

What are some common sources of variance during sample preparation in an analytical application - FAQ

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Accurate analytical results begin with consistent and precise sample preparation. However, each step in the process can introduce variability that may affect your final data. Understanding where these variances come from—and how to minimize them—is key to improving method reliability.

Where Does Variance Come From?

Even when using high-quality instruments and reagents, small inconsistencies can add up. Here are some common sources of variance:

1. Weighing

- **Variance Level:** *Very Low*
 - **Why:** Modern analytical balances are highly accurate, making gravimetric methods among the most precise in analytical chemistry.
 - **Tip:** Always calibrate your balance regularly and use proper weighing techniques to maintain accuracy.
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2. Volumetric Measurements

- **Variance Level:** *Moderate*
 - **Why:** Volumetric glassware (like flasks and pipettes) has manufacturing tolerances that can introduce small but meaningful differences in volume.
 - **Example:** A 250 mL volumetric flask typically has a tighter tolerance than a 25 mL flask, making it more reliable for preparing standard solutions.
 - **Tip:** Choose glassware with tighter tolerances when precision is critical, and always read the meniscus at eye level.
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3. Human Technique

- **Variance Level:** *Variable*
 - **Why:** Inconsistent pipetting, incomplete mixing, or improper timing can all introduce error.
 - **Tip:** Standardize procedures and train personnel thoroughly to reduce technique-based variability.
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4. Environmental Factors

- **Variance Level:** *Often Overlooked*
- **Why:** Temperature, humidity, and even air currents can affect weighing and solution stability.

- **Tip:** Perform sample prep in a controlled environment whenever possible.
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✓ Final Thought

Every step in sample preparation matters. By identifying and controlling sources of variance, you can significantly improve the accuracy and reproducibility of your analytical results.



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MicroSolv Technology Corporation

9158 Industrial Blvd. NE, Leland, NC 28451

Tel: (732) 380-8900

Fax: (910) 769-9435

Email: customers@mtc-usa.com

Website: www.mtc-usa.com