Extra Problems

1. Convert the following numbers to scientific notation:

a. 54,000 L 5.4×10^{4} L	b. 8,090,100 km 8.0901×10^{6} km
c. 0.0245 g 2.45×10^{-2} g	d. 0.000 000 049 s 4.9×10^{-8} s

2. Convert the following numbers to ordinary notation:

a. 2.8×10^{3} kg 2800 kg	b. 6.45×10^{7} ns 64,500,000 ns
c. 1.04×10^{-3} L 0.00104 L	d. 9.405×10^{-6} m 0.000009405 m

3. How many stone (a British unit of weight) does a 175-lb person weigh? There are 14.0 lbs in one stone. Show all work (dimensional analysis), use correct sig figs and units.

$$?\ \text{stone} = \frac{175\ \text{lbs}}{1} \times \frac{1\ \text{stone}}{14\ \text{lbs}} = \boxed{12.5\ \text{stone}}\ (3\ \text{sig figs})$$

4. A driver is tearing along at a speed of 2.0 km/min. How fast is this in miles/hour? There are 1.609 km in one mile and 60 min in one hr. Show all work (dimensional analysis), use correct sig figs and units.

$$?\ \text{mi/hr} = \frac{2.0\ \text{km}}{1\ \text{min}} \times \frac{1\ \text{mi}}{1.61\ \text{km}} \times \frac{60\ \text{min}}{1\ \text{hr}} = \boxed{\frac{75\ \text{mi}}{1\ \text{hr}} = 75\ \text{mi/hr}}\ (2\ \text{sig figs})$$

Mastering Problems pg. 50-51 #52, 53, 64, 65, 66, 68, 71, 72, 73, 74, 80 (a-f), 81 (a,b), 82 (a,b), 87.

52. Why must a measurement include both a number and a unit?
The number gives you the quantitative value, and the unit indicates what was measured.

53. Explain why scientists, in particular, need standard units of measurement.
Scientists from different countries have different languages and cultures but must be able to share and compare data.

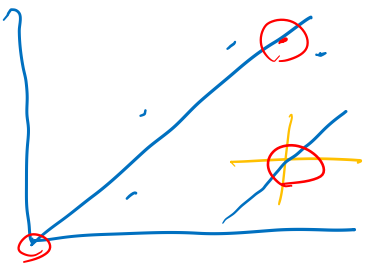
64. Why are plus and minus signs ignored in percent error calculations?
You need to know only the magnitude (size) of the difference between the experimental value and the accepted value.

65. In 50 540, which zero is significant? What is the other zero called?
The first zero is significant; the second one is a placeholder.

66. Which of the following three numbers will produce the same number when rounded to three significant figures: 3.456, 3.450, or 3.448?
3.450 and 3.448 both round to 3.45. 3.456 rounds to 3.46.

68. When multiplying 602.4 m by 3.27 m, which factor determines the number of significant figures in the answer? Explain.
3.72 m; it has the smaller number of significant figures.

71. How can you find the slope of a line graph?
Draw the best fit line, locate two points on the line and divide Δy by Δx.



72. A 5-mL sample of water has a mass of 5 g. What is the density of water?

$$D = \frac{M}{V} = \frac{5\text{ g}}{5\text{ mL}} = \boxed{1\text{ g/mL}}\ (1\text{ sig fig})$$

73. An object with a mass of 7.5 g raises the level of water in a graduated cylinder from 25.1 mL to 30.1 mL. What is the density of the object?

$$D = \frac{M}{V} = \frac{7.5\text{ g}}{(30.1\text{ mL} - 25.1\text{ mL})} = \frac{7.5\text{ g}}{5.0\text{ mL}} = \boxed{1.5\text{ g/mL}}\ (2\text{ sig figs})$$

2 sig figs

74. The density of aluminum is 2.7 g/mL. What is the volume of 8.1 g?

$$D = \frac{M}{V} \text{ so } V = \frac{M}{D} = \frac{8.1\text{ g}}{2.7\text{ g/mL}} = \boxed{3.0\text{ mL}}\ (2\text{ sig figs})$$

$$2.7\text{ g/mL} = \frac{8.1\text{ g}}{V} \qquad V = \frac{8.1\text{ g}}{2.7\text{ g/mL}}$$

80. Convert the following measurements.

a. 5.70 g to milligrams $\quad 5.70\ \text{g} \times \frac{1\text{ mg}}{1\times10^{-3}\ \text{g}} = \boxed{5.70\times10^{3}\text{ mg}}\ (3\text{ sig figs})$

b. 4.37 cm to meters $\quad \frac{4.37\ \text{cm} \mid 1\times10^{-2}\ \text{m}}{1\ \text{cm}} = \boxed{0.0437\text{ m}}\ (3\text{ sig figs})$

c. 783 kg to grams $\quad 783\ \text{kg} \times \frac{1\times10^{3}\text{ g}}{1\ \text{kg}} = \boxed{783{,}000\text{ g}}\ (3\text{ sig figs})$

d. 45.3 mm to meters $\quad \frac{45.3\ \text{mm} \mid 1\times10^{-3}\ \text{m}}{1\ \text{mm}} = \boxed{0.0453\text{ m}}\ (3\text{ sig figs})$

e. 10 m to centimeters $\quad 10\ \text{m} \times \frac{1\text{ cm}}{1\times10^{-2}\ \text{m}} = \boxed{1000\text{ cm}}\ (1\text{ sig fig})$

f. 37.5 g/mL to kg/L $\quad \frac{37.5\ \text{g} \mid 1\text{ kg} \mid 1\ \text{mL}}{1\ \text{mL} \mid 1\times10^{3}\ \text{g} \mid 1\times10^{-3}\ \text{L}} = \boxed{37.5\text{ kg/L}}\ (3\text{ sig figs})$

81. The accepted length of a steel pipe is 5.5 m. Calculate the perecent error for each of these measurements.

a. 5.2 m $\quad \%\text{ error} = \frac{|5.2\text{ m} - 5.5\text{ m}|}{5.5\text{ m}} \times 100\% = \frac{0.3}{5.5} \times 100\% = \boxed{6\%}\ (1\text{ sig fig})$

1 SF 5%

b. 5.5 m $\quad \%\text{ error} = \frac{|5.5\text{ m} - 5.5\text{ m}|}{5.5\text{ m}} \times 100 = \boxed{0\%}\ (0\text{ sig figs})$

82. The accepted density for copper is 8.96 g/mL. Calculate the percent error for each of these measurements.

a. 8.86 g/mL $\quad \%\text{ error} = \frac{|8.86\text{ g/mL} - 8.96\text{ g/mL}|}{8.96\text{ g/mL}} \times 100\% = \frac{0.10}{8.96} \times 100\% = \boxed{1.1\%}\ (2\text{ sig figs})$

2 SF

b. 8.92 g/mL $\%\ \text{error} = \dfrac{|8.92\ \text{g/mL} - 8.96\ \text{g/mL}|}{8.96\ \text{g/mL}} \times 100\% = \dfrac{0.04}{8.96} = \boxed{0.4\%}$ (1 sig fig)

87. Graph the following data with the volume on the x-axis and the mass on the y-axis. Then calculate the slope of the line.

Density Table	
Volume (mL)	Mass (g)
2.0	5.4
4.0	10.8
6.0	16.2
8.0	21.6
10.0	27.0