Title: Measurement in the Chemistry Laboratory

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Summary: This lab activity introduces error in measurement. Students learn how to record the appropriate number of significant digits using common laboratory equipment, and how to express the error of repetitive measurements.

Context for Use: This activity is designed for a laboratory setting, and will take between two to three hours depending on the number of students relative to needed equipment and the students’ prior exposure to basic lab equipment. It is intended for a freshman level class.

Learning Goals: At the conclusion of this lab activity, students will:
- Know how many significant digits should be recorded when using basic laboratory equipment
- Know how to calculate a mean, average deviation, standard deviation, and standard error using spreadsheet software
- Know how to select the right volumetric glassware for measuring small volumes
- Be able to calculate a density to the correct number of significant digits

Quantitative Concepts/Skills:

Background: Students need no prior knowledge for completing this activity.

Materials needed:
- Digital balances
- 10 and 100 ml graduated cylinders
- 5 or 10 ml volumetric pipettes
- 100 ml volumetric flasks
- Small solids (rocks, etc.) and assorted liquids for density determination
- A colored dye (suggested, Congo red)
- Visible spectrophotometer and cuvettes
- Access to computers with spreadsheet software

Assessment plan: A pretest will be given to evaluate students’ prior understanding of concepts. The same test will be given at the completion of the activity to assess learning gains.