Example Lab Summary Page for PHSX 216 Lab 1: Measuring Instruments & Error Analysis

PURPOSE: Experimentally determine density of cylinder and compare experimental results to accepted value $\rho_{acc} = 7620\ \mathrm{kg/m^3}$

MEASUREMENTS:

Diameter (ruler)	$d_r \pm \delta d_r =$ ⬚ ± ⬚ [units]
Diameter (calipers)	$d_c \pm \delta d_c =$ ⬚ ± ⬚ units]
Length (ruler)	$l_r \pm \delta l_r =$ ⬚ ± ⬚ [units]
Length (calipers)	$l_c \pm \delta l_c =$ ⬚ ± ⬚ [units]
Mass (analytic)	$m_a \pm \delta m_a =$ ⬚ ± ⬚ [units]
Mass (electronic)	$m_e \pm \delta m_e =$ ⬚ ± ⬚ [units]

NOTE: It may be that all your values (represented by ⬚ here) are found only in the spreadsheet where you recorded your data and did your calculations, but even so having a complete list of all your measurements and calculations – ***including the equations*** – makes taking the post-lab quiz much faster and easier.

CALCULATIONS:

Fractional uncertainties for all measurements

$(\delta d_r/d_r) =$ ⬚

$(\delta d_l/d_l) =$ ⬚

$(\delta l_r/l_r) =$ ⬚

$(\delta l_c/l_c) =$ ⬚

$(\delta m_a/m_a) =$ ⬚

$(\delta m_e/m_e) =$ ⬚

NOTE: Fractional uncertainties are unitless ratios; make sure both x and δx are in the ***same units*** when calculating $(x/\delta x)$

Cylinder volume (ruler and calipers)

$V_r =$ ⬚ [units] Eq: $V = \pi\left(\frac{d}{2}\right)^2 l$

$V_c =$ ⬚ [units]

Cylinder density (using most precise and least precise measurements)

$\rho_{mp} \pm \delta\rho_{mp} =$ ⬚ ± ⬚ [units] Eq's: $\rho = \frac{4m}{\pi d^2 l}$

$\rho_{lp} \pm \delta\rho_{lp} =$ ⬚ ± ⬚ [units] $\delta\rho = |\rho|\sqrt{\left(\frac{\delta m}{m}\right)^2 + \left(-2\frac{\delta d}{d}\right)^2 + \left(-1\frac{\delta l}{l}\right)^2}$

RESULT ANALYSIS:

- $\rho_{mp} \pm \delta\rho_{mp}$ (DOES / DOES NOT) agree with ρ_{acc} because the accepted value (IS / IS NOT) within the experimental result interval.
- $\rho_{lp} \pm \delta\rho_{lp}$ (DOES / DOES NOT) agree with ρ_{acc} because the accepted value (IS / IS NOT) within the experimental result interval.