

Exp 3: Analysis

PART 1 (TA DEMONSTRATION)

$$m \pm \delta m = (14.56 \pm 0.01)g$$

$$D \pm \delta D = (2.345 \pm 0.005)cm$$

$$h \pm \delta h = (5.025 \pm 0.005)cm$$

$$V = \frac{1}{4} \pi D^2 h$$

$$V = \frac{\pi \times (2.345 \text{ cm})^2 \times (5.025 \text{ cm})}{4}$$

$$V = 21.702594 \text{ cm}^3$$

Consider significant figures: Keep one more significant figure than your measured values allow ...

$$V = 21.703 \text{ cm}^3$$

$$V = \frac{1}{4} \pi D^2 h = 21.703 \frac{\text{g}}{\text{cm}^3}$$

Every measured quantity in your equation must appear under the radical (square root). Note that when a quantity is raised to a power (D^2) the exponent is inside the parentheses.

$$\delta V = \pm V \times \sqrt{\left(2 \frac{\delta D}{D}\right)^2 + \left(\frac{\delta h}{h}\right)^2}$$

$$\delta V = \pm 21.703 \text{cm}^3 \times \sqrt{\left(2 \times \frac{.005 \text{cm}}{2.345 \text{cm}}\right)^2 + \left(\frac{.005 \text{cm}}{5.025 \text{cm}}\right)^2} = \pm 0.0950361 \text{cm}^3 \Rightarrow \delta V = \pm 0.10 \text{cm}^3$$

Round uncertainty to one significant figure, unless it is the number one.

If it is the number one, keep two significant figures.

$$V \pm \delta V = (21.70 \pm 0.10) \text{cm}^3$$

When you propagate error, the uncertainty of the quantity, δV , determines the significant figures of the quantity, V . The precision of each value must match (e.g., hundredths).

$$\rho = \frac{m}{V}$$

$$\rho = \frac{14.56\text{g}}{21.70\text{cm}^3} = 0.670967742 \frac{\text{g}}{\text{cm}^3}$$

Consider significant figures: Keep one more significant figure than your values allow ...

$$\rho = 0.67097 \frac{\text{g}}{\text{cm}^3}$$

$$m \pm \delta m = (14.56 \pm 0.01)g$$

$$V \pm \delta V = (21.70 \pm 0.10)cm^3$$

$$\rho = \frac{m}{V} = \frac{14.56g}{21.70cm^3} = 0.67097 \frac{g}{cm^3}$$

Every measured quantity in your equation must appear under the radical (square root).

$$\delta\rho = \pm\rho \times \sqrt{\left(\frac{\delta m}{m}\right)^2 + \left(\frac{\delta V}{V}\right)^2}$$

$$\delta\rho = \pm 0.67097 \frac{g}{cm^3} \times \sqrt{\left(\frac{0.01g}{14.56g}\right)^2 + \left(\frac{0.10cm^3}{21.70cm^3}\right)^2}$$

Round uncertainty to one significant figure, unless it is the number one.

If it is the number one, keep two significant figures.

$$\delta\rho = \pm 0.0031262 \frac{g}{cm^3} \Rightarrow \delta\rho = \pm 0.003 \frac{g}{cm^3}$$

$$\rho \pm \delta\rho = (0.671 \pm 0.003) \frac{g}{cm^3}$$

When you propagate error, the uncertainty of the quantity, $\delta\rho$, determines the significant figures of the quantity, ρ .

The precision of each value must match (e.g., thousandths).