

Chapter 1: Chemistry: The Study of Change

1. A tentative explanation for a set of observations that can be tested by further experimentation is referred to as
A) a hypothesis. B) a law. C) a theory. D) none of the above.
Ans: A Category: Easy Section: 1.3
2. A concise verbal or mathematical statement of a relationship between phenomena that is always the same under the same conditions is referred to as
A) a hypothesis. B) a law. C) a theory. D) none of the above.
Ans: B Category: Easy Section: 1.3
3. A unifying principle that explains a body of facts and relations is referred to as
A) a hypothesis. B) a law. C) a theory. D) none of the above.
Ans: C Category: Easy Section: 1.3
4. Complete the following sentence. A *hypothesis* is
A) a tentative explanation for a set of observations that can be tested by further experimentation.
B) a statement describing a relationship between phenomena that is always the same under the same conditions.
C) a unifying principle that explains a body of facts and relations.
D) a model used to visualize the invisible.
Ans: A Category: Easy Section: 1.3
5. Complete the following sentence. A *scientific law* is
A) a tentative explanation for a set of observations that can be tested by further experimentation.
B) a statement describing a relationship between phenomena that is always the same under the same conditions.
C) a unifying principle that explains a body of facts and relations.
D) a model used to visualize the invisible.
Ans: B Category: Easy Section: 1.3
6. Complete the following sentence. A *theory* is
A) a tentative explanation for a set of observations that can be tested by further experimentation.
B) a statement describing a relationship between phenomena that is always the same under the same conditions.
C) a unifying principle that explains a body of facts and relations.
D) a model used to visualize the invisible.
Ans: C Category: Easy Section: 1.3

7. Choose the response that includes all the items listed below that are pure substances.
i. orange juice ii. steam iii. ocean water iv. oxygen v. vegetable soup
A) i, iii, v B) ii, iv C) i, iii, iv D) iv only E) all of them are pure
Ans: B Category: Easy Section: 1.3
8. Which of the following is an example of a *physical* property?
A) corrosiveness of sulfuric acid
B) toxicity of cyanide
C) flammability of gasoline
D) neutralization of stomach acid with an antacid
E) lead becomes a liquid when heated to 601°C
Ans: E Category: Easy Section: 1.6
9. Which one of the following is an example of a *physical* property?
A) dynamite explodes D) ice floats on top of liquid water
B) meat rots if it is not refrigerated E) a silver platter tarnishes
C) gasoline burns
Ans: D Category: Easy Section: 1.6
10. Which one of the following represents a *physical* change?
A) water, when heated to 100°C , forms steam
B) bleach turns hair yellow
C) sugar, when heated, becomes brown
D) milk turns sour
E) apples, when exposed to air, turn brown
Ans: A Category: Easy Section: 1.6
11. All of the following are properties of sodium. Which one is a *physical* property of sodium?
A) Its surface turns black when first exposed to air.
B) It is a solid at 25°C and changes to a liquid when heated to 98°C .
C) When placed in water it sizzles and a gas is formed.
D) When placed in contact with chlorine it forms a compound that melts at 801°C .
E) Sodium is never found as the pure metal in nature.
Ans: B Category: Easy Section: 1.6
12. All of the following are properties of tin. Which one is a *chemical* property of tin?
A) Tin can be hammered into a thin sheet.
B) At -40°C a sheet of tin crumbles to a gray powder.
C) Tin melts at 231.9°C .
D) When a bar of tin is bent, it emits an audible "cry".
E) Tin erodes when added to hydrochloric acid, and a clear gas forms.
Ans: E Category: Medium Section: 1.6

13. Which one of the following represents a *chemical* change?

- A) boiling water to form steam
- B) burning a piece of coal
- C) heating lead until it melts
- D) mixing iron filings and sand at room temperature
- E) breaking glass

Ans: B Category: Medium Section: 1.6

14. Which of the following does *not* represent a *chemical* change?

- A) a freshly cut apple turns brown
- B) milk turns sour on standing at room temperature
- C) when cooled to 0°C, liquid water becomes ice
- D) frying an egg
- E) fermentation of sugar to alcohol

Ans: C Category: Easy Section: 1.6

15. The SI prefixes *nano* and *deci* represent, respectively:

- A) 10^{-9} and 10^{-6} .
- B) 10^6 and 10^{-3} .
- C) 10^3 and 10^{-3} .
- D) 10^9 and 10^{-6} .
- E) 10^{-9} and 10^{-1} .

Ans: E Category: Easy Section: 1.7

16. The SI prefixes *milli* and *mega* represent, respectively:

- A) 10^6 and 10^{-6} .
- B) 10^{-3} and 10^6 .
- C) 10^3 and 10^{-6} .
- D) 10^{-3} and 10^9 .
- E) 10^{-6} and 10^{-3} .

Ans: B Category: Easy Section: 1.7

17. The SI prefixes *kilo* and *centi* represent, respectively:

- A) 10^3 and 10^{-2} .
- B) 10^6 and 10^{-1} .
- C) 10^{-3} and 10^{-2} .
- D) 10^{-6} and 10^2 .
- E) 10^2 and 10^{-3} .

Ans: A Category: Easy Section: 1.7

18. A nanometer corresponds to:

- A) 10^{-2} meters.
- B) 10^{-3} meters.
- C) 10^{-6} meters.
- D) 10^{-9} meters.
- E) 10^{-12} meters.

Ans: D Category: Easy Section: 1.7

19. A microliter corresponds to:

- A) 10^{-2} liters.
- B) 10^{-3} liters.
- C) 10^{-6} liters.
- D) 10^{-9} liters.
- E) 10^{-12} liters.

Ans: C Category: Easy Section: 1.7

28. The element gallium melts at 29.8°C . What temperature is this in $^{\circ}\text{F}$?
A) -54.1°F B) -7.8°F C) $+13.5^{\circ}\text{F}$ D) $+51.3^{\circ}\text{F}$ E) $+85.6^{\circ}\text{F}$
Ans: E Category: Medium Section: 1.7
29. Many home freezers maintain a temperature of 0°F . Express this temperature in $^{\circ}\text{C}$.
A) -32°C B) -18°C C) 0°C D) 18°C E) 57.6°C
Ans: B Category: Medium Section: 1.7
30. The highest temperature ever recorded in Phoenix, Arizona, was 122°F . Express this temperature in $^{\circ}\text{C}$.
A) 50.0°C B) 64.4°C C) 67.8°C D) 162.0°C E) 219.6°C
Ans: A Category: Medium Section: 1.7
31. Dry ice (carbon dioxide) changes from a solid to a gas at -78.5°C . What is this temperature in $^{\circ}\text{F}$?
A) -173°F
B) -12.6°F
C) -109°F
D) -75.6°F
E) none of them are within 2°F of the right answer
Ans: C Category: Medium Section: 1.7
32. Liquid nitrogen boils at -195.8°C . Express the boiling point of liquid nitrogen in kelvin.
A) -469.0 K
B) -77.4 K
C) all temperatures are 0 K on the Kelvin scale
D) 77.4 K
E) 469.0 K
Ans: D Category: Medium Section: 1.7
33. Liquid nitrogen boils at -195.8°C . Express the boiling point of liquid nitrogen in $^{\circ}\text{F}$.
A) -384.4°F B) -352.4°F C) -320.4°F D) -140.8°F E) -76.8°F
Ans: C Category: Medium Section: 1.7
34. Express the number 26.7 in scientific notation.
A) 2.67×10^{-2}
B) 2.67×10^{-1}
C) 2.67×10^1
D) 2.67×10^2
E) 26.7 is already written in scientific notation
Ans: C Category: Easy Section: 1.8

35. Express the number 0.000053 in scientific notation.
A) 5.3×10^{-2} B) 5.3×10^{-3} C) 5.3×10^{-4} D) 5.3×10^{-5} E) 5.3×10^{-6}
Ans: D Category: Easy Section: 1.8
36. The number 1.050×10^9 has how many significant figures?
A) 2 B) 3 C) 4 D) 9 E) 13
Ans: C Category: Easy Section: 1.8
37. How many significant figures are there in 1.3070 g?
A) 6 B) 5 C) 4 D) 3 E) 2
Ans: B Category: Easy Section: 1.8
38. Express the fraction $1/23$ as a decimal to 4 significant figures.
A) 0.0434 B) 0.0435 C) 0.04347 D) 0.04348 E) 0.04350
Ans: D Category: Medium Section: 1.8
39. Express the fraction $1/51$ in scientific notation to 3 significant figures.
A) $2 \times 10^{-2.00}$ D) 1.97×10^{-2}
B) $2.0 \times 10^{-2.00}$ E) 2.00×10^{-2}
C) 1.96×10^{-2}
Ans: C Category: Medium Section: 1.8
40. After carrying out the following operations, how many significant figures are appropriate to show in the result?
 $(13.7 + 0.027) \div 8.221$
A) 1 B) 2 C) 3 D) 4 E) 5
Ans: C Category: Medium Section: 1.8
41. How many significant figures does the result of the following operation contain?
 8.52010×7.9
A) 2 B) 3 C) 4 D) 5 E) 6
Ans: A Category: Easy Section: 1.8
42. How many significant figures does the result of the following sum contain?
 $8.5201 + 1.93$
A) 1 B) 2 C) 3 D) 4 E) 5
Ans: D Category: Easy Section: 1.8
43. How many significant figures does the result of the following sum contain?
 $8.520 + 2.7$
A) 1 B) 2 C) 3 D) 4 E) 5
Ans: C Category: Easy Section: 1.8

44. How many significant figures does the difference $218.7201 - 218.63$ contain?
A) 1 B) 2 C) 3 D) 5 E) 7
Ans: A Category: Easy Section: 1.8
45. Do the indicated arithmetic and give the answer to the correct number of significant figures.
 $(1.5 \times 10^{-4} \times 61.3) + 2.01 =$
A) 2.0192 B) 2.0 C) 2.019 D) 2.02 E) 2.019195
Ans: D Category: Medium Section: 1.8
46. When 7.02°C is converted to the Fahrenheit scale, how many significant figures are there in the $^\circ\text{F}$ result?
A) 1 B) 2 C) 3 D) 4 E) 5
Ans: C Category: Medium Section: 1.8
47. How many cubic inches are in 1.00 liter?
A) 61.0 in^3 B) 155 in^3 C) 394 in^3 D) $1.64 \times 10^4 \text{ in}^3$ E) none of them
Ans: A Category: Medium Section: 1.9
48. Convert 500. milliliters to quarts. (1L = 1.06 qt)
A) 1.88 qt B) 0.472 qt C) 0.528 qt D) 4.72×10^5 qt E) 5.28×10^5 qt
Ans: C Category: Medium Section: 1.9
49. A US barrel is 4.21 cubic feet. Express this volume in liters.
A) 3.99×10^{-5} L B) 1.99×10^{-2} L C) 19.9 L D) 105 L E) 119 L
Ans: E Category: Medium Section: 1.9
50. A barrel of oil contains 42.0 gallons. How many liters is this? (1L = 1.06 qt)
A) 9.9 L B) 11 L C) 142 L D) 158 L E) 178 L
Ans: D Category: Easy Section: 1.9
51. The average distance from Earth to the sun is 9.3×10^7 miles. How many kilometers is this?
A) 1.5×10^8 km D) 1.7×10^{-8} km
B) 1.5×10^5 km E) 1.5×10^{11} km
C) 5.6×10^7 km
Ans: A Category: Medium Section: 1.9
52. What is the area, in square centimeters, of an 8.5 inch by 11 inch sheet of paper?
A) 94 cm^2 B) 240 cm^2 C) 420 cm^2 D) $6.0 \times 10^2 \text{ cm}^2$ E) $1.2 \times 10^4 \text{ cm}^2$
Ans: D Category: Medium Section: 1.9

