Fundamentals of General, Organic, and Biological Chemistry, 7e **(McMurry)**
Chapter 1 Matter and Measurements

1) Which of the following is a chemical property?
A) melting point
B) mass
C) flammability
D) volume
E) temperature
Answer: C
Diff: 1
Section: 1.1

2) All of the following are examples of matter **except**
A) heat.
B) air.
C) water.
D) salt.
E) plants.
Answer: A
Diff: 1
Section: 1.1

3) Which of the following is a physical property?
A) flammability
B) conductivity
C) ability to support combustion
D) corrosiveness
E) inertness
Answer: B
Diff: 1
Section: 1.1

4) Which is an example of matter?
A) electrical current
B) conductivity
C) reactivity
D) plastic
E) anxiety
Answer: D
Diff: 1
Section: 1.1

5) Which of the following is a chemical property of aspirin?
A) It does not decompose when protected from moisture.
B) It does not readily dissolve in water.
C) It can be compressed into tablets when mixed with cornstarch.
D) It melts at 135°C.
E) It is a white crystalline solid in pure form at room temperature.
Answer: A
Diff: 1
Section: 1.1

6) Which of the following is a physical change?
A) the rusting of iron
B) the condensation of water vapor
C) the baking of a potato
D) the explosion of nitroglycerin
Answer: B
Diff: 1
Section: 1.1

7) Which statement describes a physical change?
A) winding an alarm clock
B) turning on a flashlight
C) digesting your lunch
D) burning the morning toast
E) lighting a match
Answer: A
Diff: 1
Section: 1.1

8) Which of the following causes a chemical change?
A) winding an alarm clock
B) metabolizing fat
C) slicing a tomato
D) digging a hole
E) pumping gasoline
Answer: B
Diff: 2
Section: 1.1

9) A chemist is given an unknown gas sample. Which observation describes a chemical property of the sample?
A) It extinguishes a glowing splint.
B) It has a sharp, stinging odor.
C) It is colorless.
D) Its density is greater than that of air.
E) It weighs 11.2 grams.
Answer: A
Diff: 2
Section: 1.1

10) Which of the following is an example of matter?
A) light
B) clothing
C) forgiveness
D) jealousy
E) wisdom
Answer: B
Diff: 1
Section: 1.2

11) Chemistry is important to the study of which of the following subjects?
A) Geology
B) Biology
C) Astronomy
D) Physics
E) All of these
Answer: E
Diff: 1
Section: 1.1

12) A chemist is given an unknown sample. Which of her observations is **not** a physical property?
A) The sample is a colorless liquid.
B) The sample has an odor similar to gasoline.
C) The sample is flammable.
D) The sample size is 55 mL.
E) The density of the liquid is 0.789 g/mL.
Answer: C
Diff: 2
Section: 1.1

13) Which of the following is a **physical** property of aspirin?
A) Aspirin can moderate some heart disorders when ingested.
B) Aspirin does not decompose when tightly sealed in a bottle.
C) Aspirin yields carbon dioxide and water vapor when burned.
D) Aspirin can be pressed into tablets when mixed with cornstarch.
E) Aspirin reacts with water to produce salicylic acid and acetic acid.
Answer: D
Diff: 3
Section: 1.1

14) Which best describes the size and shape of a sample of gas?
A) It has definite volume and definite shape.
B) It has definite volume, but shape is determined by the container.
C) Its volume is determined by the container, but it has a definite shape.
D) Volume and shape are both determined by the container.
E) Volume and shape cannot be described.
Answer: D
Diff: 1
Section: 1.2

15) Which term does **not** describe a conversion between states of matter?
A) condensation
B) evaporation
C) freezing
D) melting
E) mixing
Answer: E
Diff: 1
Section: 1.2

16) 1-butanethiol, one of the compounds giving skunks their distinctive odor, freezes at -115.7°C and boils at 98.5°C. What is its phase at 37°C, the normal body temperature of humans?
A) solid
B) liquid
C) gas
D) a mixture of solid and liquid
E) a mixture of liquid and gas
Answer: B
Diff: 3
Section: 1.2

