Hon Chemistry Name_____
Date:

C5 • Measurements and Calculations

ACCURACY & PRECISION

Idea 1: Measurements (3.25 cm) are different than other numbers (3.14159265).

- Measurements represent an action by someone with some measuring instrument.
- Measurements have built-in uncertainty; no measurement is exact.
- Measurements have units.

Idea 2: The uncertainty in a measurement needs to be communicated.

Definitions:

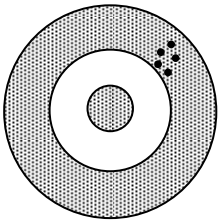
accuracy – how close a measurement is to _____

precision – how close a measurement is to _____

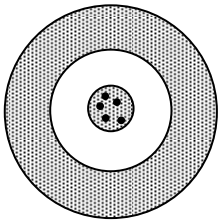
Precision versus Accuracy:

Look at each target below and decide whether the situation is accurate, precise, both, or neither:

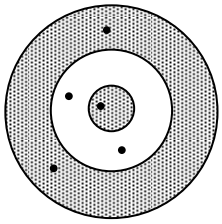
(Note: it is "accepted" that the bull's eye is the place everyone aims for.)



Accurate?: Yes / No
Precise?: Yes / No



Accurate?: Yes / No
Precise?: Yes / No



Accurate?: Yes / No
Precise?: Yes / No

Precision Problems:

Several lab groups measure the density of aluminum. Here is their data:

Team 1	Team 2	Team 3	Team 4	Team 5	Team 6	Team 7
2.65 g/cm^3	2.75 g/cm^3	2.80 g/cm^3	2.77 g/cm^3	2.60 g/cm^3	2.65 g/cm^3	2.68 g/cm^3

If the density of aluminum is 2.70 g/cm3, were the lab groups accurate? (hint: calculate the average of the data) Were the groups precise?

Here is more data. Is this more precise, less precise, or the same precision as the above data? _____

Team 1	Team 2	Team 3	Team 4	Team 5	Team 6	Team 7
2.60 g/cm^3	2.70 g/cm^3	2.80 g/cm^3	2.75 g/cm^3	2.65 g/cm^3	2.62 g/cm^3	2.78 g/cm^3

Accuracy Problems:

$$\% \text{ error} = \frac{\text{measured value} - \text{actual value}}{\text{actual value}} \times 100$$

1. Working in the laboratory, a student find the density of a piece of pure aluminum to be 2.85 g/cm^3. The accepted value for the density of aluminum is 2.699 g/cm^3. What is the student's percent error?

2. A student experimentally determines the specific heat of water to be 4.29 J/g x C^o. He then looks up the specific heat of water on a reference table and finds that is is 4.18 J/g x C^o. What is his percent error?

3. A student takes an object with an accepted mass of 200.00 grams and masses it on his own balance. He records the mass of the object as 196.5 g. What is his percent error?