CHEMISTRY I (H)
SF, UNITS, TEMPERATURE, DENSITY PRACTICE

1. Determine the number of significant figures in each of the following numbers:
   a. 5.06
   b. 0.008
   c. 400
   d. 60.
   e. 0.003090
   f. 10001

2. Perform each of the following calculations using the proper rule:
   a. 8.0 + 7.999 =
   b. 8.0 x 7.999 =
   c. 8.0 – 7.999 =
   d. 8.0 ÷7.999 =

3. Convert each of the numbers in #1 to scientific notation, keeping the same number of significant figures in the number as were there originally.

4. Make each of the following metric-metric conversions:
   a. 156 cm = _____ km
   b. 6.02×10^{-12} Mg = _____ μg
   c. 5.00 μL = _____ mL
   d. 3.14×10^{5} Gm = _____ dm

5. Make each of the following metric-English conversions:
   a. 2.00 L = _____ gal (1 L = 1.06 qt; 1 gal = 4 qt)
   b. 150 lb = _____ kg (1 lb = 454 g)
   c. 5.00 km = _____ mi (1 mi = 1.61 km)
   d. 35 mi/h = _____ m/s

6. Convert each of the following:
   a. 86°F to °C
   b. –40°C to °F
   c. 25°C to K
   d. 303 K to °F

7. A piece of paper from my printer has a mass of 4.597 g. Its dimensions are 21.6 cm x 27.9 cm x 0.0229 cm. What is the density of the paper in g/cm^3?

8. A paper clip from my desk has a mass of 0.440 g. Its diameter is 0.100 cm, and its density is determined to be 4.87 g/cm^3. What is the length of the paper clip in cm? ($V_{cylinder} = \pi r^2 h$)

9. A typical men's shot put has a 5.11 in diameter and a density of 6.31 g/cm^3. What is the mass of the shot in lb? ($V_{sphere} = (4/3)\pi r^3$; 1 in = 2.54 cm)

ANSWERS

1. a. 3
   b. 1
   c. 1
   d. 2
   e. 4
   f. 5

2. a. 16.0
   b. 64
   c. 0.0
   d. 1.0

3. a. 5.06×10^{1}
   b. 8×10^{-3}
   c. 4×10^{2}
   d. 6.0×10^{1}
   e. 3.090×10^{-3}
   f. 1.0001×10^{4}

4. a. 0.00156 km or 1.56×10^{-3} km
   b. 6.02 μg
   c. 0.00500 mL or 5.00×10^{-3} mL
   d. 3.14×10^{15} dm

5. a. 0.530 gal
   b. 68.1 kg
   c. 3.11 mi
   d. 15.7 m/s

6. a. 30°C
   b. −40°F
   c. 298 K
   d. 86°F

7. 0.333 g/cm^3

8. 11.5 cm

9. 15.9 lb

1. a. 3 d. 2
   b. 1 e. 4
   c. 1 f. 5

2. a. 16.0 c. 0.0
   b. 64 d. 1.0

3. a. 5.06×10^{1} d. 6.0×10^{1}
   b. 8×10^{-3} e. 3.090×10^{3}
   c. 4×10^{2} f. 1.0001×10^{4}

4. a. $156\ \text{cm} \times \frac{1\ \text{m}}{1 \times 10^{2}\ \text{cm}} \times \frac{1 \times 10^{-3}\ \text{km}}{1\ \text{m}} = 0.00156\ \text{km}$ or $1.56 \times 10^{-3}\ \text{km}$
   b. $6.02 \times 10^{-12}\ \text{g} \times \frac{1\ \mu\text{g}}{1 \times 10^{-6}\ \text{g}} \times \frac{1 \times 10^{6}\ \mu\text{g}}{1\ \text{g}} = 6.02\ \mu\text{g}$
   c. $5.00\ \mu\text{L} \times \frac{1\ \text{L}}{1 \times 10^{6}\ \mu\text{L}} \times \frac{1 \times 10^{3}\ \text{mL}}{1\ \text{L}} = 0.00500\ \text{mL}$ or $5.00 \times 10^{-3}\ \text{mL}$
   d. $3.14 \times 10^{5}\ \text{Gm} \times \frac{1\ \text{m}}{1 \times 10^{-9}\ \text{Gm}} \times \frac{1 \times 10^{1}\ \text{dm}}{1\ \text{m}} = 3.14 \times 10^{15}\ \text{dm}$

5. a. $2.00\ \text{L} \times \frac{1.06\ \text{qt}}{1\ \text{L}} \times \frac{1\ \text{gal}}{4\ \text{qt}} = 0.530\ \text{gal}$
   b. $150\ \text{lb} \times \frac{454\ \text{g}}{1\ \text{lb}} \times \frac{1 \times 10^{-3}\ \text{kg}}{1\ \text{g}} = 68.1\ \text{kg}$
   c. $5.00\ \text{km} \times \frac{1\ \text{mi}}{1.61\ \text{km}} = 3.11\ \text{mi}$
   d. $\frac{85\ \text{mi}}{1\ \text{hr}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{1\ \text{min}}{60\ \text{s}} \times \frac{1.61\ \text{km}}{1\ \text{mi}} \times \frac{1\ \text{m}}{1 \times 10^{-3}\ \text{km}} = \frac{15.7\ \text{m}}{\text{s}}$

6. a. $(86°\text{F} - 32°\text{F}) \times \frac{5°\text{C}}{9°\text{F}} = 30°\text{C}$
   b. $\left(-40°\text{C} \times \frac{9°\text{F}}{5°\text{C}}\right) + 32°\text{F} = -40°\text{F}$
   c. $25°\text{C} + 273 = 298\ \text{K}$
   d. $303\ \text{K} - 273 = \left(30°\text{C} \times \frac{9°\text{F}}{5°\text{C}}\right) + 32°\text{F} = 86°\text{F}$

7. $V = 21.6\ \text{cm} \times 29.9\ \text{cm} \times 0.0229\ \text{cm} = 15.8\ \text{cm}^3$
   $D = \frac{4.597\ \text{g}}{15.8\ \text{cm}^3} = 0.333\ \frac{\text{g}}{\text{cm}^3}$

8 $\frac{1\ cm^3}{4.87\ g} \times 0.440\ g = 0.0903\ cm^3 = V$

$0.0903\ cm^3 = (3.14)\left(\frac{0.100\ cm}{2}\right)^2 h$

$h = 11.5\ cm$

9 $\frac{5.11\ in}{2} = 2.56\ in \times \frac{2.54\ cm}{1\ in} = 6.49\ cm = r$

$V = \frac{4}{3}(3.14)(6.49\ cm)^3 = 1144\ cm^3$

$\frac{6.31\ g}{cm^3} \times 1144\ cm^3 \times \frac{1\ lb}{454\ g} = 15.9\ lb$