CHM 130 Sig Fig Practice Problems

Significant digits or figures are not something we make up to terrorize you all semester long. They represent the accuracy of a measurement. For example, a cheap bathroom scale bought at the dollar store reads your weight as 152 pounds, not 152.45809 pounds. It is not that accurate. Significant digits are very important in all measurements. Now remember that conversion factors such as (1 L / 1000 mL) or (1 foot = 12 inches) DO NOT affect the significant digits because they are exact numbers or definitions.

A. Rules - note that # means a non-zero digit (123456789)
   1. Digits 1 to 9 always count
   2. Zeros in front never count
   3. Zeros after a # do not count unless they are also after a decimal place
   4. Zeros in between any digits that count, count also

B. Examples
   1. 2040 - 3 sig fig
   2. 2040.0 - 5 sig fig
   3. 00204.0 - 4 sig fig
   4. 0.00204 - 3 sig fig
   5. 0.020400 - 5 sig fig
   6. 2.0400 - 5 sig fig
   7. 100,000 - 1 sig fig
   8. 100,000.0 -7 sig fig
   9. 0.0001 - 1 sig fig
   10. 0.000100 - 3 sig fig

C. When multiplying or dividing, the answer must have the same number of sig fig as the least sig fig in the problem. Your answer can not be more accurate than any measurement in the problem. It is kinda like the weakest link in the problem dictates how accurate the answer can be.

D. When adding or subtracting the answer must have the same number of decimal places as the least number of decimal places in the problem. Your answer can not be more accurate than any measurement in the problem.

E. Example: Pretend we weigh something on a cheap scale, and it is 3.5 grams. Then we weigh something else on a scientific scale and it is 4.2448 grams. If we add them together the answer is 7.7 grams because we can only have one decimal place.

F. Now pretend we multiply 2.569 inches by 1.7 inches. Answer is 4.4 in^2 because the least amount of sig fig was 2 sig fig so the answer can only have 2 sig fis. Also, inch x inch = inch squared!

G. Now remember that conversion factors such as (1 L / 1000 mL) DO NOT affect the significant digits because they are exact numbers. Any such equality will not dictate the sig figs in your final answer.

H. More examples:
   1. 3340 ft x 1.2 ft = 4.0 x 10^3 ft^2 The answer must have 2 sig dig cause of the 1.2 thus 4000 is incorrect because it only has 1 sig dig.
   2. 88359 m^2 / 3 m = 30,000 m The answer can only have 1 sig dig cause of the 3.
   3. 8.888 m x 3.29853 m = 29.32 m^2 The answer must have 4 sig dig like 8.888.
   4. 1.25 mm + 3.2 mm = 4.5 mm The answer can only have one decimal place like the 3.2.
   5. 145 L - 0.222 L = 145 L The answer cannot have any decimal places cause 145 has none.
   6. 145 g - 0.99 g = 144 g The answer cannot have any decimal places.
   7. 0.042 m + 1.33 m = 1.37 m The answer can have only 2 decimal places like 1.33.

Practice Problems - Work these on your own, THEN look at the answers that follow.

1. How many significant digits are in 23,000?
2. How many significant digits are in 4000.00?
3. How many significant digits are in 0.00023040?
4. How many significant digits are in 400?
5. How many significant digits are in 7.2500?
6. How many significant digits are in 0.00333?
7. Write the numbers in 1-6 above in scientific notation.
8. Write these numbers in scientific notation: 42,000; 27.0040; 150,000,000; 0.00000003500; 50,000; 0.0205
9. What are the metric units for volume, mass and length?
10. Round the following numbers to 3 sig figs:
    1. 234,555,359
    2. 0.090035
    3. 939.25
    4. 14,090
    5. 0.008499
    6. 11.1111
11. 12.5849 mg + 2.4 mg =
12. 432.5 mL - 24.3984 mL =
13. 246 m x 1.5 m =
14. 974.59 m^2 / 14.2 m =
15. $3.85 \times 10^{-18} / 7.35 \times 10^{-36}$ =
16. $(5.55 \times 10^{15})(8.88 \times 10^{18})$ =

Answers

1. 2
2. 6
3. 5
4. 1
5. 5
6. 3
7. 2.3×10^4, 4.00000×10^3, 2.3040×10^{-4}, 4×10^2, 7.2500×10^0, 3.33×10^{-3} (Note that you must keep the correct number of significant digits when putting into scientific notation)
8. 4.2×10^4; 2.70040×10^1; 1.5×10^8, 3.500×10^{-8}; 5×10^4; 2.05×10^{-2}
9. Liters, grams, meters
10. 235,000,000 and 0.0900 and 939 and 14,100 and 0.00850 and 11.1
11. 15.0 mg
12. 408.1 mL
13. 370 m^2
14. 68.6 m
15. 5.24×10^{17}
16. 4.93×10^{34}