17) Malic acid, a compound used to increase the acidity of fruit-flavored products, freezes at 128°C and boils at 150°C. What is its phase at 100°C, a temperature used in food processing applications?
A) solid
B) liquid
C) gas
D) a mixture of solid and liquid
E) a mixture of liquid and gas
Answer: A
Diff: 3
Section: 1.2

18) Which factor determines the state of matter in which a substance exists?
A) amount
B) color
C) density
D) odor
E) temperature
Answer: E
Diff: 3
Section: 1.2

19) Which of the following are states of matter?
A) solid
B) suspension
C) solution
D) precipitate
E) all of the above
Answer: A
Diff: 1
Section: 1.2

20) Barium sulfate is described as a white crystalline solid that melts at 1580°C and decomposes at 1600°C. At a temperature of 500°C, you would expect a sample of barium sulfate to be a
A) colorless liquid.
B) white crystalline solid.
C) yellow liquid.
D) white cloud of vapor.
E) form that cannot be determined.
Answer: B
Diff: 3
Section: 1.2

21) Which of the following is a pure substance?
A) root beer
B) bleach
C) eggs
D) gasoline
E) neon
Answer: E
Diff: 1
Section: 1.3

22) Which of the following observations demonstrates that a solid sample is a **compound**?
A) It cannot be broken down into simpler substances by chemical methods.
B) It cannot be broken down into simpler substances by physical methods.
C) Heating the substance causes it to melt, then to boil.
D) Heating the substance causes no visible color change.
E) Crushing the sample does not affect its other properties.
Answer: B
Diff: 1
Section: 1.3

23) A pure substance
A) always has the same elemental composition.
B) is composed of more than one element.
C) can be broken into its components by physical means.
D) is chemically inert.
E) changes color when placed in bright sunlight.
Answer: A
Diff: 1
Section: 1.3

24) Which of the following is a mixture?
A) cough syrup
B) iron
C) helium
D) sodium hydrogen carbonate
E) steam
Answer: A
Diff: 2
Section: 1.3

25) Which of the following can be classified as a pure compound?
A) alcohol in water, C_2H_5OH in H_2O
B) sugar, $C_{12}H_{22}O_{11}$
C) carbon, C
D) iodine, I_2
Answer: B
Diff: 2
Section: 1.3

26) List and describe two differences between pure substances and mixtures.
Answer:
1. The composition of a pure substance is always the same, regardless of the source, but the composition of a mixture can vary.
2. Mixtures can be separated into their components by physical changes; some pure substances can be separated into components by chemical change.
Diff: 1
Section: 1.3

27) List three examples of pure substances and three examples of mixtures **that have not been previously discussed in class.**
Answer: Anything that makes sense in your class.
Diff: 1
Section: 1.3

28) Vegetable oil is a(an) _____, and is found in the _____ phase.
A) element; liquid
B) compound; solid
C) mixture; liquid
D) compound; gas
E) mixture; solid
Answer: C
Diff: 2
Section: 1.3

29) A reddish powder is heated gently in a loosely covered container. After the heating a silvery metal remains in the container, and a glowing wooden splint placed into the container bursts into flame. The original substance is a(an) _____, and the solid and gas produced are _____.
A) element; compounds
B) compound; elements
C) mixture; compounds
D) compound; compounds
E) mixture; elements
Answer: B
Diff: 3
Section: 1.3

30) Each symbol denotes an element **except**
A) Co.
B) CO.
C) Cu.
D) C.
E) Cl.
Answer: B
Diff: 1
Section: 1.4

31) Which of the following is an element?
A) fire
B) iron
C) salt
D) water
E) wine
Answer: B
Diff: 1
Section: 1.4

32) What is the chemical symbol for chlorine?
A) C
B) Ca
C) Cl
D) Cr
E) Cu
Answer: C
Diff: 1
Section: 1.4

33) What is the chemical symbol for calcium?
A) C
B) Ca
C) Cl
D) Cr
E) Cu
Answer: B
Diff: 1
Section: 1.4

34) What is the chemical symbol for copper?
A) C
B) Ca
C) Cl
D) Cr
E) Cu
Answer: E
Diff: 1
Section: 1.4

35) What is the chemical symbol for chromium?
A) C
B) Ca
C) Cl
D) Cr
E) Cu
Answer: D
Diff: 1
Section: 1.4

36) The most common element by mass percent in the human body is
A) carbon.
B) hydrogen.
C) oxygen
D) sulfur.
E) phosphorus.
Answer: C
Diff: 1
Section: 1.4

37) Xylene, a compound with the formula C_8H_{10}, is composed of
A) any combination of atoms of carbon and hydrogen in a four to five ratio.
B) eight atoms of carbon and ten atoms of hydrogen.
C) eight atoms of calcium and ten atoms of helium.
D) ten atoms of carbon and eight atoms of hydrogen.
E) any combination of atoms of carbon and hydrogen that add up to 18 total.
Answer: B
Diff: 1
Section: 1.4

38) Which symbol does **not** denote a compound?
A) CO_2
B) CCl_4
C) C_2H_4
D) Cr
E) $CaCO_3$
Answer: D
Diff: 1
Section: 1.4

39) Which element is **not** essential for human life?
A) C
B) H
C) P
D) Pb
E) Ca
Answer: D
Diff: 1
Section: 1.4

40) What is the symbol for tungsten?
A) W
B) Tu
C) Sn
D) St
E) Ti
Answer: A
Diff: 1
Section: 1.4

41) What element is represented by the chemical symbol K?
A) kaolin
B) phosphorus
C) potassium
D) silver
E) sodium
Answer: C
Diff: 2
Section: 1.4

42) What element is represented by the chemical symbol Ag?
A) argon
B) arsenic
C) gold
D) mercury
E) silver
Answer: E
Diff: 2
Section: 1.4

43) Of the elements listed, the most abundant by mass percent in the earth's crust is
A) silicon.
B) aluminum.
C) hydrogen.
D) iron.
E) sodium.
Answer: A
Diff: 2
Section: 1.4

44) The formula for ammonia, NH_3, represents a compound composed of
A) one atom of nickel and three atoms of hydrogen.
B) one atom of nitrogen and three atoms of hydrogen.
C) three atoms of nitrogen and three atoms of hydrogen.
D) three atoms of nitrogen and one atom of hydrogen.
E) one atom of nitrogen and three atoms of helium.
Answer: B
Diff: 2
Section: 1.4

45) The formula for sodium carbonate, Na_2CO_3, represents a compound composed of
A) two atoms of sodium, three atoms of carbon, and three atoms of oxygen.
B) two atoms of sodium, one atom of carbon, and three atoms of oxygen.
C) six atoms of sodium, two atoms of carbon, and six atoms of oxygen.
D) one atom of sodium and one atom of carbonate.
E) two atoms of sodium and three atoms of carbonate.
Answer: B
Diff: 2
Section: 1.4

46) The formula for calcium sulfate, $CaSO_4$, represents a compound composed of

A) two atoms of calcium, four atoms of sulfur, and four atoms of oxygen.
B) one atom of calcium, four atoms of sulfur, and four atoms of oxygen.
C) one atom of calcium, one atom of sulfur, and four atoms of oxygen.
D) one atom of calcium and four atoms of sulfate.
E) one atom of calcium and one atom of sulfate.
Answer: C
Diff: 2
Section: 1.4

47) The formula for glucose, $C_6H_{12}O_6$, represents a compound composed of

A) six atoms of carbon, twelve atoms of hydrogen, and six atoms of oxygen.
B) six atoms of carbon, ten atoms of hydrogen, and four atoms of oxygen.
C) one atom of carbon, two atoms of hydrogen, and one atom of oxygen.
D) six atoms of carbon and six atoms of water.
E) six atoms of carbon and two atoms of water.
Answer: A
Diff: 2
Section: 1.4

