Today's Lecture

- ✓Announcements
- ✓Quizzes
- ✓Uncertainty in Measurements

Announcements

- Office hours
  - Mon, Wed, 11:30-12:30 am
  - Sun,Tue,Thu 12:00-1:00 pm
- Reading
  - Chapter 1, focus on Sections (1.4), **(1.5)** and (1.6)
- Suggested Problems
  - 23,25,27,29,31,33,35,37,39,41,43,45,47,49,51,53, 59,61,67,69

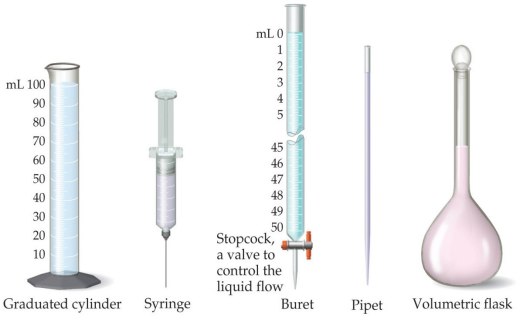
Quizzes

Quiz 1: Estimate room temperature (~72° F) in ° C.

- ~ 15° C
- ~ 22° C
- ~ 27° C
- ~ 32° C
- ~ 37° C

Quiz 2 :Which represents the largest volume?

- 0.25 L
- 2.5 x 10^2 mL
- 2.5 x 10^6 μL
- 2.5 x 10^8 nL
- 2.5 x 10^{10} pL



Matter And Measurement

Significant Figures

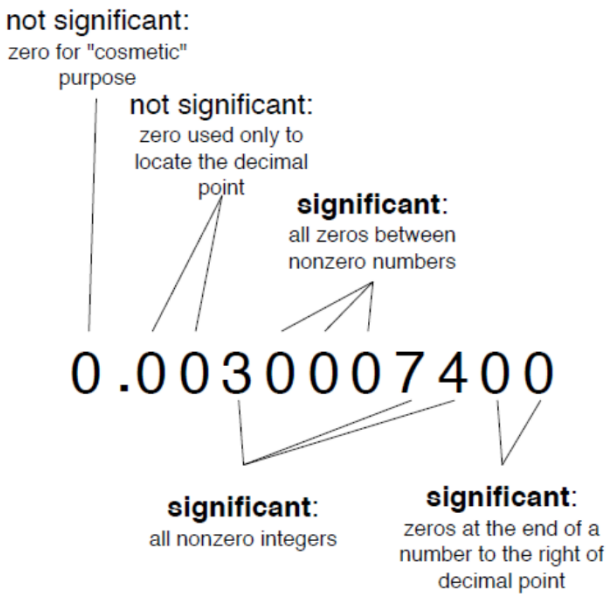
- The term significant figures refers to digits that were measured.
- When rounding calculated numbers, we pay attention to significant figures so we do not overstate the accuracy of our answers.

Matter And Measurement

Significant Figures

1. All nonzero digits are significant.
2. Zeroes between two significant figures are themselves significant.
3. Zeroes at the beginning of a number are never significant.
4. Zeroes at the end of a number are significant if a decimal point is written in the number.

Matter And Measurement



Matter And Measurement

Significant Figures

- When addition or subtraction is performed, answers are rounded to the least significant decimal place.
- When multiplication or division is performed, answers are rounded to the number of digits that corresponds to the *least* number of significant figures in any of the numbers used in the calculation.

Sample Exercise 1 Relating Significant Figures to the Uncertainty of a Measurement

What difference exists between the measured values 4.0 g and 4.00 g?

Practice Exercise

A balance has a precision of ± 0.001 g. A sample that has a mass of about 25 g is placed on this balance. How many significant figures should be reported for this measurement?

Sample Exercise 2 Determining the Number of Significant Figures in a Measurement

How many significant figures are in each of the following numbers (assume that each number is a measured quantity): **(a)** 4.003, **(b)** 6.023×10^{23}, **(c)** 5000?

Practice Exercise

How many significant figures are in each of the following measurements:
(a) 3.549 g, **(b)** 2.3×10^4 cm, **(c)** 0.00134 m^3?

Sample Exercise 3: Determining the Number of Significant figures in a Calculated Quantity

The width, length, and height of a small box are 15.5 cm, 27.3 cm, and 5.4 cm, respectively. Calculate the volume of the box, using the correct number of significant figures in your answer.

Practice Exercise

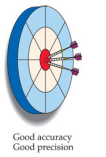
It takes 10.5 s for a sprinter to run 100.00 m. Calculate the average speed of the sprinter in meters per second, and express the result to the correct number of significant figures.

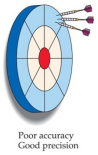
Sample Exercise 4 Determining the Number of Significant figures in a Calculated Quantity

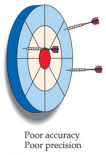
A gas at 25 ° C fills a container whose volume is 1.05×10^3 cm^3. The container plus gas have a mass of 837.6 g. The container, when emptied of all gas, has a mass of 836.2 g. What is the density of the gas at 25 ° C?

Accuracy versus Precision

- Accuracy refers to the proximity of a measurement to the true value of a quantity.
- Precision refers to the proximity of several measurements to each other.







Matter And Measurement

A student measured the concentration of a solution three times, obtaining values of 0.010 *M*, 0.060 *M*, and 0.030 *M*. The average concentration was thus 0.033 *M*. The accepted value was 0.034 *M*. The student's data has:

a. good accuracy and good precision.
b. poor accuracy but good precision.
c. poor accuracy and poor precision.
d. good accuracy but poor precision.

Matter And Measurement

Next Lecture

- Dimensional Analysis
  - Chapter 1
    - Section (1.6)