

Chapter 2 Practice

2.1 Measurement: A Foundation of Good Science

1. Write the following in standard notation:

- 1.62×10^{-5} 0.0000162
- 2.992×10^5 299,200

2. Write the following in scientific notation:

- 150,000,000 1.5×10^8
- 0.0008923 8.923×10^{-4}

3. Fill in the appropriate values. See how many you can do without looking them up.

- a. 1 milliliter = 10^{-3} liters b. 1 kilogram = 1,000 grams
c. 1 mm = 10^{-3} m d. 1 MJ = 10^6 J

4. Identify the unit represented by each abbreviation.

cm	kg	ng	μ L	mL	ML	kJ
centimeter	kilogram	nanogram	microliter	milliliter	megaliter	kilojoule

5. Find the number of significant figures in each measurement:

- 4.300 km 4
- 0.0052 g 2
- 0.308 kJ 3

6. Complete the following calculations. Answer to the correct number of significant figures.

- a. $(1.4 \times 10^6)(9.1 \times 10^{-5})$ = 1.3×10^2 (or 130)
b. $(5.4 \times 10^5)/(3.7 \times 10^{-5})$ = 1.5×10^{10}
c. $(2.1 \times 10^4) \div 3.0$ = 7.0×10^3 (or 7,000)

2.2 Unit Conversion

7. Solve the following, including units: $(2.021 \times 10^{12} \text{ kJ}) \times \frac{1,000 \text{ J}}{1 \text{ kJ}} \times \frac{1 \text{ cal}}{4.184 \text{ J}} = 4.830 \times 10^{14} \text{ cal}$

8. Solve the following, including units: $\frac{5.20 \times 10^8 \text{ g}}{7.85 \times 10^6 \text{ g/m}^3} = 66.2 \text{ m}^3$

9. How many milliliters are in 5.9 L? **5,900 mL**
10. How many grams are in 5,300 mg? **5.3 g**
11. You are laying tile in a kitchen with an area of 9.4 square meters. What is this area in square feet? (1 meter = 3.28 feet)
100 ft² (This is rounded to two significant digits. 1 m² = 10.8 ft²)
12. A large soft drink has a volume of 0.950 L. What is this volume in cm³? **950 cm³**
13. A stream flows at a rate of 10.4 liters per hour. Convert this rate to cubic meters per day.
0.250 m³/day (Remember, 1 L = 1 dm³, and 1 m³ = 1,000 dm³)
14. A waterway contains 10.3 milligrams of an impurity per gallon of water. How many micrograms of impurity are present per liter of water?
2,720 µg/L (This is rounded to three significant digits. 1 mg = 1,000 µg, and 1 gal = 3.79 L)

2.3 Density: Relating Mass to Volume

15. A student working in the laboratory needs 500 g of a liquid chemical whose density is 1.41 g/cm³. What volume of this liquid should he measure?

$$V = m/d = (500 \text{ g})/(1.41 \text{ g/cm}^3) = 354 \text{ cm}^3$$

(This assumes three significant digits in 500 g.)

16. What is the mass of a 5.31-mL sample of a liquid with a density of 2.10 g/mL?

$$m = dV = (2.10 \text{ g/mL})(5.31 \text{ mL}) = 11.2 \text{ g}$$

2.4 Measuring Temperature

17. The average human body temperature is 98.6 °F. Convert this temperature to degrees Celsius and to Kelvin.
37.0 °C; 310.2 K

18. In July, the average high temperature in New York City is 28 °C. Convert this temperature to degrees Fahrenheit and to Kelvin.

$$\mathbf{82\text{ }^{\circ}\text{F}; 301\text{ K}}$$

Challenge

19. Upon graduating with a good GPA and work experience, you are pleased to receive two job offers. Company A offers a salary of \$42,000/year. Company B offers an hourly pay of \$25.00/hour. Assuming that you will work 50 weeks per year at 40 hours/week, use the factor-label method to find your annual income at Company B. Which offer is more lucrative?

$$\mathbf{Company\ A: \$42,000/year}$$

Company B: \$50,000/year. Company B is more lucrative.

20. You recently started a candle-making business and need to purchase a large amount of a unique scented wax. You plan to charge \$9.95 per large candle. The wax you need is available from a U.S. supplier for \$24.00/lb, and also from a German supplier for €9.20/kg. If the current exchange rate is \$1 = €0.76 and 1 kg = 2.20 lb, which supplier is giving the better price?

U.S. supplier: \$24.00/lb = €40.13/kg

German supplier: \$5.50/lb = €9.20/kg

The German supplier is much less expensive.