Measurement Lab

Introduction: The accurate and precise measurement of physical quantities is at the heart of scientific investigation. This lab is designed to provide some practice with measurement tools common to many labs, and requires a demonstration of understanding the concepts of accuracy and precision.

Part I: length

Measure the dimensions of a standard index card accurately to the correct precision. When using a ruler or other similar device, the correct precision to measure is indicated by the smallest marked interval on the tool. Measure each dimension three times, and find the averaged result.

Index card:

|  |  |  |
| --- | --- | --- |
|  | Length (cm) | Width (cm) |
| Trial 1 |  |  |
| Trial 2 |  |  |
| Trial 3 |  |  |
| Average\* |  |  |

\* NOTE: performing calculations on measurements does not allow for the increase of precision. Thus, averaged results should have the same precision as the measured ones.

Part II: mass

Measure the mass of the flask or beaker at your table using a triple-beam balance (TBB). Before you begin, be sure to zero the balance, so that a reading of 0 is achieved with nothing on the pan. Once again, the correct precision is indicated by the smallest marked unit.

Flask or beaker

|  |  |
| --- | --- |
|  | Mass (g) |
| Trial 1 |  |
| Trial 2 |  |
| Trial 3 |  |
| Average\* |  |

Part III: volume

Measure the volume of liquid provided using a graduated cylinder. Before you begin, make sure you know what interval is indicated by the different lines on the cylinder. Also, remember to read the volume from the bottom of the curved surface of the liquid (meniscus).

Liquid

|  |  |
| --- | --- |
|  | Volume (mL) |
| Trial 1 |  |
| Trial 2 |  |
| Trial 3 |  |
| Average\* |  |

Analysis

1. Were the measurements you took qualitative or quantitative? What is the difference between these two types of observations?

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2. What is the purpose of averaging three different measurements? Which quality of measurement is improved, accuracy or precision?

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3. What limits the precision at which a measurement can be made?

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4. Which measurements would be more useful: accurate measurements that aren’t very precise, or highly precise measurements that aren’t as accurate? Why?

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