3 SCIENTIFIC MEASUREMENT

Reviewing Content

57. Lissa: inaccurate and imprecise
Lamont: accurate and precise
Leigh Anne: inaccurate and precise

58. **a.** infinite **b.** 4
c. infinite **d.** infinite

59. **a.** 98.5 L **b.** 0.000 763 cg
c. 57.0 m **d.** 12.2°C

60. **a.** 43 g **b.** 225.8 L
c. 92.0 kg **d.** 32.4 m^3

61. (59) **a.** 9.85×10^1 L **b.** 7.63×10^{-4} cg
c. 5.70×10^1 m **d.** 1.22×10^1°C
(60) **a.** 4.3×10^1 g **b.** 2.258×10^2 L
c. 9.20×10^1 kg **d.** 3.24×10^1 m^3

62. The error is the difference between the experimental value and the accepted. The percent error is the error divided by the accepted value multiplied by 100.

63. **a.** second **b.** meter
c. kelvin **d.** kilogram

64. km, m, dm, cm, mm, mm, nm, pm;
1 km = 10^3 m, 1 dm = 10^{-1} m,
1 cm = 10^{-2} m. 1 mm = 10^{-3} m,
1 mm = 10^{-6} m, 1 nm = 10^{-9} m,
1 pm = 10^{-12} m

65. **a.** 2.4 mm
b. 13.95 cm
c. 27.50 cm

66. 1235 K

67. conversion factor

68. They must equal one another.

69. The unit of the conversion factor in the denominator must be identical to the unit in the given measurement or the previous conversion factor.

70. **a.** 1.57 s **b.** 4.27×10^4 mL
c. 2.61×10^{-4} mm **d.** 6.5×10^2 dm
e. 6.42×10^{-3} kg **f.** 8.25×10^9 ng

71. **a.** 7.3 mL/s **b.** 78.6 mg/mm^2
c. 1.54 g/cm^3

72. 10^6 mL

73. 2.83×10^2 mg, 0.283 g, 2.83×10^{-4} kg; 6.6 g, 6.6×10^2 cg, 6.6×10^{-3} kg; 2.8×10^{-1} mg, 2.8×10^{-2} cg, 2.8×10^{-7} kg

74. density = mass/volume

75. Yes, neither mass nor volume of a solid or liquid changes appreciably with location.

76. No, the density of the metal bar is 12 g/cm^3, but density of gold is 19 g/cm^3.

77. The carbon dioxide–filled balloon would sink. The neon and hydrogen-filled balloons would rise, the hydrogen at a much faster rate.

Understanding Concepts

78. Improper calibration or improper use of the measuring device.

79. e, d, c, f, a, b

80. **a.** accurate and precise
b. inaccurate and precise
c. inaccurate and imprecise

81. °F = 1.8°C + 32

82. germanium

83. 1 g/10^2 cg, 10^2 cg/1 g, 1 g/10^3 mg, 10^3 mg/1 g,10^2 cg/10^3 mg,
10^3 mg/10^2 cg

84. 81.3 kg

85. 0.69 – 0.789 g/cm^3

86. 4.20 x 10^4 cm^3

87. 0.804 g/cm^3

88. 3.6 min lost

89. 0.92 kg/L

90. **a.** C_2 = –90°C, C_4 = 0°C, C_6 = 70°C, C_8 = 125°C
b. C_1 through C_4
c. three
d. From C_1 through C_9, the increase is approximately 39°C/additional carbon. Over the range C_3 through C_9, the increase is approximately 32°C/additional carbon.

91. 8.3 min

92. 73 g

93. 5.52 kg/dm^3

94. 24.0 kg of water

Critical Thinking

95. Yes, the mass of an object is constant. The weight of an object varies with location.

96. 16.3 g

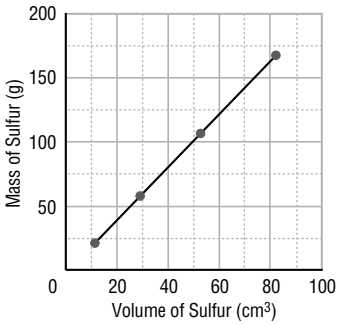
97. 31.1 m/s

98. You do not change your estimate. Counting the extra 15 ducks would suggest greater precision than was used in the estimate.

99. Answers will vary. Lakes would freeze solid from the bottom up; aquatic life would be destroyed; possible climate changes.

100. Gasoline is a mixtures and has a variable composition.

101. density of sulfur = 2.1 g/cm^3;



102. **a.** The oxygen-filled balloon will sink; the nitrogen-filled balloon will rise.
b. nitrogen; The "weighted" average density of air is closer to the density of nitrogen.

Concept Challenge

103. Volume of iron = 45.1 cm^3
Mass of lead = 514 g Pb

104. 8.0 g Sr

105. 1.8×10^3 kg

106. **a.** 85 g
b. 1.3 g/mL

107. 1.79 mL

108. **a.** corn oil on top of water on top of mercury
b. The density of sugar is greater than the density of water and less than the density of mercury; it floats between the layers of mercury and water.
c. The sugar cube will dissolve in the water over time.