

Precision Of Laboratory Equipment And Types Of Error

Quick Check

A student weighs a Canadian penny and finds the mass is 2.57 g. Data from the Canadian Mint indicates a penny from that year should weigh 2.46 g.

1. What is the absolute uncertainty of the penny's mass?
 2. What is the percentage error of the penny's mass?
 3. Suggest a reasonable source of the error.
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Questions:

1. A zinc slug comes from a science supply company with a stated mass of 5.000 g. A student weighs the slug three times, collecting the following values: 4.891 g, 4.901 g, and 4.890 g. Are the student's values accurate? Are they precise (consider both meanings)?
2. A student doing experimental work finds the density of a liquid to be 0.1679 g/cm^3 . The known density of the liquid is 0.1733 g/cm^3 . What is the absolute error of the student's work? What is the percent error?
3. Two students weigh the same object with a known mass of 0.68 g. One student obtains a mass of 0.72 g, while the other gets a mass of 0.64 g. How do their percent errors compare? How do their absolute errors compare?
4. In an experiment to determine the density of a liquid, a maximum error of 5.00% is permitted. If the true density is 1.44 g/cm^3 , what are the maximum and minimum values within which a student's answer may fall into the acceptable range?
5. What is the mass, including uncertainty, arrived at as the result of summing $45.04 \text{ g} \pm 0.03 \text{ g}$, and $39.04 \text{ g} \pm 0.02 \text{ g}$?

6. What is the smallest number that could result from subtracting $22\text{ m} \pm 2\text{ m}$ from $38\text{ m} \pm 3\text{ m}$?
7. The dimensions of a rectangle are measured to be $19.9\text{ cm} \pm 0.1\text{ cm}$ and $2.4 \pm 0.1\text{ cm}$. What is the area of the rectangle, including the range uncertainty?
8. Read each of the following devices, including a reasonable range uncertainty:

