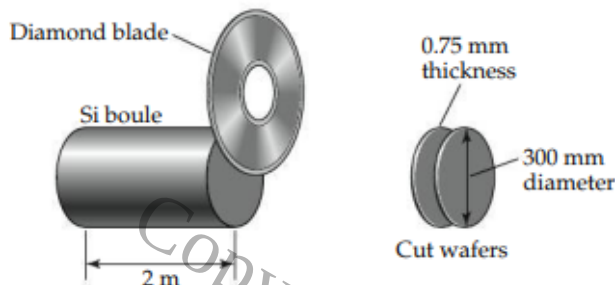


- 1.34 Silicon for computer chips is grown in large cylinders called “boules” that are 300 mm in diameter and 2 m in length, as shown. The density of silicon is  $2.33 \text{ g/cm}^3$ . Silicon wafers for making integrated circuits are sliced from a 2.0 m boule and are typically 0.75 mm thick and 300 mm in diameter. (a) How many wafers can be cut from a single boule? (b) What is the mass of a silicon wafer? (The volume of a cylinder is given by  $\pi r^2 h$ , where  $r$  is the radius and  $h$  is its height.)



### Uncertainty in Measurement (Section 1.5)

- 1.35 Indicate which of the following are exact numbers: (a) the mass of a 3 by 5-inch index card, (b) the number of ounces in a pound, (c) the volume of a cup of Seattle’s Best coffee, (d) the number of inches in a mile, (e) the number of microseconds in a week, (f) the number of pages in this book.
- 1.36 Indicate which of the following are exact numbers: (a) the mass of a 32-oz can of coffee, (b) the number of students in your chemistry class, (c) the temperature of the surface of the Sun, (d) the mass of a postage stamp, (e) the number of milliliters in a cubic meter of water, (f) the average height of NBA basketball players.
- 1.37 What is the number of significant figures in each of the following measured quantities? (a) 601 kg, (b) 0.054 s, (c) 6.3050 cm, (d) 0.0105 L, (e)  $7.0500 \times 10^{-3} \text{ m}^3$ , (f) 400 g.
- 1.38 Indicate the number of significant figures in each of the following measured quantities: (a) 3.774 km, (b) 205  $\text{m}^2$ , (c) 1.700 cm, (d) 350.00 K, (e) 307.080 g, (f)  $1.3 \times 10^3 \text{ m/s}$ .
- 1.39 Round each of the following numbers to four significant figures and express the result in standard exponential notation: (a) 102.53070, (b) 656.980, (c) 0.008543210, (d) 0.000257870, (e)  $-0.0357202$ .
- 1.40 (a) The diameter of Earth at the equator is 7926.381 mi. Round this number to three significant figures and express it in standard exponential notation. (b) The circumference of Earth through the poles is 40,008 km. Round this number to four significant figures and express it in standard exponential notation.
- 1.41 Carry out the following operations and express the answers with the appropriate number of significant figures.
- (a)  $14.3505 + 2.65$   
 (b)  $952.7 - 140.7389$   
 (c)  $(3.29 \times 10^4)(0.2501)$   
 (d)  $0.0588/0.677$
- 1.42 Carry out the following operations and express the answer with the appropriate number of significant figures.

- (a)  $320.5 - (6104.5/2.3)$   
 (b)  $[(285.3 \times 10^5) - (1.200 \times 10^3)] \times 2.8954$   
 (c)  $(0.0045 \times 20,000.0) + (2813 \times 12)$   
 (d)  $863 \times [1255 - (3.45 \times 108)]$

- 1.43 You weigh an object on a balance and read the mass in grams according to the picture. How many significant figures are in this measurement?



- 1.44 You have a graduated cylinder that contains a liquid (see photograph). Write the volume of the liquid, in milliliters, using the proper number of significant figures.



### Dimensional Analysis (Section 1.6)

- 1.45 Using your knowledge of metric units, English units, and the information on the back inside cover, write down the conversion factors needed to convert (a) mm to nm, (b) mg to kg, (c) km to ft, (d)  $\text{in.}^3$  to  $\text{cm}^3$ .
- 1.46 Using your knowledge of metric units, English units, and the information on the back inside cover, write down the conversion factors needed to convert (a)  $\mu\text{m}$  to mm, (b) ms to ns, (c) mi to km, (d)  $\text{ft}^3$  to L.
- 1.47 (a) A bumblebee flies with a ground speed of 15.2 m/s. Calculate its speed in km/hr. (b) The lung capacity of the blue whale is  $5.0 \times 10^3 \text{ L}$ . Convert this volume into gallons. (c) The Statue of Liberty is 151 ft tall. Calculate its height in meters. (d) Bamboo can grow up to 60.0 cm/day. Convert this growth rate into inches per hour.
- 1.48 (a) The speed of light in a vacuum is  $2.998 \times 10^8 \text{ m/s}$ . Calculate its speed in miles per hour. (b) The Sears Tower in Chicago is 1454 ft tall. Calculate its height in meters. (c) The Vehicle Assembly Building at the Kennedy Space Center in Florida has a volume of  $3,666,500 \text{ m}^3$ . Convert this volume to liters and express the result in standard exponential notation. (d) An individual suffering from a high cholesterol level in her