

## Chapter 2

# The Metric System

### Key Terms

1. What is the term for the amount of energy required to raise one gram of water one degree on the Celsius scale?
  - (a) Calorie
  - (B) calorie
  - (c) joule
  - (d) kilocalorie
  - (e) none of the above
2. What is the term for the basic unit of temperature in the metric system?
  - (A) Celsius degree ( $^{\circ}\text{C}$ )
  - (b) Fahrenheit degree ( $^{\circ}\text{F}$ )
  - (c) Kelvin unit (K)
  - (d) all of the above
  - (e) none of the above
3. What is the term for a unit that expresses the volume occupied by a cube 1 centimeter on a side?
  - (a)  $\text{cm}^2$
  - (B)  $\text{cm}^3$
  - (c)  $\text{mm}^2$
  - (d)  $\text{mm}^3$
  - (e) none of the above
4. What is the term for the amount of mass in a unit volume?
  - (A) density
  - (b) specific mass
  - (c) specific gravity
  - (d) specific volume
  - (e) none of the above
5. What is the term for a nondecimal system of measurement without a basic unit for length, mass, or volume?
  - (A) English system
  - (b) metric system
  - (c) International System (SI)
  - (d) all of the above
  - (e) none of the above

6. What is the term for a statement of two exactly equal values?
  - (A) exact equivalent
  - (b) exact value
  - (c) identical equivalent
  - (d) identical value
  - (e) none of the above
  
7. What is the term for the basic unit of temperature in the English system?
  - (a) Celsius degree ( $^{\circ}\text{C}$ )
  - (B) Fahrenheit degree ( $^{\circ}\text{F}$ )
  - (c) Kelvin unit (K)
  - (d) all of the above
  - (e) none of the above
  
8. What is the term for the basic unit of mass in the metric system?
  - (A) gram
  - (b) liter
  - (c) meter
  - (d) second
  - (e) none of the above
  
9. What is the term that refers to the flow of energy from an object at a higher temperature to an object at a lower temperature?
  - (a) calorie
  - (B) heat
  - (c) joule
  - (d) specific heat
  - (e) none of the above
  
10. What is the term that refers to a measurement system with seven base units?
  - (a) English system
  - (b) metric system
  - (C) International System (SI)
  - (d) all of the above
  - (e) none of the above
  
11. What is the term for a unit of energy in the SI system?
  - (a) Calorie
  - (b) calorie
  - (C) joule
  - (d) kilocalorie
  - (e) none of the above

12. What is the term for the base unit of temperature in the SI system?
- (a) Celsius degree ( $^{\circ}\text{C}$ )
  - (b) Fahrenheit degree ( $^{\circ}\text{F}$ )
  - (c) Kelvin unit (K)
  - (d) all of the above
  - (e) none of the above
13. What is the term for the basic unit of volume in the metric system?
- (a) gram
  - (B) liter
  - (c) meter
  - (d) second
  - (e) none of the above
14. What is the term for the basic unit of length in the metric system?
- (a) gram
  - (b) liter
  - (C) meter
  - (d) second
  - (e) none of the above
15. What is the term for a decimal system of measurement with basic units for length, mass, and volume?
- (a) English system
  - (B) metric system
  - (c) troy system
  - (d) all of the above
  - (e) none of the above
16. What is the term that expresses the amount of a single quantity compared to an entire sample; an expression of parts per hundred parts?
- (A) percent
  - (b) proportion
  - (c) quotient
  - (d) reciprocal
  - (e) none of the above
17. What is the term for the relationship between a fraction and its inverse?
- (a) percent
  - (b) proportion
  - (c) ratio
  - (D) reciprocal
  - (e) none of the above

18. What is the term for the basic unit of time in the metric system?
- (a) gram
  - (b) liter
  - (c) meter
  - (D) second
  - (e) none of the above
19. What is the term for the ratio of the density of a substance compared to the density of water at 4 °C?
- (a) density
  - (b) specific mass
  - (C) specific gravity
  - (d) specific volume
  - (e) none of the above
20. What is the term for the amount of energy required to raise one gram of any substance one degree on the Celsius scale?
- (a) calorie
  - (b) heat
  - (C) specific heat
  - (d) joule
  - (e) none of the above
21. What is the term for the average energy of molecules in motion?
- (a) heat
  - (b) joule
  - (c) specific heat
  - (D) temperature
  - (e) none of the above
22. What is the term for a systematic method of problem solving which proceeds from a given value to a desired value by the conversion of units?
- (a) algebraic analysis
  - (b) metric analysis
  - (c) problem analysis
  - (D) unit analysis
  - (e) none of the above
23. What is the term for a statement of two equivalent quantities?
- (a) unit analysis
  - (B) unit equation
  - (c) unit equivalent
  - (d) unit factor
  - (e) none of the above

24. What is the term for the ratio of two equivalent quantities?
- (a) unit analysis
  - (b) unit equation
  - (c) unit equivalent
  - (D) unit factor
  - (e) none of the above
25. What is the term for the technique of determining the volume of a solid or a gas by measuring the volume of water it displaces?
- (a) volume by calculation
  - (b) volume by difference
  - (C) volume by displacement
  - (d) volume by immersion
  - (e) none of the above

### **Section 2.1 Basic Units and Symbols**

1. Which of the following is a basic unit and symbol in the metric system?
- (a) meter (m)
  - (b) gram (g)
  - (c) liter (L)
  - (D) all of the above
  - (e) none of the above
2. Which of the following is a basic unit and symbol in the metric system?
- (a) centimeter (cm)
  - (b) kilogram (kg)
  - (c) milliliter (mL)
  - (d) all of the above
  - (E) none of the above
3. Which of the following is a basic unit and symbol in the metric system?
- (a) decimeter (dm)
  - (b) gram (gm)
  - (C) liter (L)
  - (d) all of the above
  - (e) none of the above
4. What is the symbol for the metric unit micrometer?
- (a) cm
  - (b) mm
  - (c) Mm

- (D)  $\mu\text{m}$
  - (e) none of the above
5. What is the symbol for the metric unit nanogram?
- (a) mg
  - (b) Ng
  - (C) ng
  - (d)  $\mu\text{g}$
  - (e) none of the above
6. What is the symbol for the metric unit microliter?
- (a) cL
  - (b) mL
  - (c) ML
  - (D)  $\mu\text{L}$
  - (e) none of the above
7. What is the name corresponding to the metric symbol km?
- (a) kilomega
  - (B) kilometer
  - (c) kilomicro
  - (d) kilomilli
  - (e) none of the above
8. What is the name corresponding to the metric symbol dg?
- (a) decagram
  - (B) decigram
  - (c) dekagram
  - (d) dekigram
  - (e) none of the above
9. What is the name corresponding to the metric symbol mL?
- (a) megaliter
  - (b) metroliter
  - (c) microliter
  - (D) milliliter
  - (e) none of the above
10. What quantity is expressed by the metric unit centimeter?
- (A) length
  - (b) mass
  - (c) volume
  - (d) time
  - (e) none of the above

11. What quantity is expressed by the metric unit kilogram?
- (a) length
  - (B) mass
  - (c) volume
  - (d) time
  - (e) none of the above
12. What quantity is expressed by the metric unit milliliter?
- (a) length
  - (b) mass
  - (C) volume
  - (d) time
  - (e) none of the above

