

Lab Tips: Precision vs. Efficiency

Getting precise and accurate measurements in the lab is the first step to a successful experiment, but high-precision measurements can slow you down. Here are some tips for getting precise results efficiently.

Know how to minimize error

Random

Unpredictable variations, such as a breeze in the air or slight differences in angle when reading a volume

Minimize by

Taking multiple readings and averaging the results



Systematic

Errors resulting from the measurement, equipment, or reaction conditions

Minimize by

- Calibrating equipment accurately
- Revisiting your assumptions, hypotheses
- Using equipment correctly
- Using the right equipment (see below)

Interpret procedure correctly

Save time in lab by using only the level of precision the procedure requires.

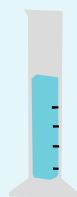
Procedure says	Translation	Use
"Add about 20 mL of water"	"Add anywhere from 15 to 25 mL of water"	Graduated cylinder
"Add 20.00 mL of water"	"Measure exactly 20.00 mL"	Volumetric pipet
"Weigh 0.5 g of sample to the nearest 0.0001 g"	"Weigh out anywhere from 0.4510 to 0.5499 g of sample and record the mass you weighed"	Analytical balance

Use the right equipment



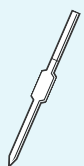
Beaker, flask

Best for holding samples and mixing solutions, not measuring



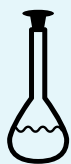
Graduated cylinder

Best for transferring approximate amounts of 1-500 mL of liquid (2-3 significant figures)



Volumetric pipet

Best for transferring precise amounts of 1-100 mL of liquids (3-4 significant figures)



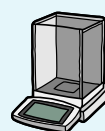
Volumetric flask

Best for preparing a precise amount of 10-1,000 mL of solution (4 significant figures)



Top-loading balance

Best for weighing an approximate amount of a small (<10 g) sample or a precise amount of a large (>10 g) sample (2-5 significant figures)



Analytical balance

Best for weighing a precise amount of a small (<20 g) sample (4-6 significant figures)