South Pasadena • Chemistry

Name_____

Period _____   Date ___/___/___

Unit 2 • What Can We Measure About Chemicals?

A C C U R A C Y   &   P R E C I S I O N

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.

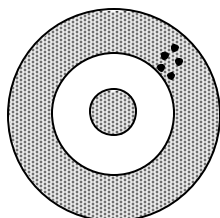Idea 2: The uncertainty in a measurement needs to be communicated.

Definitions:

accuracy – how close a measurement is to _____

precision – how close a measurement is to _____
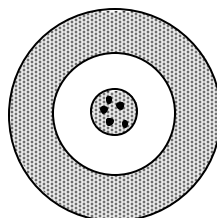
Precision versus Accuracy:

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.)
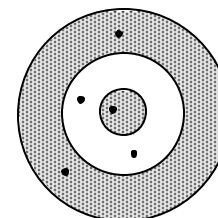

Accurate?: Yes / No   Accurate?: Yes / No   Accurate?: Yes / No

Precise?:   Yes / No   Precise?:   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

What is the average density? _____g/cm^3

Subtract the highest value from the lowest value: _____   Divide this number by 2: _____

The precision of the measurement can be shown as _____$\pm$_____ g/cm^3.

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

<u>Accuracy Problems:</u>

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

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 it is 4.18 J/g x C^o. What is the percent error?

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

4. Often, with accuracy we are concentrating on one measurement. However, we can also look at a collection of measurements and simply take the average. Does this target represent someone who is accurate? _____ Precise? _____