### Chp 1—Matter and Measurements

1. The radius of a potassium atom is 0.227 nm. What is the radius in millimeters?

2. If the temperature of a beaker of water is 65.0°F, what is its temperature in Celsius?

3. If the outdoor temperature is 17.0°C, what is the temperature in Fahrenheit? (Remember: water melts at 0°C and 32°F; water boils at 100°C and 212°F)

4. The boiling point of ammonia is -33.3°C. What is this temperature in kelvin?

5. Water freezes at 0.0°C. What temperature does this correspond to in kelvin?

6. Many experiments are conducted at 298 K. What is this temperature in Celsius?

7. The boiling point for liquid oxygen is 90.0 K. What is the boiling point in Fahrenheit?

8. A standard sheet of paper is 8.5 × 11 inches. What is the surface area, in cm², of one side of a sheet of paper? (2.54 cm = 1.00 inch)

9. The dimensions of a box are 1.2 feet by 0.50 feet by 0.75 feet. Calculate the volume of the box in cubic centimeters. (2.54 cm = 1.00 inch; 12.0 inches = 1.00 foot)

10. How many miles are covered in a 15 km race? (1 mile = 5280 feet, 12 inches = 1 foot, 1 inch = 2.54 cm)

| ANSWERS | 1) 2.27 × 10⁻⁷ mm | 5) 273.2 K | 10) 9.3 mile | 15) 29 kg |
| | 2) 18.3°C | 6) 25°C | 11) 1.43 × 10⁻⁷ mm | 16) 1.79 g/mL |
| | 3) 62.0°F | 7) -297.8°F | 12) 14 km/L | 17) 808 g |
| | 4) 239.9 K | 8) 6.0 × 10² cm³ | 13) 77 pm | 18) 8.6 × 10² L |
| | | 9) 1.3 × 10⁴ cm³ | 14) 523 g & 571 mL | 19) -24.6°C |

11. Atomic dimensions are often reported in Ångstroms (1 Å = 1 × 10⁻¹⁰ m). If the atomic radius of an aluminum atom is 1.43 Ångstroms, what is its radius in millimeters?

12. If the fuel efficiency of an automobile is 32 miles per gallon, what is its fuel efficiency in kilometers per liter? (1 km = 0.621 mile, 1.000 L = 1.057 quarts, 4 quarts = 1 gallon)

13. The volume of a carbon atom is 1.9 × 10⁻³⁰ m³. What is the radius of the atom in picometers? The volume of a sphere is (4/3)πr³.

14. 525 mL of water at 25°C (density = 0.997 g/mL) is placed in a container. The water is then cooled to form ice at -10°C (density = 0.917 g/mL). What is the mass and volume of the ice?

15. If the density of nitrogen in air is 0.87 g/L, what mass (in kg) of nitrogen is contained in a room with dimensions of 4.0 m × 3.5 m × 2.4 m?

16. A solid with a mass of 19.3 g is added to a graduated cylinder filled with water to the 25.0 mL mark. After the solid sinks to the bottom, the water level is at 35.8 mL. What is the density of the solid?

17. A barometer is filled with a cylindrical column of mercury that is 76.0 cm high and 1.000 cm in diameter. If the density of mercury is 13.53 g/cm³, what is the mass of mercury in the column?

18. Calcium carbonate, or limestone, is relatively insoluble in water. At 25°C, only 5.8 mg will dissolve in 1.0 liter of water. What volume of water is needed to dissolve 5.0 g of calcium carbonate?

19. At what point is the temperature in °C twice that of the temperature in °F?