67. The density of lead is 11.4 g/cm^3 at 25°C . Calculate the volume occupied by 25.0 g of lead.
A) 2.19 cm^3 B) 0.456 cm^3 C) 285 cm^3 D) 1.24 cm^3 E) 6.05 cm^3
Ans: A Category: Easy Section: 1.9
68. Iron has a density of 7.86 g/cm^3 . The volume occupied by 55.85 g of iron is
A) 0.141 cm^3 B) 7.11 cm^3 C) 2.8 cm^3 D) 439 cm^3 E) None of the above.
Ans: B Category: Easy Section: 1.9
69. Iridium is essentially tied with osmium for the distinction of being called the “densest element” with a density of 22.5 g/cm^3 . What would be the mass in pounds of a $1.0 \text{ ft} \times 1.0 \text{ ft} \times 1.0 \text{ ft}$ cube of iridium. ($1 \text{ lb} = 453.6 \text{ g}$)
A) 1.5 lb B) 5.2 lb C) 6.20 lb D) $1.4 \times 10^3 \text{ lb}$ E) $6.4 \times 10^5 \text{ lb}$
Ans: D Category: Medium Section: 1.9
70. Bromine is a red liquid at 25°C . Its density is 3.12 g/cm^3 . What is the volume of 28.1 g of liquid bromine?
A) 87.7 cm^3 D) 28.1 cm^3
B) 0.111 cm^3 E) None of the above.
C) 9.01 cm^3
Ans: C Category: Easy Section: 1.9
71. The Hope diamond weighs 44.0 carats. Determine the volume occupied by the diamond, given that its density is 3.5 g/cm^3 at 20°C , and that $1 \text{ carat} = 0.200 \text{ g}$.
A) 2.5 cm^3 B) 0.40 cm^3 C) 0.016 cm^3 D) 63 cm^3 E) 150 cm^3
Ans: A Category: Medium Section: 1.9
72. What is the volume of a 2.5 g block of metal if its density is 4.75 g/cm^3 ?
A) 0.53 cm^3 B) 1.9 cm^3 C) 2.5 cm^3 D) 4.75 cm^3 E) 11.9 cm^3
Ans: A Category: Easy Section: 1.9
73. The density of mercury is 13.6 g/cm^3 . What is the mass in pounds of 1.0 gallons of mercury? ($1 \text{ lb} = 453.6 \text{ g}$; $1 \text{ gal} = 3.785 \text{ L}$)
A) 0.11 lb B) $30. \text{ lb}$ C) 51 lb D) 83 lb E) 110 lb
Ans: E Category: Medium Section: 1.9
74. The density of mercury is 13.6 g/cm^3 . What volume (in quarts) is occupied by $100. \text{ g}$ of Hg? ($1 \text{ L} = 1.06 \text{ qt}$)
A) 144 qt B) 7.35 qt C) 7.79 qt D) $7.79 \times 10^{-3} \text{ qt}$ E) $1.44 \times 10^{-4} \text{ qt}$
Ans: D Category: Medium Section: 1.9

80. Radio waves travel at the speed of light, which is 3.00×10^8 m/s. How many minutes does it take for a radio message to reach Earth from Saturn if Saturn is 7.9×10^8 km from Earth?

- A) 4.4×10^{-2} min D) 44 min
 B) 1.6×10^5 min E) 2.6 min
 C) 4.0×10^{15} min

Ans: D Category: Medium Section: 1.9

81. Radio waves travel at the speed of light, which is 3.00×10^8 m/s. How many kilometers will radio messages travel in exactly one year?