### Section 2.2 Metric Conversion Factors

13. According to the metric system, 1 Tm = \_\_\_\_\_ m.
- (A)  $1 \times 10^{12}$
  - (b)  $1 \times 10^9$
  - (c)  $1 \times 10^{-9}$
  - (d)  $1 \times 10^{-12}$
  - (e) none of the above
14. According to the metric system, 1 Gg = \_\_\_\_\_ g.
- (a)  $1 \times 10^{12}$
  - (B)  $1 \times 10^9$
  - (c)  $1 \times 10^{-9}$
  - (d)  $1 \times 10^{-12}$
  - (e) none of the above
15. According to the metric system, 1 ML = \_\_\_\_\_ L.
- (A)  $1 \times 10^6$
  - (b)  $1 \times 10^3$
  - (c)  $1 \times 10^{-3}$
  - (d)  $1 \times 10^{-6}$
  - (e) none of the above
16. According to the metric system, 1 ks = \_\_\_\_\_ s.
- (a)  $1 \times 10^6$
  - (B)  $1 \times 10^3$

- (c)  $1 \times 10^{-3}$
- (d)  $1 \times 10^{-6}$
- (e) none of the above

17. According to the metric system, 1 m = \_\_\_\_\_ dm.

- (a)  $1 \times 10^2$
- (B)  $1 \times 10^1$
- (c)  $1 \times 10^{-1}$
- (d)  $1 \times 10^{-2}$
- (e) none of the above

18. According to the metric system, 1 g = \_\_\_\_\_ cg.

- (A)  $1 \times 10^2$
- (b)  $1 \times 10^1$
- (c)  $1 \times 10^{-1}$
- (d)  $1 \times 10^{-2}$
- (e) none of the above

19. According to the metric system, 1 L = \_\_\_\_\_ mL.

- (A)  $1 \times 10^3$
- (b)  $1 \times 10^2$
- (c)  $1 \times 10^{-2}$
- (d)  $1 \times 10^{-3}$
- (e) none of the above

20. According to the metric system, 1 s = \_\_\_\_\_  $\mu$ s.

- (a)  $1 \times 10^9$
- (B)  $1 \times 10^6$
- (c)  $1 \times 10^{-6}$
- (d)  $1 \times 10^{-9}$
- (e) none of the above

21. According to the metric system, 1 s = \_\_\_\_\_ ns.

- (a)  $1 \times 10^{12}$



- (B)  $1 \times 10^9$
  - (c)  $1 \times 10^{-9}$
  - (d)  $1 \times 10^{-12}$
  - (e) none of the above
22. According to the metric system,  $1 \text{ s} = \underline{\hspace{2cm}}$  ps.
- (A)  $1 \times 10^{12}$
  - (b)  $1 \times 10^9$
  - (c)  $1 \times 10^{-9}$
  - (d)  $1 \times 10^{-12}$
  - (e) none of the above

### Section 2.3 Metric–Metric Conversions

23. What is the *first step* in the unit analysis method of problem solving?
- (A) Write down the unit asked for in the answer.
  - (b) Write down the given value related to the answer.
  - (c) Apply a unit factor to convert a unit in the given value.
  - (d) Round off the answer in the calculator display.
  - (e) none of the above
24. What is the *second step* in the unit analysis method of problem solving?
- (a) Write down the unit asked for in the answer.
  - (B) Write down the given value related to the answer.
  - (c) Apply a unit factor to convert a unit in the given value.
  - (d) Round off the answer in the calculator display.
  - (e) none of the above
25. What is the *third step* in the unit analysis method of problem solving?
- (a) Write down the unit asked for in the answer.
  - (b) Write down the given value related to the answer.
  - (C) Apply a unit factor to convert a unit in the given value.
  - (d) Round off the answer in the calculator display.
  - (e) none of the above
26. What is the three-step sequence in applying the unit analysis method?
- (a) 1–unknown unit, 2–unit factor, 3–relevant given value
  - (B) 1–unknown unit, 2–relevant given value, 3–unit factor
  - (c) 1–relevant given value, 2–unknown unit, 3–unit factor

- (d) 1–unit factor, 2–unknown unit, 3–relevant given value
  - (e) 1–unit factor, 2–relevant given value, 3–unknown unit
27. What is the three-step sequence in applying the unit analysis method?
- (a) 1–unit factor, 2–unknown unit, 3–relevant given value
  - (b) 1–unit factor, 2–relevant given value, 3–unknown unit
  - (C) 1–unknown unit, 2–relevant given value, 3–unit factor
  - (d) 1–unknown unit, 2–unit factor, 3–relevant given value
  - (e) 1–relevant given value, 2–unknown unit, 3–unit factor
28. What is the three-step sequence in applying the unit analysis method?
- (a) 1–relevant given value, 2–unknown unit, 3–unit factor
  - (b) 1–unit factor, 2–unknown unit, 3–relevant given value
  - (c) 1–unknown unit, 2–unit factor, 3–relevant given value
  - (D) 1–unknown unit, 2–relevant given value, 3–unit factor
  - (e) 1–unit factor, 2–relevant given value, 3–unknown unit
29. Which of the following unit factors is derived from 1 meter = 100 centimeters?
- (a) 1 m/1 cm
  - (b) 100 cm/100 m
  - (C) 1 m/100 cm
  - (d) 1 cm/100 m
  - (e) none of the above
30. Which of the following unit factors is derived from 1 kilogram = 1000 grams?
- (a) 1 g/1 kg
  - (b) 1000 kg/1000 g
  - (c) 1 g/1000 kg
  - (D) 1 kg/1000 g
  - (e) none of the above
31. Which of the following unit factors is derived from 1 liter = 1000 milliliters?
- (a) 1 L/1 mL
  - (b) 1000 mL/1000 L
  - (C) 1 L/1000 mL
  - (d) 1 mL/1000 L
  - (e) none of the above
32. If a 20.0 mL test tube measures 15.0 cm, what is the length in meters?
- (A) 0.150 m
  - (b) 1.50 m
  - (c) 15.0 m
  - (d) 1500 m
  - (e) none of the above
33. If a 250 mL beaker weighs 95.4 g, what is the mass in kilograms?
- (A) 0.0954 kg
  - (b) 0.954 kg

- (c) 95.4 kg
  - (d) 95,400 kg
  - (e) none of the above
34. If a 125 mL Erlenmeyer flask weighs 88.5 g, what is the volume in liters?
- (A) 0.125 L
  - (b) 1.25 L
  - (c) 125 L
  - (d) 125,000 L
  - (e) none of the above
35. If an automobile airbag inflates in 25  $\mu$ s, what is the time in seconds?
- (A) 0.000 025 s
  - (b) 0.000 25 s
  - (c) 25,000 s
  - (d) 25,000,000 s
  - (e) none of the above
36. If a downhill ski measures 185 cm, what is the length in decimeters?
- (a) 1.85 dm
  - (B) 18.5 dm
  - (c) 1850 dm
  - (d) 18,500 dm
  - (e) none of the above
37. If a glass marble weighs 3150 mg, what is the mass in centigrams?
- (a) 3.15 cg
  - (b) 31.5 cg
  - (C) 315 cg
  - (d) 31,050 cg
  - (e) none of the above
38. If a can of soda contains 355 mL, what is the volume in deciliters?
- (a) 0.355 dL
  - (B) 3.55 dL
  - (c) 35.5 dL
  - (d) 3550 dL
  - (e) none of the above
39. If a computer chip switches off-on-off in 0.015  $\mu$ s, what is the switching time in nanoseconds?
- (a) 0.000 000 015 ns
  - (b) 0.000 015 ns
  - (C) 15 ns
  - (d) 15,000 ns
  - (e) none of the above

40. If Earth is  $1.50 \times 10^8$  km from the Sun, what is the distance in Tm?
- (A)  $1.50 \times 10^{-1}$  Tm
  - (b)  $1.50 \times 10^2$  Tm
  - (c)  $1.50 \times 10^5$  Tm
  - (d)  $1.50 \times 10^{23}$  Tm
  - (e) none of the above
41. If Earth is  $1.50 \times 10^8$  km from the Sun, what is the distance in Gm?
- (a)  $1.50 \times 10^{-1}$  Gm
  - (B)  $1.50 \times 10^2$  Gm
  - (c)  $1.50 \times 10^5$  Gm
  - (d)  $1.50 \times 10^{20}$  Gm
  - (e) none of the above
42. If Earth is  $1.50 \times 10^8$  km from the Sun, what is the distance in Mm?
- (a)  $1.50 \times 10^{-1}$  Mm
  - (b)  $1.50 \times 10^2$  Mm
  - (C)  $1.50 \times 10^5$  Mm
  - (d)  $1.50 \times 10^{17}$  Mm
  - (e) none of the above
43. If the radius of a potassium atom is  $2.27 \times 10^{-7}$  mm, what is the radius in  $\mu\text{m}$ ?
- (a)  $2.27 \times 10^{-16}$   $\mu\text{m}$
  - (b)  $2.27 \times 10^{-10}$   $\mu\text{m}$
  - (C)  $2.27 \times 10^{-4}$   $\mu\text{m}$
  - (d)  $2.27 \times 10^5$   $\mu\text{m}$
  - (e) none of the above
44. If the radius of a silicon atom is  $1.18 \times 10^{-8}$  cm, what is the radius in nm?
- (a)  $1.18 \times 10^{-15}$  nm
  - (b)  $1.18 \times 10^{-10}$  nm

- (C)  $1.18 \times 10^{-1}$  nm
- (d)  $1.18 \times 10^3$  nm
- (e) none of the above

45. If the radius of a nickel atom is  $1.25 \times 10^{-9}$  dm, what is the radius in pm?
- (a)  $1.25 \times 10^{-20}$  pm
  - (b)  $1.25 \times 10^{-18}$  pm
  - (c)  $1.25 \times 10^{-10}$  pm
  - (D)  $1.25 \times 10^2$  pm
  - (e) none of the above

### Section 2.4 Metric–English Conversions

46. Which of the following English–metric equivalents is correct?
- (a) 1 in. = 2.54 cm
  - (b) 1 lb = 454 g
  - (c) 1 qt = 946 mL
  - (D) all of the above
  - (e) none of the above
47. Which of the following English–metric equivalents is correct?
- (a) 1 in. = 454 cm
  - (b) 1 lb = 2.54 g
  - (C) 1 qt = 946 mL
  - (d) all of the above
  - (e) none of the above
48. Which of the following English–metric equivalents is correct?
- (a) 1 in. = 2.54 cm
  - (b) 1 lb = 454 g
  - (c) 1 qt = 946 mL
  - (d) 1 sec = 1.00 s
  - (E) all of the above
49. Which of the following unit factors is derived from 1 meter = 39.4 inches?
- (a) 1 m/1 in.
  - (B) 1 m/39.4 in.
  - (c) 39.4 in./39.4 m
  - (d) 1 in./39.4 m
  - (e) none of the above

50. Which of the following unit factors is derived from 1 kilogram = 2.20 pounds?
- (a) 1 kg/1 lb
  - (B) 1 kg/2.20 lb
  - (c) 1 lb/1 kg
  - (d) 1 lb/2.20 kg
  - (e) none of the above
51. Which of the following unit factors is derived from 1 liter = 1.06 quarts?
- (a) 1 L/1 qt
  - (B) 1 L/1.06 qt
  - (c) 1 qt/1 L
  - (d) 1 qt/1.06 L
  - (e) none of the above
52. If a copper wire is 195 cm long, what is the length in inches?
- (a) 43.0 in.
  - (B) 76.8 in.
  - (c) 195 in.
  - (d) 495 in.
  - (e) 885 in.
53. If a silver chain has a mass of 25.0 g, what is the mass in pounds?
- (A) 0.0551 lb
  - (b) 0.0264 lb
  - (c) 18.1 lb
  - (d) 37.8 lb
  - (e) 11,400 lb
54. If a water bottle contains 375 mL, what is the volume in quarts?
- (A) 0.396 qt
  - (b) 0.826 qt
  - (c) 1.21 qt
  - (d) 2.52 qt
  - (e) 355,000 qt
55. If the Moon is 246,000 miles from Earth, what is the distance in kilometers?  
(Given: 1 mi = 1.61 km )
- (a) 0.000 006 54 km
  - (b) 15,300 km
  - (c) 153,000 km
  - (D) 396,000 km
  - (e) 3,960,000 km

56. If 842 pounds of Moon samples have been collected from lunar landings, what is the mass expressed in kilograms? (Given: 1 kg = 2.20 lb)
- (a) 309 kg
  - (B) 383 kg
  - (c) 3830 kg
  - (d) 1850 kg
  - (e) 11,100 kg
57. If an automobile gas tank holds 17.4 gallons, what is the volume in liters?  
(Given: 1 gal = 3.785 L)
- (a) 0.218 L
  - (b) 3.785 L
  - (c) 4.60 L
  - (d) 17.4 L
  - (E) 65.9 L
58. If a 10K race is 10.0 km, what is the distance in yards?  
(Given: 1 yd = 0.914 m)
- (a) 0.00914 yd
  - (b) 0.0109 yd
  - (c) 9140 yd
  - (d) 10,000 yd
  - (E) 10,900 yd
59. If the mass of Mars is  $6.42 \times 10^{23}$  kg, what is the mass in pounds?  
(Given: 1 lb = 454 g)
- (a)  $1.41 \times 10^{18}$  lb
  - (b)  $2.91 \times 10^{23}$  lb
  - (c)  $6.42 \times 10^{23}$  lb
  - (D)  $1.41 \times 10^{24}$  lb
  - (e)  $2.91 \times 10^{24}$  lb
60. If a patient is injected with 0.500 L of IV saline, what is the volume in quarts?  
(Given: 1 qt = 946 mL)
- (a)  $5.29 \times 10^{-7}$  qt
  - (b) 0.500 qt
  - (C) 0.529 qt
  - (d) 4.73 qt
  - (e)  $4.73 \times 10^5$  qt

61. If a 125 micron tissue slice is 125  $\mu\text{m}$  thick, what is the thickness in inches?
- (a)  $4.92 \times 10^{-7}$  in.
  - (B)  $4.92 \times 10^{-3}$  in.
  - (c)  $3.18 \times 10^{-2}$  in.
  - (d)  $3.18 \times 10^6$  in.
  - (e)  $4.92 \times 10^9$  in.
62. If 500 mL of liquid mercury weighs 6.53 kg, what is the mass in pounds?
- (a) 1.44 lb
  - (b) 2.96 lb
  - (c) 7.19 lb
  - (D) 14.4 lb
  - (e) 2960 lb
63. If 10.0 kg of water occupies 10.0 liters, what is the volume in quarts?
- (a)  $9.46 \times 10^6$  qt
  - (B) 10.6 qt
  - (c) 10.0 qt
  - (d) 9.46 qt
  - (e)  $1.06 \times 10^{-5}$  qt

### Section 2.5 The Percent Concept

64. A sample of white gold is: 18.0 g gold, 3.0 g silver, 2.0 g cobalt, and 1.0 g platinum. What is the percent platinum in the sample?
- (A) 4.2%
  - (b) 8.3%
  - (c) 13%
  - (d) 25%
  - (e) 75%
65. A sample of rose gold is: 12.0 g gold, 5.0 g silver, and 7.0 g copper. What is the percent copper in the sample?
- (a) 12%
  - (B) 29%
  - (c) 50%
  - (d) 58%
  - (e) 75%
66. A sample of lime gold is: 14.0 g gold, 7.0 g silver, and 3.0 g copper. What is the percent copper in the sample?



