Announcements

Wednesday, January 14, 2009

Intro/Ch1 assignment in MasteringChemistry is due Wed, Jan 21 .

Ch2 assignment will be posted tomorrow and will be due Wed, Jan 28.

See me in my office (E224) if you have not received the MasteringChemistry Course ID in your MetNet email.

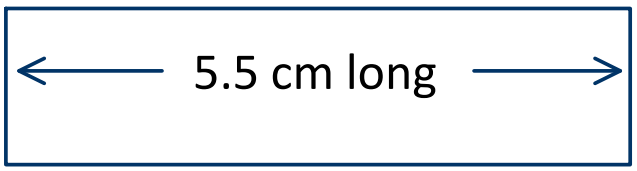
No classes Monday, Jan 19. Optional questions/review in Tues and Wed labs next week.

Quiz 1 on names and symbols of common elements is on Monday, Feb 2. See the course webpage for the handout of elements you need to have memorized.

Exact numbers: totally certain
by definition or counting

Measurements: contain some uncertainty

length:



marks 0.1 cm apart

marks every 1 cm

	Team A:	Team B:	Team C:
	5.6 cm	5.68 cm	5.49 cm
	5.5 cm	5.66 cm	5.51 cm
	5.4 cm	5.67 cm	5.50 cm
Averages:	5.5 cm	5.67 cm	5.50 cm

Quality of measurements:

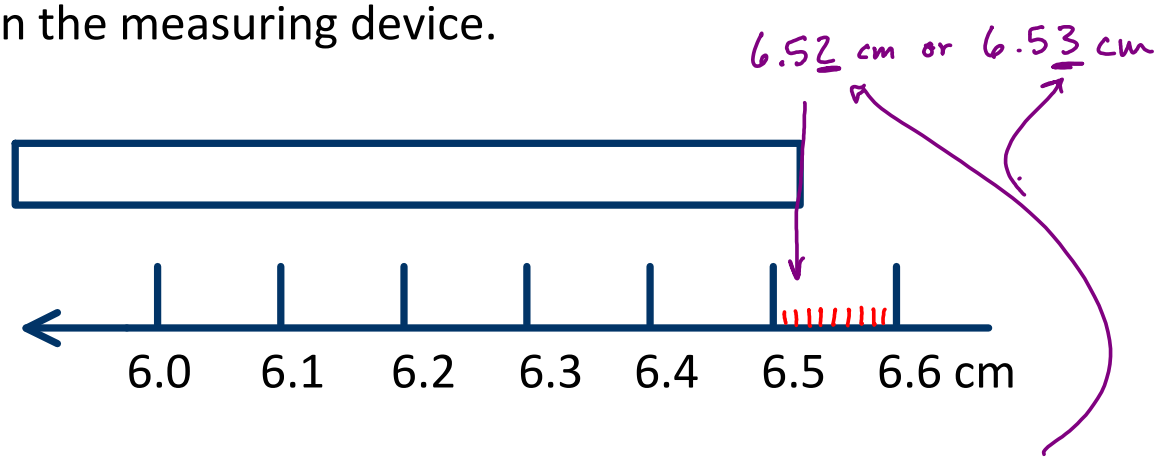
Accuracy: "correctness" - how close to "true" value

A & C more accurate than B

Precision: "repeatability" - how close a group of values are to each other

B & C more precise than A

Precision is usually dependent on how many marks are on the measuring device.



Every metric measurement has exactly one uncertain digit.

Significant figures: used to track uncertainty through calculations

10.0 cm / 3 = 3.3333333 .... cm

too many digits

we don't know this length that precisely

Which digits in a measurement are significant?

1. All nonzero digits are significant
   a. 23.48 cm 4 sf
   b. 1.22 cm 3 sf

2. Leading zeroes (to left of nonzero digits) are never significant
   a. 0.00281 cm 3 sf
   b. 0.000281 cm 3 sf

3. Trapped zeroes (interior) are always significant
   a. 0.002081 cm 4 sf
   b. 0.03002005 cm 7 sf

4. Trailing zeroes (to right of nonzero digits) are significant **IF** there's a decimal point anywhere in the measurement
   a. 0.0050 cm 2 sf
   b. 48000.0 cm 6 sf
   c. 48000. cm 5 sf
   d. 48000 cm at least 2 (unclear exactly how many s.f.)

Rounding reduces the number of sig figs in a measurement.

421.38 cm → round to 4 s.f. → 421.4 cm

look at 1 digit to right of last sig fig:

0-4 round down

5-9 round up

922.248 cm → round to 4 s.f. → 922.2 cm

5497 cm → round to 2 s.f. → 5500 cm

5497 cm → round to 3 s.f. → 5500 cm

only clearly shows 2 sf!

~~5500.~~ cm 4 sf

- cannot clearly show 3 sf in decimal notation
- must use scientific notation

Scientific notation:

- used to easily report very small or very large numbers
- always clearly shows any desired number of significant figures (never ambiguous)

$\#$ between 1-10 $\times$ $10^{\square}$ power of 10

$10^0 = 1$

$10^1 = 10$

$10^2 = 10 \times 10 = 100$

$10^3 = 1000$

$2.00 \times 10^2 =$ 200. decimal pt required to preserve # sig figs

scientific not

decimal not.

$2.000 \times 10^2 =$ 200.0

5500(.)

$5500 =$ 5.50×10^3

say we need 3 s.f.

pos power of 10 makes 5.50 larger

Scientific notation

9.78×10^{3} —decimal→ 9780 (no decimal point)

9.78

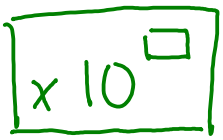
1.34×10^{-2} —decimal→ 0.0134

1.34

makes 1.34 smaller

0.000 013 8 —sci→ 1.38×10^{-5}

To use scientific notation on your calculator, you must use the [E] [EE] or [EXP] key.



To enter 1.38×10^{5} :

1.38 [E] 5

To enter 2.551×10^{-3} :

text calculator: 2.551 [E] [(−)] 3

numeric calculator: 2.551 [E] 3 [+/−]

Mastering Chemistry 2.551 * 10 [-3]

or 2.551 * 10 ^ -3

1. Multiplying or dividing:
   a. find the value with the fewest sig figs
   b. round answer to that number of sig figs

You travel 20.0 miles in 3.0 hours. What is your average speed in miles per hour?

$$\frac{20.0 \text{ mi}}{3.0 \text{ hr}} = 6.666667 \text{ mi/hr}$$

★ 2 sf

round to 2 sf

$$6.7 \text{ mi/hr}$$

100.00 cm / 5 pieces =

4.873×10^{2} cm x 9.2×10^{-4} cm =