- A) 9.46×10^{15} km D) 9.46×10^{12} km
 B) 7.30×10^8 km E) 3.33×10^{-3} km
 C) 7.10×10^{10} km

Ans: D Category: Medium Section: 1.9

82. The city of Los Angeles is now approximately 2400 miles south of Alaska. It is moving slowly northward as the San Andreas fault slides along. If Los Angeles is to arrive near Anchorage, Alaska, in 76 million years, at what average rate will it have to move in mm per month?

- A) 2.0×10^{-10} mm/mo. D) 9.5 mm/mo.
 B) 6.6×10^{-6} mm/mo. E) 51 mm/mo.
 C) 4.2 mm/mo.

Ans: C Category: Medium Section: 1.9

83. The recommended daily allowance (RDA) of calcium is 1.2 g. Calcium carbonate contains 12.0% calcium by mass. How many grams of calcium carbonate are needed to provide the RDA of calcium?

- A) 0.10 g B) 0.14 g C) 1.2 g D) 10 g E) 14 g

Ans: D Category: Medium Section: 1.9

84. The radius of the Earth is approximately 6370 km. If one could dig down straight towards the center of the Earth, one would find that the outermost 2890 km (the crust and the mantle) has an average density of about 4.5 g/cm^3 . Farther down is the core. If the average density of the Earth is 5.5 g/cm^3 , what is the average density of the Earth's core? (Recall that the volume of a sphere is given by $V = (4/3)\pi r^3$.)

- A) $11. \text{ g/cm}^3$ D) 1.9 g/cm^3
 B) $57. \text{ g/cm}^3$ E) not enough data is provided
 C) 6.2 g/cm^3

Ans: A Category: Difficult Section: 1.7

89. One of the common intravenous fluids, called physiological saline, is a homogeneous mixture of NaCl in water. In this mixture, 0.89% of the mass is contributed by the NaCl. What mass of NaCl is found in 450. mL of physiological saline?
(Given: density of physiological saline = 1.005 g/cm^3)
A) 2.0 g B) 4.0 g C) 5.1 g D) 508 g E) 400 g
Ans: B Category: Medium Section: 1.9
90. A special flask used in the determination of densities, called a pycnometer, has a mass of 16.3179 g when empty, and it has a mass of 48.0250 g when filled with water at 20.0°C . When this same pycnometer is filled with ethyl alcohol at 20.0°C , it is found to have a mass of 41.3934 g. Find the density of ethyl alcohol at 20.0°C .
(Given: at 20.0°C , the density of water is 0.9982 g/mL)
A) 0.7894 g/mL D) 1.303 g/mL
B) 0.7923 g/mL E) 0.7674 g/mL
C) 0.7908 g/mL
Ans: A Category: Medium Section: 1.9
91. A particular flask has a mass of 17.4916 g when empty. When filled with ordinary water at 20.0°C (density = 0.9982 g/mL), the mass of the flask is now 43.9616 g. The density of so-called "heavy water" at 20.0°C is 1.1053 g/mL . What will the mass of the flask be when filled with heavy water at 20.0°C ?
A) 29.2573 g B) 46.8016 g C) 46.7489 g D) 29.3100 g E) 43.9140 g
Ans: B Category: Medium Section: 1.9
92. Define *matter*.
Ans: Matter is anything that occupies space and has mass.
Category: Easy Section: 1.4
93. What are the three states of matter?
Ans: Solid, liquid, and gas
Category: Easy Section: 1.5
94. What are the common names for the three states of the compound water?
Ans: Ice, water, and steam
Category: Easy Section: 1.5
95. Define *pure substance*.
Ans: Something that has a definite composition
Category: Easy Section: 1.4
96. Give three examples of pure substances.
Ans: (Answers will vary.) Gold, sugar, oxygen, argon, water, methane
Category: Easy Section: 1.4

97. Define *mixture*.

Ans: A mixture is a combination of two or more substances in which the substances retain their distinct identities.

