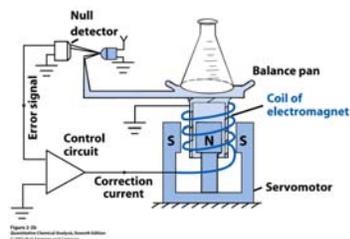## Tools of the Trade: Lab Notebooks

Lab notebooks **must**:

1. be complete, accurate documents of the experiment,

2. be understandable to someone trying to *reproduce* your experiment,

3. be able to serve as a legal document for your work.

1

Tools of the Trade: Balances

Most laboratories use *electronic* balances

All critical weighing should be done "by difference"
1. weigh bottle + reagent
2. remove necessary amount of reagent
3. weigh bottle + remaining reagent
4. mass of reagent removed = #1 - #2

Why do this???

2

Balance Considerations

Common sources of error:

1. Improper sample handling
2. Failure to allow for complete cooling
3. Failure to close balance cover
4. Non-leveled balance
5. Drift due to static charges
6. Buoyancy-induced errors

   Inherent in any mass measurement!

<u>Buoyancy Correction</u>

$$m = \frac{m'\left(1 - \dfrac{d_a}{d_w}\right)}{\left(1 - \dfrac{d_a}{d}\right)}$$

m' = mass from balance
m = true mass
d_a = density of air
d_w = d. of calibration weights
d = d. of object weighed

What does this mean??

Buoyancy Effects

~0.11 % error for H_2O
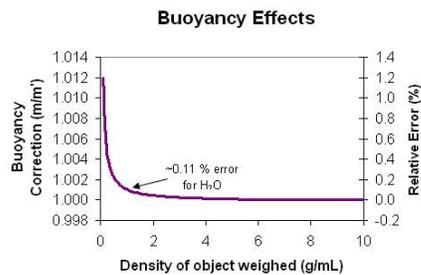
3

Solids Handling

- All solid samples should be dried in an oven to remove adsorbed water, etc.
  - Use a beaker covered with a watch glass (and glass hooks) to prevent contamination.
  - Allow adequate cooling time before weighing.
  - Store dried materials in a *dessicator.*

Watchglass   Bent glass hook

FIGURE 2-20 Use a watchglass as a dust cover while drying reagents or crucibles in the oven.
Harris, *Quantitative Chemical Analysis, 8e*
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Weighing bottle with cap ajar

Beaker   Reagent

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Glassware Considerations, Do's and Don'ts

- Know the history of your glassware
- Beware of adsorption
- Don't store basic solutions in volumetric glassware
- Know the difference between TC vs. TD

   TC =

   TD =

- Realize that volumetric glassware is calibrated to a given *tolerance* at a given temperature. (Class A is the best, and most expensive)
  - Tolerance vs. Precision
  - Glass (and water and most other materials) undergo temperature-dependant volume changes

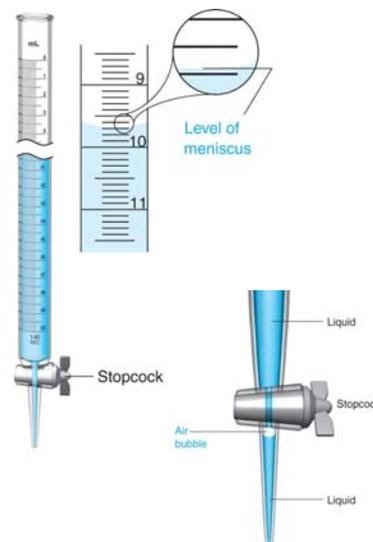**TABLE 2-3   Tolerances of Class A volumetric flasks**

Flask capacity (mL)	Tolerance (mL)
1	±0.02
2	±0.02
5	±0.02
10	±0.02
25	±0.03
50	±0.05
100	±0.08
200	±0.10
250	±0.12
500	±0.20
1 000	±0.30
2 000	±0.50

Harris, *Quantitative Chemical Analysis, 8e*
© 2011 W. H. Freeman

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Buret Use

1. Rinse buret with 2-3 small (~5 mL) portions of solution prior to use. Rinse w/ 2-3 portions of water after use.
2. Avoid air bubbles in the tip.
3. Read buret with meniscus at eye level. Allow enough time for solution to flow down the inner walls into the bulk.
4. Read from bottom of meniscus to 1/10th of the smallest graduation.
5. Near the endpoint, "cut" drops.
6. Be sure all material that is dispensed has the opportunity to react.

6

Volumetric Flasks

- Vol. flasks are TC (typically).

1. Mix solution well before filling to the mark.

2. Fill solution so that meniscus is at the mark

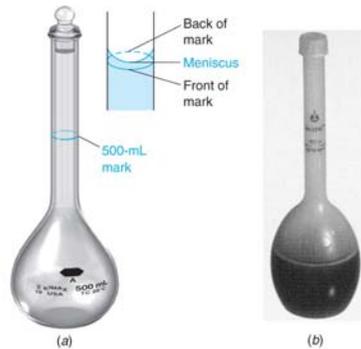3. Invert flask at least 20 times, while rotating 90 degrees each time to insure complete mixing.

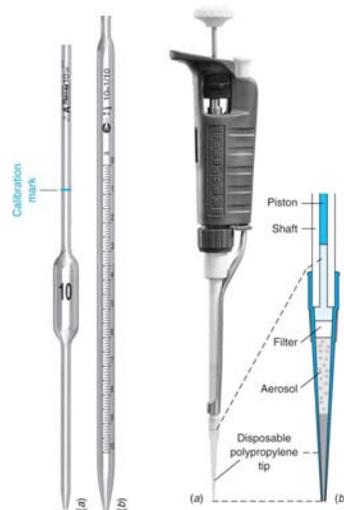**TABLE 2-3   Tolerances of Class A volumetric flasks**

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1 000	±0.30
2 000	±0.50

Harris, Quantitative Chemical Analysis, 8e

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Pipets

1. Transfer or volumetric – TD
   - DO NOT BLOW OUT!
2. Measuring (Mohr)
   - Dispense by difference.
   - Volume in the tip is not calibrated!
3. Blow out pipets:
   - Ostwald-Folin and serological
   - Look for ground in "ring" on end.
4. Micropipets
   - Read directions for the pipet.
   - Typically expel all solution in the tip
5. Hold all pipets vertically when filling and dispensing.

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