

## Assignment 3: Reading and Calibration Error CM3215 Chem Eng Fundamentals Lab

Prof. Faith A. Morrison

### Learning Objectives of the Exercise

We have learned about *replicate error* and *reading error*, and here we learn about *calibration error*. These three quantities enter into uncertainty of measured quantities (we combine the three in quadrature to obtain the overall standard error of a quantity). We have the following objectives for this assignment:

- Practice finding the standard reading error  $e_R$  of measured quantities
- Learn the basics of calibration error
- Practice calculating the standard calibration error of measured quantities

The Exercise: Perform week 3 and submit memo week 4, Wednesday 3 February 2016, in class, or to HW Box A if done early. This is an **individual** assignment. You will need 5 Reading/Calibration Worksheets (combined version)

1. Determine the **standard reading error** of the following quantities as measured or determined by the equipment available to you in the laboratory (prepare filled-in worksheets):
  - a. mass (by our lab analytical balance)
  - b. volume (by our pycnometers)
  - c. current (by digital multimeter, both lab versions)
  - d. temperature (by our lab digital indicator with thermocouple)
  - e. height of Blue Fluid 175 in the manometers

Discuss your answer to question 1 with the lab section and Instructor. In your submission, compare your answers and the answers obtained by your section-mates.

2. Determine the **standard calibration error** of the following quantities for the equipment available to you in the laboratory (prepare filled-in worksheets):
  - a. mass (by analytical balance)
  - b. volume (by pycnometer)
  - c. current (by digital multimeter, both lab versions)
  - d. temperature (by digital indicator with thermocouple)
  - e. height of Blue Fluid 175 in the manometers

Discuss your answer to question 3 with the lab section and Instructor. In your submission, compare your answers and the answers obtained by your section-mates.

3. For each instrument, which is larger for each, reading error or calibration error? What is the combined error (in quadrature)?

Prepare a memo to Dr. Morrison in which you report on the consensus values of the items in problems 1, 2, and 3. This is due week 4 Wednesday, in class.