Category: Easy Section: 1.4

98. Name two types of mixtures.

Ans: Homogeneous mixture and heterogeneous mixture

Category: Easy Section: 1.4

99. Give three examples of mixtures.

Ans: (Answers will vary.) Air, gasoline, sea water, salt and sand, iron filings and sand

Category: Easy Section: 1.4

100. Define *element*.

Ans: An element is a substance that cannot be separated into simpler substances by chemical means.

Category: Easy Section: 1.4

101. Define *compound*.

Ans: A compound is a substance composed of atoms of two or more elements chemically united in fixed proportions.

Category: Easy Section: 1.4

102. Give examples of three physical properties.

Ans: (Answers will vary.) Melting point, boiling point, density, color

Category: Easy Section: 1.4

103. Give an example of an *extensive* property.

Ans: (Answers will vary.) Mass, length, and volume

Category: Easy Section: 1.6

104. Give an example of an *intensive* property.

Ans: (Answers will vary.) Temperature, density, melting point, boiling point

Category: Easy Section: 1.6

105. Identify the following as a *physical* or *chemical* change: Bacteria convert milk to yogurt.

Ans: Chemical

Category: Easy Section: 1.6

106. Identify the following as a *physical* or *chemical* change: Water is broken down into hydrogen and oxygen.

Ans: Chemical

Category: Easy Section: 1.6

107. Identify the following as a *physical* or *chemical* change: Formation of snowflakes.
Ans: Physical
Category: Easy Section: 1.6
108. Identify the following as a *physical* or *chemical* change: Rusting of a piece of iron.
Ans: Chemical
Category: Easy Section: 1.6
109. Identify the following as a *physical* or *chemical* change: Ripening of fruit.
Ans: Chemical
Category: Easy Section: 1.6
110. Identify the following as a *physical* or *chemical* change: Fashioning a table leg from a piece of wood.
Ans: Physical
Category: Easy Section: 1.6
111. Identify the following as a *physical* or *chemical* change: Fermenting grapes.
Ans: Chemical
Category: Easy Section: 1.6
112. Classify the following as a *physical* or *chemical* change: Antifreeze boils out of a radiator.
Ans: Physical
Category: Easy Section: 1.6
113. Classify the following as a *physical* or *chemical* change: Food spoils.
Ans: Chemical
Category: Easy Section: 1.6
114. Classify the following as a *physical* or *chemical* change: Alcohol evaporates.
Ans: Physical
Category: Easy Section: 1.6
115. Classify the following as either a *physical* or a *chemical* property: Ice melts at 0°C.
Ans: Physical
Category: Easy Section: 1.6
116. Classify the following as either a *physical* or a *chemical* property: Newspaper burns.
Ans: Chemical
Category: Easy Section: 1.6

117. Classify the following as either a *physical* or a *chemical* property: The vitamin content of foods in contact with air falls.
Ans: Chemical
Category: Easy Section: 1.6
118. Classify the following as a *pure substance* or a *mixture*: Ice cream.
Ans: Mixture
Category: Easy Section: 1.4
119. Classify the following as a *pure substance* or a *mixture*: Bread.
Ans: Mixture
Category: Medium Section: 1.4
120. Classify the following as a *pure substance* or a *mixture*: Seven-Up®.
Ans: Mixture
Category: Easy Section: 1.4
121. Classify the following as an *element*, a *compound*, or a *mixture*: Air.
Ans: Mixture
Category: Easy
122. Classify the following as an *element*, a *compound*, or a *mixture*: Table salt (non-iodized).
Ans: Compound
Category: Medium
123. Classify the following as an *element*, a *compound*, or a *mixture*: Chicken broth.
Ans: Mixture
Category: Easy
124. Classify the following as an *element*, a *compound*, or a *mixture*: Oxygen gas.
Ans: Element
Category: Easy
125. Classify the following as a *mixture*, a *compound*, or an *element*: Brewed coffee, ready to drink.
Ans: Mixture
Category: Easy Section: 1.4
126. Classify the following as a *mixture*, a *compound*, or an *element*: Sugar to put in a cup of coffee.
Ans: Compound
Category: Easy Section: 1.4