- (a) 3.0%
  - (B) 13%
  - (c) 29%
  - (d) 58%
  - (e) 67%
67. A sample of 10K gold contains the following: 10.0 g gold, 4.0 g silver, 5.0 g copper, and 5.0 g nickel. What is the percent gold in the sample?
- (a) 10%
  - (b) 14%
  - (C) 42%
  - (d) 58%
  - (e) 71%
68. A sample of 18K gold contains the following: 18.0 g gold, 3.0 g silver, and 3.0 g copper. What is the percent gold in the sample?
- (a) 6.0%
  - (b) 18%
  - (c) 25%
  - (d) 33%
  - (E) 75%
69. A sample of 22K gold contains the following: 22 g gold, 1.0 g silver, and 1.0 g copper. What is the percent gold in the sample?
- (a) 1.0%
  - (b) 4.5%
  - (c) 9.1%
  - (D) 92%
  - (e) 96%
70. Sterling silver contains 925 parts silver and 75 parts copper by mass. What is the percent silver in sterling silver in the sample?
- (a) 7.50%
  - (b) 8.11%
  - (c) 12.3%
  - (D) 92.5%
  - (e) 100%
71. Sterling silver contains 925 parts silver and 75 parts copper by mass. What is the percent copper in sterling silver in the sample?
- (A) 7.5%
  - (b) 8.1%
  - (c) 12%
  - (d) 93%
  - (e) 100%

72. A 1980 penny has a mass of 3.015 g and is 95.0% copper. What is the mass of copper in the coin?
- (a) 0.151 g
  - (b) 0.286 g
  - (c) 0.603 g
  - (d) 1.51 g
  - (E) 2.86 g
73. A 1980 penny has a mass of 3.015 g and is 5.00% zinc. What is the mass of zinc in the coin?
- (A) 0.151 g
  - (b) 0.286 g
  - (c) 0.603 g
  - (d) 1.51 g
  - (e) 2.86 g
74. A 2015 penny has a mass of 2.507 g and is 2.5% copper. What is the mass of copper in the coin?
- (A) 0.063 g
  - (b) 0.24 g
  - (c) 0.63 g
  - (d) 2.4 g
  - (e) 6.3 g
75. A 2015 penny has a mass of 2.507 g and is 97.5% zinc. What is the mass of zinc in the coin?
- (a) 0.0627 g
  - (b) 0.244 g
  - (c) 0.627 g
  - (d) 2.38 g
  - (E) 2.44 g
76. If a 5¢ coin has a mass of 5.07 g and is 75.0% copper, what is the mass of copper in the coin?
- (a) 0.203 g
  - (b) 0.676 g
  - (c) 1.27 g
  - (d) 1.69 g
  - (E) 3.80 g
77. If a 5¢ coin has a mass of 5.07 g and is 25.0% nickel, what is the mass of nickel in the coin?
- (a) 0.203 g
  - (b) 0.676 g
  - (C) 1.27 g
  - (d) 1.69 g
  - (e) 3.80 g
78. Stainless steel is an alloy of iron, chromium, nickel, and manganese metals. If a 5.00 g sample is 18.0% chromium, what is the mass of chromium in the sample?

- (a) 0.0450 g
  - (b) 0.0900 g
  - (c) 0.450 g
  - (D) 0.900 g
  - (e) 1.80 g
79. Stainless steel is an alloy of iron, chromium, nickel, and manganese metals. If a 5.00 g sample is 10.5% nickel, what is the mass of nickel in the sample?
- (a) 0.0263 g
  - (b) 0.0525 g
  - (c) 0.263 g
  - (D) 0.525 g
  - (e) 1.05 g
80. Stainless steel is an alloy of iron, chromium, nickel, and manganese metals. If a 5.00 g sample is 2.00% manganese, what is the mass of manganese in the sample?
- (a) 0.00500 g
  - (b) 0.0100 g
  - (c) 0.0500 g
  - (D) 0.100 g
  - (e) 0.200 g
81. Sterling silver is composed of 92.5% silver and 7.5% copper. If a sterling silver ring contains 6.55 g of silver, what is the mass of the ring?
- (a) 0.0708 g
  - (b) 0.491 g
  - (c) 6.06 g
  - (D) 7.08 g
  - (e) 87.3 g
82. A ruby contains 52.7% aluminum, 47.1% oxygen, and traces of chromium. If the ruby contains 0.125 g of aluminum, what is the mass of the gemstone?
- (a) 0.0659 g
  - (b) 0.125 g
  - (C) 0.237 g
  - (d) 0.265 g
  - (e) 0.625 g
83. A sapphire contains 52.7% aluminum, 47.1% oxygen, and traces of titanium. If the sapphire contains 0.155 g of oxygen, what is the mass of the gemstone?
- (a) 0.0730 g
  - (b) 0.155 g
  - (c) 0.294 g
  - (D) 0.329 g
  - (e) 0.775 g

## Section 2.6 Volume by Calculation

84. If a brass rectangular solid measures 3.80 cm by 2.55 cm by 1.25 cm, what is the volume of the solid?
- (a) 0.0826 cm<sup>3</sup>
  - (b) 1.19 cm<sup>3</sup>
  - (c) 1.86 cm<sup>3</sup>
  - (d) 7.75 cm<sup>3</sup>
  - (E) 12.1 cm<sup>3</sup>
85. If a copper rectangular solid measures 5.15 cm by 1.25 cm by 1.25 cm, what is the volume of the solid?
- (a) 0.124 cm<sup>3</sup>
  - (b) 3.30 cm<sup>3</sup>
  - (c) 4.12 cm<sup>3</sup>
  - (d) 6.44 cm<sup>3</sup>
  - (E) 8.05 cm<sup>3</sup>
86. If a stainless steel rectangular solid measures 5.05 cm by 1.50 cm by 1.25 cm, what is the volume of the solid?
- (a) 0.106 cm<sup>3</sup>
  - (b) 2.69 cm<sup>3</sup>
  - (c) 4.21 cm<sup>3</sup>
  - (d) 6.06 cm<sup>3</sup>
  - (E) 9.47 cm<sup>3</sup>
87. A sheet of aluminum foil has a volume of 0.555 cm<sup>3</sup>. If the foil measures 10.0 cm by 10.0 cm, what is the thickness of the foil?
- (a) 0.000 555 cm
  - (B) 0.005 55 cm
  - (c) 0.0555 cm
  - (d) 55.5 cm
  - (e) 180 cm
88. A sheet of tin foil has a volume of 0.645 mm<sup>3</sup>. If the foil measures 10.0 mm by 12.5 mm, what is the thickness of the foil?
- (a) 0.000 516 mm
  - (B) 0.005 16 mm
  - (c) 0.0516 mm
  - (d) 80.6 mm