48) The formula $BaSO_4$ represents a compound composed of

A) two atoms of barium, four atoms of sulfur, and four atoms of oxygen.
B) one atom of barium, four atoms of sulfur, and four atoms of oxygen.
C) one atom of barium, one atom of sulfur, and four atoms of oxygen.
D) one atom of boron, four atoms of sulfur, and four atoms of oxygen.
E) one atom of boron, one atom of sulfur, and four atoms of oxygen.
Answer: C
Diff: 2
Section: 1.4

49) Amphetamine, a commonly abused drug, is composed of nine atoms of carbon, 13 atoms of hydrogen, and one atom of nitrogen. The chemical formula of amphetamine is written

A) $C_9H_{13}N_1$
B) C_9H_{13}
C) $C_9H_{13}N$
D) $C_{13}H_{93}N_0$
E) $C_9H_1N_{13}$
Answer: C
Diff: 3
Section: 1.4

50) Caffeine, the active ingredient in coffee, is composed of eight atoms of carbon, ten atoms of hydrogen, and four atoms of nitrogen. The chemical formula of caffeine is written
A) CHNO
B) $C_8H_{10}N_4O_2$
C) $C_8H_{10}N_4$
D) $C_8H_{12}N_4O_4$
E) $C_8H_{10}N_4O$
Answer: B
Diff: 3
Section: 1.4

51) Element Z has the following properties:
a. noncombustible
b. unreactive
c. colorless, odorless gas at room temperature
d. nonconductor of electricity

Element Z can be classified as a _____ and will be found _____ the zigzag line of the periodic table.
A) metal; to the left of
B) metalloid; along side of
C) non-metal; to the right of
D) non-metal; along side of
E) metal; to the right of
Answer: C
Diff: 3
Section: 1.5

52) Which chemical symbol represents a <u>non-metal</u>?
A) Al
B) B
C) Ga
D) Si
E) P
Answer: E
Diff: 1
Section: 1.5

53) Which chemical symbol represents a **metallic** element?
A) Ar
B) Br
C) Ca
D) H
E) P
Answer: C
Diff: 2
Section: 1.5

54) Which chemical symbol represents a metalloid?
A) Al
B) B
C) Ga
D) Zn
E) Ar
Answer: B
Diff: 1
Section: 1.5

55) Element Z has the following properties:
a. silvery-white solid at room temperature
b. malleable
c. used as a catalyst
d. conducts electricity

Element Z can be classified as a _____ and will be found _____ the zigzag line of the periodic table.
A) metal; along side of
B) metalloid; along side of
C) non-metal; to the right of
D) non-metal; along side of
E) metal; to the left of
Answer: E
Diff: 3
Section: 1.5

56) Consider the chemical reaction described as

$$\text{mercury(II) oxide} \xrightarrow{\text{heat}} \text{mercury} + \text{oxygen.}$$

Identify the reactant(s) in this example.
A) heat
B) mercury + oxygen
C) mercury(II) oxide
D) mercury
E) oxygen
Answer: C
Diff: 2
Section: 1.6

57) A chemical reaction occurs when
A) a substance's structure is altered.
B) a substance is heated.
C) two or more substances are mixed.
D) a substance is dissolved in water.
E) all of the above
Answer: A
Diff: 1
Section: 1.6

58) When the prefix *milli* is used in the metric or SI system, a fundamental unit of measurement is multiplied by what factor?
A) 10^{-3}
B) 10^{-2}
C) 10^{-6}
D) 10^{3}
E) 10^{6}
Answer: A
Diff: 2
Section: 1.7

59) When the prefix *centi* is used in the metric system, a fundamental unit of measurement is multiplied by what factor?
A) 10^{-3}
B) 10^{-2}
C) 10^{-6}
D) 10^{3}
E) 10^{6}
Answer: B
Diff: 2
Section: 1.7

60) How many meters are there in one kilometer?
A) 10^{-3}
B) 10^{-2}
C) 10^{-6}
D) 10^{3}
E) 10^{6}
Answer: D
Diff: 2
Section: 1.7

61) How long is 1 cm?
A) 0.01 mm
B) 1 mm
C) 10 mm
D) 100 mm
Answer: C
Diff: 3
Section: 1.7