127. Classify the following as a *mixture*, a *compound*, or an *element*: Orange juice.
Ans: Mixture
Category: Easy Section: 1.4
128. A pure yellow crystalline substance, when heated in a vacuum, releases a greenish gas and a red powder. Is the original yellow crystalline substance a compound or element?
Ans: Compound
Category: Medium Section: 1.4
129. In the process of fixing breakfast you:
1. break open the egg
2. fry it
3. cut the fried egg into pieces
4. toast a slice of bread
5. cut the toast in half
Which of these are chemical processes?
Ans: 2 (frying the egg) and 4 (toasting the bread)
Category: Medium Section: 1.6
130. An organic liquid has a density of 0.8 g/cm^3 . What is the mass of a 42.0 mL sample of this liquid?
Ans: 30 g
Category: Easy Section: 1.7
131. What is the density of copper if 11.8 cm^3 of copper has a mass of 105.2 g?
Ans: 8.92 g/cm^3
Category: Easy Section: 1.7
132. An automobile engine has a piston displacement of $1,600 \text{ cm}^3$. Express this volume in liters.
Ans: 1.6 L
Category: Easy Section: 1.9
133. An automobile engine has a piston displacement of $1,600 \text{ cm}^3$. Express this volume in cubic inches. (1 in = 2.54 cm)
Ans: 98 in^3
Category: Easy Section: 1.9

134. An investor paid market price for a chunk of gold that he was told was pure. The gold bar had a mass of 440 g, but was slightly irregular so an exact volume could not be calculated. The investor filled a large graduated cylinder with water, immersed the chunk of gold, and observed an increase in the apparent volume of material in the graduated cylinder of 25.0 mL. Pure gold has a density of 19.3 g/cm^3 . Did the investor get her money's worth? Why or why not?

Ans: No. The investor's metal density is 17.6 g/cm^3 , thus the bar must not be pure gold.

Category: Medium Section: 1.9

135. An American engineer who had been transferred to Europe was asked to build bridge pilings exactly as he had in the United States. Each piling required 20.0 cubic yards of concrete in the United States. How many cubic meters of concrete are required for each piling? Given: $1 \text{ yd} = 0.914 \text{ m}$.

Ans: 15.3 m^3

Category: Medium Section: 1.9

136. A soft drink costs 75 cents for a 12-oz can. A two-liter bottle costs \$1.25. In which form is the soft drink more expensive? How much more expensive? ($1.0 \text{ L} = 1.057 \text{ qt}$, $1 \text{ qt} = 32 \text{ oz}$)

Ans: The two-liter bottle is the better value. The can is over three times more expensive by volume.

Category: Medium Section: 1.9

137. A person weighs 150 lb, and the correct dosage of a drug is given as 1.50 mg per kilogram of body weight. How many milligrams of the drug should be given? ($2.20 \text{ lb} = 1 \text{ kg}$)

Ans: 102 mg

Category: Medium Section: 1.9

138. You just measured a block of wood and obtained the following information:

mass = 55.120 g

length = 8.5 cm

height = 4.3 cm

width = 3.3 cm

Determine the volume and density of the wood block.

Ans: Volume of the wood block = 120 cm^3 ; density of the wood block = 0.46 g/cm^3 .

Category: Medium Section: 1.9

139. You just measured a metal cylinder and obtained the following information:

mass = 3.543 g
diameter = 0.53 cm
height = 4.4 cm

Determine the volume (V) and density of the cylinder. ($V = \pi r^2 h$, where r = radius, h = height, $\pi = 3.14$)

Ans: Volume of the cylinder = 0.97 cm³; density of the cylinder = 3.7 g/cm³.