- (e) 194 mm
89. A sheet of gold foil has a volume of  $0.750 \text{ cm}^3$ . If the foil measures 50.0 cm by 10.0 cm, what is the thickness of the foil?
- (a) 0.000 150 cm
  - (B) 0.001 50 cm
  - (c) 0.0150 cm
  - (d) 375 cm
  - (e) 667 cm
90. If a brass solid has a volume of  $46.5 \text{ cm}^3$ , what is the volume in cubic inches?
- (A)  $2.84 \text{ in.}^3$
  - (b)  $7.21 \text{ in.}^3$
  - (c)  $18.3 \text{ in.}^3$
  - (d)  $118 \text{ in.}^3$
  - (e)  $762 \text{ in.}^3$
91. If a bronze solid has a volume of  $25.5 \text{ cm}^3$ , what is the volume in cubic inches?
- (A)  $1.56 \text{ in.}^3$
  - (b)  $3.95 \text{ in.}^3$
  - (c)  $10.0 \text{ in.}^3$
  - (d)  $64.8 \text{ in.}^3$
  - (e)  $418 \text{ in.}^3$
92. If a copper solid has a volume of  $8.75 \text{ cm}^3$ , what is the volume in cubic inches?
- (A)  $0.534 \text{ in.}^3$
  - (b)  $1.36 \text{ in.}^3$
  - (c)  $3.44 \text{ in.}^3$
  - (d)  $22.2 \text{ in.}^3$
  - (e)  $143 \text{ in.}^3$

### Section 2.7 Volume by Displacement

93. A piece of jade is added to a 100-mL graduated cylinder with 50.0 mL of water. If the resulting water level is 60.5 mL, what is the volume of the jade?
- (A) 10.5 mL
  - (b) 39.5 mL
  - (c) 50.0 mL
  - (d) 89.5 mL
  - (e) none of the above
94. A piece of jade is added to a 100-mL graduated cylinder with 45.0 mL of water. If the resulting water level is 60.5 mL, what is the volume of the jade?
- (A) 15.5 mL
  - (b) 39.5 mL

- (c) 55.0 mL
  - (d) 84.5 mL
  - (e) none of the above
95. A piece of jade is added to a 100-mL graduated cylinder with 55.5 mL of water. If the resulting water level is 68.0 mL, what is the volume of the jade?
- (A) 12.5 mL
  - (b) 32.0 mL
  - (c) 44.5 mL
  - (d) 87.5 mL
  - (e) none of the above
96. A sample of baking soda is heated and releases carbon dioxide gas into a 1000-mL flask. If the flask initially contains 555 mL of water and 101 mL remain after the gas has displaced a portion of the water, what is the volume of the gas?
- (a) 101 mL
  - (b) 445 mL
  - (C) 454 mL
  - (d) 899 mL
  - (e) none of the above
97. A sample of baking soda is heated and releases carbon dioxide gas into a 1000-mL flask. If the flask initially contains 655 mL of water and 203 mL remain after the gas has displaced a portion of the water, what is the volume of the gas?
- (a) 203 mL
  - (b) 345 mL
  - (C) 452 mL
  - (d) 797 mL
  - (e) none of the above
98. A sample of baking soda is heated and releases carbon dioxide gas into a 1000-mL flask. If the flask initially contains 752 mL of water and 305 mL remain after the gas has displaced a portion of the water, what is the volume of the gas?
- (a) 248 mL
  - (b) 305 mL
  - (C) 447 mL
  - (d) 695 mL
  - (e) none of the above

## Section 2.8 The Density Concept

99. A glass cylinder contains four liquid layers: mercury ( $d = 13.6 \text{ g/mL}$ ), chloroform ( $d = 1.49 \text{ g/mL}$ ), water ( $d = 1.00 \text{ g/mL}$ ), ether ( $d = 0.708 \text{ g/mL}$ ). If a cork stopper ( $d = 0.50 \text{ g/mL}$ ) is dropped into the cylinder, where does it come to rest?
- (A) on top of the ether layer
  - (b) on top of the water layer
  - (c) on top of the chloroform layer
  - (d) on top of the mercury layer
  - (e) on the bottom of the cylinder
100. A glass cylinder contains four liquid layers: mercury ( $d = 13.6 \text{ g/mL}$ ), chloroform ( $d = 1.49 \text{ g/mL}$ ), water ( $d = 1.00 \text{ g/mL}$ ), and ether ( $d = 0.708 \text{ g/mL}$ ). If an ice cube ( $d = 0.92 \text{ g/mL}$ ) is dropped into the cylinder, where does it come to rest?
- (a) on top of the ether layer
  - (B) on top of the water layer
  - (c) on top of the chloroform layer
  - (d) on top of the mercury layer
  - (e) on the bottom of the cylinder
101. A glass cylinder contains four liquid layers: mercury ( $d = 13.6 \text{ g/mL}$ ), chloroform ( $d = 1.49 \text{ g/mL}$ ), water ( $d = 1.00 \text{ g/mL}$ ), ether ( $d = 0.708 \text{ g/mL}$ ). If a rubber stopper ( $d = 1.2 \text{ g/mL}$ ) is dropped into the cylinder, where does it come to rest?
- (a) on top of the ether layer
  - (b) on top of the water layer
  - (C) on top of the chloroform layer
  - (d) on top of the mercury layer
  - (e) on the bottom of the cylinder
102. A glass cylinder contains four liquid layers: mercury ( $d = 13.6 \text{ g/mL}$ ), chloroform ( $d = 1.49 \text{ g/mL}$ ), water ( $d = 1.00 \text{ g/mL}$ ), and ether ( $d = 0.708 \text{ g/mL}$ ). If a marble ( $d = 2.7 \text{ g/mL}$ ) is dropped into the cylinder, where does it come to rest?
- (a) on top of the ether layer
  - (b) on top of the water layer
  - (c) on top of the chloroform layer
  - (D) on top of the mercury layer
  - (e) on the bottom of the cylinder
103. A glass cylinder contains four liquid layers: mercury ( $d = 13.6 \text{ g/mL}$ ), chloroform ( $d = 1.49 \text{ g/mL}$ ), water ( $d = 1.00 \text{ g/mL}$ ), ether ( $d = 0.708 \text{ g/mL}$ ). If a gold nugget ( $d = 19.3 \text{ g/mL}$ ) is dropped into the cylinder, where does it come to rest?
- (a) on top of the ether layer
  - (b) on top of the water layer
  - (c) on top of the chloroform layer
  - (d) on top of the mercury layer
  - (E) on the bottom of the cylinder

