recorded with a buret is 0.00 mL.
Buret TD.
Full buret not recorded as 50 mL. WRONG!

8

8.20 mL

9

Part A:
Determining volume of a test tube using a Graduated cylinder.

Part B:
Determining volume of same test tube using a buret.

Part C:

Determining the precision of a volumetric pipet by measuring the mass of water Dispensed by the pipet.

Record mass of small beaker before and after. Recommend using 10 mL pipet. Volume recorded as 10.00 mL.

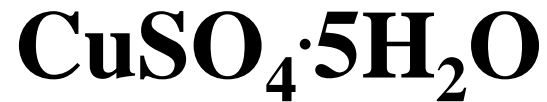**NOTE:** mass(g) of water = volume(mL)

Part D:
Introduction to Molarity.

$$\text{Molarity}(M) = \frac{\text{moles of solute}}{\text{volume of solution(L)}}$$

For example a 4.00 M HCl solution indicates That there is 4.00 mol HCl for every 1 L of solution.

Part D: cont…
Preparing a solution using a volumetric flask and a known mass of a solid(solute).

CuSO$_4$·5H$_2$O
MW = 249.68 g/mol

Assigned a Molarity.
Assigned Volume: 100.00 mL

Part D: cont…
The mass of solute depends on Molarity and the volume of solution needed.

100.00 mL = 0.10000 L

$$0.10000\,\text{L} \times \frac{\text{moles of solute}}{\text{volume of solution(L)}}(M) = \text{moles solute}$$

$$\text{moles solute} \times \frac{\text{mass of solute(g)}}{\text{mole solute}}(\text{Molar Mass}) = \text{g of solute}$$

Part D: cont…
Weigh out desired mass of solute.

Record mass used.
Mass of solute used $\rightarrow$ moles solute

$$\text{Molarity(M)} = \frac{\text{moles of solute}}{0.10000\text{(L)}}$$

Part D: cont…

Use spec20 to determine if solution prepared correctly. Spec20 measures the amount of light absorbed by the aqueous solution.

Record Absorbance.

Part E:

Preparation of a solution of known concentration by dilution of a stock solution of known concentration.

$$M_1 \times V_1 = M_2 \times V_2$$

M_1: Molarity of stock solution

V_1: Volume of stock solution

M_2: Molarity of dilute solution

V_2: Volume of dilute solution