Category: Medium Section: 1.9

140. You just measured a sugar cube and obtained the following information:

mass = 3.48 g
height = length = width = 1.3 cm

Determine the volume and density of the cube. Suppose the sugar cube was added to a cup of water. Before it dissolves, will the sugar cube float or sink to the bottom?

Ans: Volume of the sugar cube = 2.2 cm³; density of the sugar cube = 1.6 g/cm³. Before dissolving, the sugar cube will sink in a cup of water.

Category: Medium Section: 1.9

141. An archeologist finds a huge monolith in the desert. In order to estimate the weight of this object; he estimates the dimensions of the monolith and removes some chips from the rock with his hammer, collecting the following data:

dimensions of the monolith = 1.5 m × 5.2 m × 13 m
mass of rock chips = 41.73 g
volume of rock chips = 15.2 cm³

Determine the mass of the monolith in pounds, assuming it is of uniform composition. (1 lb = 453.6 g)

Ans: 6.1×10^5 lb

Category: Difficult Section: 1.9

142. What is the density of a salt solution if 50.0 mL of the solution has a mass of 57.0 g?

Ans: 1.14 g/mL

Category: Easy Section: 1.7

143. An excavator is preparing to dig a basement for a new house. Part of his contract reads that he must dispose of all the dirt he removes while digging the basement in an EPA approved landfill. He will dig a hole that is 40 feet wide by 50 feet long and 7.5 feet deep. He first uses his shovel and scoops up 1.00 kg of dirt, and then determines that the dirt has a volume of 600 cm³. The excavator knows that his dump truck can only carry 8,000 kg of dirt. How many dump-truck loads will it take to haul the dirt away?

Ans: 89 dump-truck loads

Category: Difficult Section: 1.9

144. How many significant figures does the number 30.340 contain?

Ans: 5

Category: Easy Section: 1.8

145. How many significant figures does the number 0.00721 contain?
Ans: 3
Category: Easy Section: 1.8
146. The number 9.64870×10^5 contains how many significant figures?
Ans: 6
Category: Easy Section: 1.8
147. What will be the cost of gasoline for a 3,700-mile trip in a car that gets 23 miles per gallon, if the average price of gas is \$2.90 per gallon?
Ans: \$470
Category: Medium Section: 1.9
148. What will be the cost of gasoline for a 4,700-mile automobile trip if the car gets 41 miles per gallon, and the average price of gas is \$2.79 per gallon?
Ans: \$320
Category: Medium Section: 1.9
149. The volume of a sphere is given by $V = (4/3)\pi r^3$ where r is the radius. What is the mass of a magnesium sphere with a radius of 0.80 cm? (The density of magnesium is 1.74 g/cm³.)
Ans: 3.7 g
Category: Medium Section: 1.9
150. The density of lead is 11.4 g/cm³. Express this density in pounds per cubic foot.
Ans: 711 lbs/ft³
Category: Medium Section: 1.9
151. What is the mass of 1.00 dm³ of mercury? The density of mercury is 13.6 g/cm³.
Ans: 1.36×10^4 g
Category: Medium Section: 1.9
152. The weight of a body varies according to the force of gravity exerted on the body.
Ans: True Category: Medium Section: 1.7
153. The mass of a body varies according to the force of gravity exerted on the body.
Ans: False Category: Medium Section: 1.7
154. The SI base unit of length is the centimeter.
Ans: False Category: Easy Section: 1.7
155. Mass, length, and volume are extensive properties, but density is an intensive property.
Ans: True Category: Easy Section: 1.6

156. 20°C is colder than 40°F.

Ans: False Category: Medium Section: 1.7

157. 16 megagrams (Mg) is equal to 1.6×10^7 g.

Ans: True Category: Easy Section: 1.7

158. The conversion of water into steam is an example of a *chemical* change.

Ans: False Category: Easy Section: 1.6