104. If the density of air is 1.29 g/L, which of the following is a unit factor?
- (a) 1 g/1 L
  - (b) 1 g/1.29 L
  - (c) 1.29 g/1 L
  - (d) 1.29 g/1.29 L
  - (e) 1.29 L/1 g
105. If the density of alcohol is 0.813 g/mL, which of the following is a unit factor?
- (a) 1 g/1 mL
  - (b) 1 g/0.813 mL
  - (c) 0.813 g/1 mL
  - (d) 0.813 g/0.813 mL
  - (e) 0.813 mL/1 g
106. If the density of silver is 10.5 g/cm<sup>3</sup>, which of the following is a unit factor?
- (a) 1 g/1 cm<sup>3</sup>
  - (b) 1 g/10.5 cm<sup>3</sup>
  - (c) 10.5 g/1 cm<sup>3</sup>
  - (d) 10.5 g/10.5 cm<sup>3</sup>
  - (e) 10.5 cm<sup>3</sup>/1 g
107. A 10.0 mL volume of alcohol has a mass of 7.89 g. What is the density of the alcohol in grams per milliliter?
- (a) 0.0789 g/mL
  - (B) 0.789 g/mL
  - (c) 7.89 g/mL
  - (d) 10.0 g/mL
  - (e) 78.9 g/mL
108. A 10.0 mL volume of ether has a mass of 7.14 g. What is the density of the ether in grams per milliliter?
- (a) 0.0714 g/mL
  - (B) 0.714 g/mL
  - (c) 7.14 g/mL
  - (d) 10.0 g/mL
  - (e) 71.4 g/mL
109. A 10.0 cm<sup>3</sup> volume of alcohol has a mass of 0.00705 kg. What is the density of the alcohol in grams per cubic centimeter?
- (a) 0.0705 g/cm<sup>3</sup>
  - (B) 0.705 g/cm<sup>3</sup>
  - (c) 7.05 g/cm<sup>3</sup>
  - (d) 10.0 g/cm<sup>3</sup>
  - (e) 70.5 g/cm<sup>3</sup>
110. A 10.0 mL volume of mercury has a mass of 0.136 kg. What is the density of mercury in grams per milliliter?



- (a) 1.36 g/mL
- (b) 7.35 g/mL
- (c) 13.6 g/mL
- (d) 73.5 g/mL
- (e) 136 g/mL

111. A block of aluminum has a mass of 39.589 g and measures 5.10 cm by 2.50 cm by 1.15 cm. What is the density of the rectangular aluminum block?

- (a) 0.370 g/cm<sup>3</sup>
- (B) 2.70 g/cm<sup>3</sup>
- (c) 3.11 g/cm<sup>3</sup>
- (d) 14.7 g/cm<sup>3</sup>
- (e) 22.3 g/cm<sup>3</sup>

112. A block of copper has a mass of 143.584 g and measures 5.05 cm by 2.55 cm by 1.25 cm. What is the density of the rectangular copper block?

- (a) 0.112 g/cm<sup>3</sup>
- (B) 8.92 g/cm<sup>3</sup>
- (c) 11.1 g/cm<sup>3</sup>
- (d) 28.4 g/cm<sup>3</sup>
- (e) 29.0 g/cm<sup>3</sup>

113. Osmium metal is one of the most dense elements (22.5 g/cm<sup>3</sup>). What is the mass of 10.0 cm<sup>3</sup> of the metal?

- (a) 0.444 g
- (b) 2.25 g
- (c) 22.5 g
- (D) 225 g
- (e) 444 g

114. The density of ether is 0.714 g/mL. What is the mass of 10.0 mL of ether?

- (a) 0.0714 g
- (b) 1.40 g
- (C) 7.14 g
- (d) 14.0 g
- (e) 71.4 g

115. The density of ethanol is 0.789 g/mL. What is the volume of 35.5 g of ethanol?

- (a) 2.80 mL
- (b) 4.50 mL
- (c) 28.0 mL
- (D) 45.0 mL
- (e) 280 mL

116. Platinum metal is one of the most dense elements ( $d = 21.5 \text{ g/cm}^3$ ). What is the volume of a 10.0 g sample of the metal?

- (A) 0.465 cm<sup>3</sup>

- (b) 2.15 cm<sup>3</sup>
- (c) 21.5 cm<sup>3</sup>
- (d) 215 cm<sup>3</sup>
- (e) 465 cm<sup>3</sup>

117. Magnesium metal is one of the least dense elements ( $d = 1.74 \text{ g/cm}^3$ ). What is the volume of a 10.0 g sample of the metal?

- (A) 5.75 cm<sup>3</sup>
- (b) 10.0 cm<sup>3</sup>
- (c) 17.4 cm<sup>3</sup>
- (d) 57.5 cm<sup>3</sup>
- (e) 174 cm<sup>3</sup>

### Section 2.9 Temperature

118. What are the freezing point and boiling point of water on the Fahrenheit scale?

- (a) -32 °F and 212 °F
- (b) 0 °F and 100 °F
- (c) 0 °F and 212 °F
- (d) 32 °F and 100 °F
- (E) 32 °F and 212 °F

119. What are the freezing point and boiling point of water on the Celsius scale?

- (A) 0 °C and 100 °C
- (b) 0 °C and 212 °C
- (c) 32 °C and 100 °C
- (d) 32 °C and 212 °C
- (e) 273 °C and 373 °C

120. What are the freezing point and boiling point of water on the Kelvin scale?

- (a) 0 K and 100 K
- (b) 0 K and 273 K
- (c) 100 K and 273 K
- (d) 100 K and 373 K
- (E) 273 K and 373 K

121. Table salt melts at 801 °C. What is the melting point on the Fahrenheit scale?

- (a) 427 °F
- (b) 1384 °F
- (c) 1410 °F
- (D) 1470 °F
- (e) 1490 °F

122. An antifreeze solution freezes at -100 °C. What is the freezing point on the Fahrenheit scale?

- (a) -212 °F

- (B)  $-148\text{ }^{\circ}\text{F}$
- (c)  $-88\text{ }^{\circ}\text{F}$
- (d)  $-82\text{ }^{\circ}\text{F}$
- (e)  $-73\text{ }^{\circ}\text{F}$

123. Aluminum melts at  $1220\text{ }^{\circ}\text{F}$ . What is the melting point on the Celsius scale?

- (a)  $646\text{ }^{\circ}\text{C}$
- (B)  $660\text{ }^{\circ}\text{C}$
- (c)  $696\text{ }^{\circ}\text{C}$
- (d)  $2138\text{ }^{\circ}\text{C}$
- (e)  $2164\text{ }^{\circ}\text{C}$

124. Rubbing alcohol freezes at  $-129\text{ }^{\circ}\text{F}$ . What is the freezing point on the Celsius scale?

- (a)  $-290\text{ }^{\circ}\text{C}$
- (b)  $-200\text{ }^{\circ}\text{C}$
- (c)  $-103\text{ }^{\circ}\text{C}$
- (D)  $-89.4\text{ }^{\circ}\text{C}$
- (e)  $-54\text{ }^{\circ}\text{C}$

125. Liquid hydrogen boils at  $-252\text{ }^{\circ}\text{C}$ . What is the boiling point on the Kelvin scale?

- (a)  $-525\text{ K}$
- (b)  $-252\text{ K}$
- (c)  $-21\text{ K}$
- (D)  $21\text{ K}$
- (e)  $525\text{ K}$

126. Liquid argon boils at  $-186\text{ }^{\circ}\text{C}$ . What is the boiling point on the Kelvin scale?

- (a)  $-459\text{ K}$
- (b)  $-186\text{ K}$
- (c)  $-87\text{ K}$
- (D)  $87\text{ K}$
- (e)  $459\text{ K}$