62) The abbreviation for the metric unit used to measure mass is
A) g
B) g/cm^3
C) K
D) L
E) m
Answer: A
Diff: 1
Section: 1.8

63) A student weighed a solid sample. The units for this measurement are most likely to be recorded as
A) grams.
B) grams per cubic centimeter.
C) Kelvins.
D) liters.
E) meters.
Answer: A
Diff: 1
Section: 1.8

64) The amount of matter in an object is its
A) density.
B) mass.
C) specific gravity.
D) volume.
E) weight.
Answer: B
Diff: 2
Section: 1.8

65) The measurement most likely to describe the amount of pain reliever in a headache tablet is
A) 1.5 kg.
B) 500 mg.
C) 1.00 mL.
D) 325 mg/mL.
E) 0.25 L.
Answer: B
Diff: 2
Section: 1.8

66) Which value is closest to the mass of a 2-pound box of laundry detergent?
A) 200 g
B) 2.0×10^{-4} cg
C) 9×10^{9} mg
D) 1 kg
E) 4.5×10^{3} ng
Answer: D
Diff: 3
Section: 1.8

67) Which measurement represents the **largest** quantity?
A) 4730 ng
B) 4.73×10^{-4} g
C) 4.73×10^{3} μg
D) 4.73×10^{-6} kg
E) 47.3 mg
Answer: E
Diff: 3
Section: 1.8

68) Which measurement represents the **smallest** quantity?
A) 2950 ng
B) 2.95×10^{-4} g
C) 2.95×10^{3} μg
D) 2.95×10^{-6} kg
E) 29.5 mg
Answer: A
Diff: 3
Section: 1.8

69) The metric unit used to measure volume is the
A) gram.
B) gram per cubic centimeter.
C) Kelvin.
D) liter.
E) meter.
Answer: D
Diff: 1
Section: 1.8

70) Which of the following represents the largest unit?
A) deciliter
B) dekaliter
C) kiloliter
D) megaliter
E) milliliter
Answer: D
Diff: 2
Section: 1.8

71) The units most likely to be used to measure the amount of alcohol to be added to a small test tube are
A) g.
B) mL.
C) cm.
D) kg.
E) L.
Answer: B
Diff: 2
Section: 1.8

72) In an introductory laboratory exercise, a student was asked to measure the volume of soda in a partially filled can in metric units. Which value below is most likely to be correct?
A) 1.0 kL
B) 2.5 L
C) 325 mL
D) 550 μL
E) 6.0×10^6 nL
Answer: C
Diff: 2
Section: 1.8

73) The SI unit for volume is _____ and the metric unit for volume is _____.
A) cc; L
B) L; m^3
C) m^3; L
D) mL; cc
E) m^3; cm^3
Answer: C
Diff: 3
Section: 1.8

74) Which value is closest to the amount of gasoline in a small car with a full tank (which contains about 13 gallons)?
A) 450 mL
B) 50 L
C) 85 μL
D) 12 kL
E) 3.5×10^2 dL
Answer: B
Diff: 3
Section: 1.8

75) 125 cL is the same as all of these **except**
A) 125 centiliter.
B) 125 cubic liter.
C) 1.25 liter.
D) 1250 milliliter.
E) 12.5 deciliter.
Answer: B
Diff: 3
Section: 1.8

76) Which of the following measurements has three significant figures?
A) 1,207 g
B) 4.250 g
C) 0.006 g
D) 0.0250 g
E) 0.03750 g
Answer: D
Diff: 1
Section: 1.9

77) What is the numerical value of 1.2×1.222? Express your answer using the correct number of significant figures.
A) 1.5
B) 1.47
C) 1.466
D) 1.4664
E) none of the above
Answer: A
Diff: 1
Section: 1.9

78) A laboratory technician reports that the mass of a growth removed from a patient is 274.06 g. How many significant figures does this measurement contain?
A) 2
B) 3
C) 4
D) 5
E) none of the above
Answer: D
Diff: 2
Section: 1.9

79) Which of the following numbers contains **four** significant figures?
A) 230,110
B) 23,011.0
C) 0.23010
D) 0.0230100
E) 0.002301
Answer: E
Diff: 2
Section: 1.9