127. Liquid krypton boils at  $-152\text{ }^{\circ}\text{C}$ . What is the temperature on the Kelvin scale?

- (a)  $-425\text{ K}$
- (b)  $-152\text{ K}$
- (c)  $-121\text{ K}$
- (D)  $121\text{ K}$
- (e)  $425\text{ K}$

128. Liquid helium boils at  $4\text{ K}$ . What is the boiling point on the Celsius scale?

- (a)  $-277\text{ }^{\circ}\text{C}$

- (B)  $-269\text{ }^{\circ}\text{C}$
- (c)  $4\text{ }^{\circ}\text{C}$
- (d)  $269\text{ }^{\circ}\text{C}$
- (e)  $277\text{ }^{\circ}\text{C}$

129. Liquid neon boils at 27 K. What is the boiling point on the Celsius scale?

- (a)  $-300\text{ }^{\circ}\text{C}$
- (B)  $-246\text{ }^{\circ}\text{C}$
- (c)  $27\text{ }^{\circ}\text{C}$
- (d)  $246\text{ }^{\circ}\text{C}$
- (e)  $300\text{ }^{\circ}\text{C}$

130. Liquid xenon boils at 166 K. What is the boiling point on the Celsius scale?

- (a)  $-439\text{ }^{\circ}\text{C}$
- (B)  $-107^{\circ}\text{C}$
- (c)  $166\text{ }^{\circ}\text{C}$
- (d)  $107^{\circ}\text{C}$
- (e)  $439\text{ }^{\circ}\text{C}$

### Section 2.10 The Heat Concept

131. What is the difference between a cup of tea at  $95\text{ }^{\circ}\text{C}$ , and a drop of tea at  $95\text{ }^{\circ}\text{C}$ ?

- (a) Temperature is greater in the cup of tea.
- (b) Temperature is greater in the drop of tea.
- (C) Heat is greater in the cup of tea.
- (d) Heat is greater in the drop of tea.
- (e) none of the above

132. What is the difference between a cup of tea at  $95\text{ }^{\circ}\text{C}$ , and a drop of tea at  $95\text{ }^{\circ}\text{C}$ ?

- (A) Heat is greater in the cup of tea.
- (b) Heat is greater in the drop of tea.
- (c) Temperature is greater in the cup of tea.
- (d) Temperature is greater in the drop of tea.
- (e) none of the above

133. Which of the following can express the *total* amount of heat energy in a sealed, insulated chamber?

- (a)  $20.0\text{ }^{\circ}\text{C}$
- (b)  $68.0\text{ }^{\circ}\text{F}$
- (c)  $293.0\text{ K}$
- (D)  $20.0\text{ kcal}$

- (e) all of the above
134. Which of the following can express the *average* amount of heat energy in a sealed, insulated chamber?
- (A) 20.0 °C
  - (b) 68.0 cal
  - (c) 293.0 kcal
  - (d) 20.0 J
  - (e) all of the above
135. When 100.0 g of gasoline undergoes combustion, 9560 kJ of energy is released. Express the heat released in kilocalories. (Given: 4.184 kJ = 1 kcal)
- (a)  $2.28 \times 10^0$  kcal
  - (B)  $2.28 \times 10^3$  kcal
  - (c)  $2.28 \times 10^6$  kcal
  - (d)  $4.00 \times 10^4$  kcal
  - (e)  $4.00 \times 10^7$  kcal
136. When 100.0 g of gasoline undergoes combustion, 2280 kcal of energy is released. Express the heat released in kilojoules. (Given: 4.184 kJ = 1 kcal)
- (a)  $9.54 \times 10^0$  kJ
  - (B)  $9.54 \times 10^3$  kJ
  - (c)  $9.54 \times 10^6$  kJ
  - (d)  $5.45 \times 10^4$  kJ
  - (e)  $5.45 \times 10^7$  kJ

### General Exercises

137. Which of the following are basic units and symbols in the English system?
- (a) inch (in.), ounce (oz), pint (pt)
  - (b) foot (ft), pound (lb), quart (qt)
  - (c) yard (yd), pound (lb), gallon (gal)
  - (d) mile (mi), ton (ton), gallon (gal)
  - (E) The English system does not have basic units.
138. Which of the following are base units and symbols in the International system?
- (a) centimeter (cm), gram (g), second (s)
  - (b) meter (m), gram (g), second (s)
  - (C) meter (m), kilogram (kg), second (s)
  - (d) kilometer (km), kilogram (kg), second (s)
  - (e) The International system does not have base units.

139. In performing a multistep multiplication or division calculation, when should you round off the answer in the calculator display?
- (a) after each step in the calculation
  - (b) after the first unit factor
  - (c) after the second unit factor
  - (D) after the final calculation
  - (e) none of the above
140. How many significant digits are justified by the unit factor 1 m/100 cm?
- (a) 1
  - (b) 2
  - (c) 3
  - (D) infinite
  - (e) impossible to determine
141. How many significant digits are justified by the unit factor 1 lb/454 g?
- (a) 1
  - (b) 2
  - (C) 3
  - (d) infinite
  - (e) impossible to determine
142. How many significant digits are justified by the unit factor 1 qt/946 mL?
- (a) 1
  - (b) 2
  - (C) 3
  - (d) infinite
  - (e) impossible to determine
143. Which of the following is equivalent to the volume of a 1-cm cube?
- (a) 1 L
  - (b) 1 cL
  - (c) 1 dL
  - (d) 1 kL
  - (E) 1 mL
144. Which of the following is equivalent to the volume of a 10-cm cube?
- (A) 1 L
  - (b) 1 cL
  - (c) 1 dL
  - (d) 1 kL
  - (e) 1 mL
145. Which of the following is equivalent to the volume of a 1.00-L flask?

- (a) 1.00 cm<sup>3</sup>
- (b) 10.0 cm<sup>3</sup>
- (c) 100 cm<sup>3</sup>
- (d) 946 cm<sup>3</sup>
- (E) 1000 cm<sup>3</sup>

146. If a diamond weighs 1.33 carats, what is the mass in grams?

(Given: 1 ct = 200 mg)

- (a) 0.133 g
- (b) 0.150 g
- (c) 0.200 g
- (D) 0.266 g
- (e) 6.65 g

147. An Apple iPhone has a mass of 112 g. What is its weight in ounces?

(Given: 1 lb = 454 g; 1 lb = 16 oz)

- (a) 0.0154 oz
- (b) 0.247 oz
- (C) 3.95 oz
- (d) 1790 oz
- (e) 3180 oz

148. An Apple iPad has a mass of 652 g. What is its weight in ounces?

(Given: 1 lb = 454 g; 1 lb = 16 oz)

- (a) 0.0898 oz
- (c) 1.44 oz
- (C) 23.0 oz
- (d) 40.8 oz
- (e) 18,500 oz

149. An Apple iPad has a thickness of 9.4 mm. What is its thickness in inches?

(Given: 1 in. = 2.54 cm; 1 cm = 10 mm)

- (a) 0.0239 in.
- (b) 0.239 in.
- (C) 0.370 in.
- (d) 3.70 in.
- (e) 37.0 in.

150. How many minutes for sunlight to travel from the Sun to Earth? (Assume the Sun is 93,000,000 miles from Earth and sunlight travels at  $1.86 \times 10^5$  miles per second.)

- (a) 0.0020 minute
- (b) 2.0 minutes
- (C) 8.3 minutes

- (d) 500 minutes
  - (e) 830 minutes
151. How many minutes for sunlight to travel from the Sun to Mars? (Assume the Sun is  $2.28 \times 10^8$  kilometers from Mars and sunlight travels at  $2.99 \times 10^5$  kilometers per second.)
- (a) 0.00131 minutes
  - (b) 0.0787 minutes
  - (C) 12.7 minutes
  - (d) 763 minutes
  - (e) 45,800 minutes
152. A hybrid vehicle has a mileage rating of 22 km/L. What is the gas mileage in miles per gallon? (Given: 1 mi = 1.61 km, and 1 gal = 3.78 L)
- (a) 3.6 mi/gal
  - (b) 9.4 mi/gal
  - (c) 35 mi/gal
  - (D) 52 mi/gal
  - (e) 130 mi/gal
153. An Indianapolis racecar can travel 111 m/s. What is the speed of the car in miles per hour? (Given: 1 mi = 1.61 km, and 1 h = 3600 s)
- (a) 111 mi/h
  - (b) 178 mi/h
  - (C) 248 mi/h
  - (d) 400 mi/h
  - (e) 643 mi/h
154. The Washington Monument capstone is composed of 1.00% iron, 0.75% silicon, 0.30% manganese, 0.05% copper, 0.02% tin, 0.01% sodium, and aluminum. What is the percentage of aluminum in the capstone?
- (a) 2.13%
  - (b) 50.00%
  - (c) 95.74%
  - (D) 97.87%
  - (e) 100.00%
155. Why is a sterling silver spoon smaller than a stainless steel spoon of the same weight?
- (a) sterling silver is less valuable than stainless steel
  - (b) sterling silver is more valuable than stainless steel
  - (c) sterling silver is less dense than stainless steel
  - (D) sterling silver is more dense than stainless steel
  - (e) none of the above
156. The density of water is 1.00 g/mL at 3.98 °C. What is the density of water in g/cm<sup>3</sup>?
- (A) 1.00 g/cm<sup>3</sup>
  - (b) 2.54 g/cm<sup>3</sup>



- (c) 3.98 g/cm<sup>3</sup>
- (d) 16.4 g/cm<sup>3</sup>
- (e) 62.4 g/cm<sup>3</sup>

157. The density of water is 1.00 g/mL at 4 °C. What is the density of water in kg/L?

- (A) 1.00 kg/L
- (b) 2.54 kg/L
- (c) 3.98 kg/L
- (d) 16.4 kg/L
- (e) 62.4 kg/L

158. The density of carbon tetrachloride is 1.60 g/cm<sup>3</sup>. What is the density of the liquid expressed in SI units (kg/m<sup>3</sup>)?

- (a) 0.160 kg/m<sup>3</sup>
- (b) 1.60 kg/m<sup>3</sup>
- (c) 16.0 kg/m<sup>3</sup>
- (D) 1.60 × 10<sup>3</sup> kg/m<sup>3</sup>
- (e) 1.60 × 10<sup>6</sup> kg/m<sup>3</sup>

159. Calculate the volume of Earth assuming it is spherical and has a radius (*r*) of 6370 km. The volume of a sphere equals  $4 \pi r^3/3$ , and  $\pi = 3.14$ .

- (a) 2.58 × 10<sup>11</sup> km<sup>3</sup>
- (b) 3.45 × 10<sup>11</sup> km<sup>3</sup>
- (c) 6.37 × 10<sup>11</sup> km<sup>3</sup>
- (d) 1.03 × 10<sup>12</sup> km<sup>3</sup>
- (E) 1.08 × 10<sup>12</sup> km<sup>3</sup>

160. Calculate a length of copper wire having a diameter of 0.200 cm and a mass of 15.620 g. The density of copper is 8.92 g/cm<sup>3</sup>. The volume of copper wire equals  $\pi d^2 L/4$ ,  $\pi = 3.14$ , *d* = diameter, and L = length.

- (a) 1.80 × 10<sup>-4</sup> cm
- (b) 4.00 × 10<sup>-4</sup> cm
- (c) 5.50 × 10<sup>-2</sup> cm
- (d) 1.75 cm
- (E) 55.8 cm

### A CLOSER LOOK Metric Labels

1. What is the metric volume of a 12-ounce can of soda as currently shown on the label?
  - (a) 354 mL

- (b) 354.75 mL
  - (C) 355 mL
  - (d) 12 fl oz
  - (e) 12 oz
2. Which of the following indicates metric length on a product label?
- (A) 25.0 cm
  - (b) 25.0 g
  - (c) 25.0 oz
  - (d) 25.0 mL
  - (e) 25.0 fl oz
3. Which of the following indicates metric mass on a product label?
- (a) 25.0 cm
  - (B) 25.0 g
  - (c) 25.0 oz
  - (d) 25.0 mL
  - (e) 25.0 fl oz
4. Which of the following indicates metric volume on a product label?
- (a) 25.0 cm
  - (b) 25.0 g
  - (c) 25.0 oz
  - (D) 25.0 mL
  - (e) 25.0 fl oz

### **CHEMISTRY CONNECTION The Olympics**

1. Which Olympic running race is nearly equal in length to a quarter mile?
- (a) 100 meters
  - (b) 200 meters
  - (C) 400 meters
  - (d) 1000 meters
  - (e) 2000 meters
2. Which Olympic swimming race is nearly equal in length to 100 yards?
- (A) 100 meters
  - (b) 200 meters
  - (c) 500 meters
  - (d) 50 kilometers
  - (e) 100 kilometers
3. Which Olympic skiing race is nearly equal in length to 10 kilometers?
- (a) 5000 yards
  - (B) 10,000 yards

- (c) 10 miles
  - (d) 15 miles
  - (e) 20 miles
4. Which of the following is a running event in the Olympic Summer Games?
- (a) 100 feet
  - (b) 100 yards
  - (c) 100 furlongs
  - (D) 100 meters
  - (e) 100 miles
5. Which of the following is a swimming event in the Olympic Summer Games?
- (a) 50 feet
  - (b) 50 yards
  - (c) 50 furlongs
  - (D) 50 meters
  - (e) 50 miles
6. Which of the following is a skiing event in the Olympic Winter Games?
- (a) 1000 feet
  - (b) 100 yards
  - (c) 10 miles
  - (D) 10 kilometers
  - (e) all of the above

### **A CLOSER LOOK Lower Gasoline Bills**

1. At which of the following temperatures is it most economical to fill a gas tank?
- (a) 50 °C
  - (b) 40 °C
  - (c) 30 °C
  - (d) 20 °C
  - (E) 10 °C
2. At which of the following temperatures is it most economical to fill a gas tank?
- (A) 40 °F
  - (b) 50 °F
  - (c) 60 °F
  - (d) 70 °F
  - (e) 80 °F
3. With the exception of ice floating in water, what is the only other substance that is less dense in the solid state than the liquid state?
- (a) acetone

- (B) ammonia
- (c) chloroform
- (d) ethanol
- (e) gasoline

4. What are the only two liquids that violate the principle of greater density at temperatures below their freezing points?
- (a) acetone and turpentine
  - (B) ammonia and water
  - (c) chloroform and ether
  - (d) ethanol and methanol
  - (e) gasoline and diesel fuel