80) Which of the following numbers contains **five** significant figures?
A) 0.04910
B) 0.4910
C) 4.9100
D) 49,100
E) 4,910,000
Answer: C
Diff: 2
Section: 1.9

81) In which of the following numbers are <u>all</u> of the zeros not significant?
A) 3300
B) 0.0450
C) 45.060
D) 607.80
Answer: A
Diff: 1
Section: 1.9

82) What is the total length of two pieces of tubing which measure 4.5 cm and 3.222 cm? Express the answer to the correct number of significant figures.
A) 3.722 cm
B) 4.722 cm
C) 7.722 cm
D) 7.7 cm
E) 8 cm
Answer: D
Diff: 2
Section: 1.9

83) Find the difference between two masses measured as 123.6 grams and 115.972 grams. Express the answer to the correct number of significant figures.
A) 7.6 grams
B) 7.63 grams
C) 7.628 grams
D) 8.0 grams
E) 8 grams
Answer: A
Diff: 2
Section: 1.9

84) What is the area of a piece of metal foil that measures 43.9 cm by 29.21 cm? Express the answer to the correct number of significant figures.
A) 128 cm^2
B) 1280 cm^2
C) 1282.3 cm^2
D) 1282.32 cm^2
E) 1282.319 cm^2
Answer: B
Diff: 2
Section: 1.9

85) The numerical value for $(5.6 \times 10^4) \div (7.89 \times 10^2)$ is equal to, with the proper number of significant figures:
A) 70.976
B) 71
C) 7.098×10^1
D) 71.0
E) 70.98
Answer: B
Diff: 2
Section: 1.9

86) What is the numerical value of $\frac{1.50}{1.222 \times 10^3}$? Express your answer using the correct number of significant figures.

A) 10^{-3}

B) 1×10^{-3}

C) 1.2×10^{-3}

D) 1.23×10^{-3}

E) 1.227×10^{-3}

Answer: D
Diff: 2
Section: 1.9

87) The volume of a gas sample is recorded as 0.0970 L. How many significant figures is this?

A) 2
B) 3
C) 4
D) 5
E) None, because this is an exact number.

Answer: B
Diff: 2
Section: 1.9

88) How many significant figures should be retained in the result of the following calculation?

$$\frac{(11.13 - 2.6) \times 10^4}{(103.05 + 16.9) \times 10^{-6}}$$

A) 1
B) 2
C) 3
D) 4

Answer: B
Diff: 2
Section: 1.9

89) What is the total length of two pieces of rubber tubing which are 7.69 cm and 4.028 cm in length? Express this answer to the correct number of significant figures.

A) 11.7 cm
B) 11.69 cm
C) 11.718 cm
D) 11.72 cm
E) 12 cm

Answer: D
Diff: 2
Section: 1.9

90) Which choice best describes the degree of uncertainty in the measurement 16.30 g?
A) The uncertainty cannot be determined without additional information.
B) The quantity is exact.
C) ±1.00 g
D) ±0.10 g
E) ±0.01 g
Answer: E
Diff: 3
Section: 1.9

91) Which choice best describes the degree of uncertainty in the measurement 4.0032 g?
A) The uncertainty cannot be determined without additional information.
B) The quantity is exact.
C) The measurement is between 4.002 and 4.004 g.
D) The measurement is between 4.0031 and 4.0033 g.
E) The measurement is between 3.99 and 4.01 g.
Answer: D
Diff: 3
Section: 1.9

92) The number 5.320×10^2 in conventional notation is
A) 532.0.
B) 53.20.
C) 5.320.
D) 0.5320.
E) 0.005320.
Answer: A
Diff: 1
Section: 1.10

93) In scientific notation, the number 185,000,000 is
A) 185×10^6.
B) 1.85×10^6.
C) 1.85×10^8.
D) 185×10^{-8}.
E) 1.85×10^{-8}.
Answer: C
Diff: 2
Section: 1.10

94) In scientific notation, the number 0.0046 is expressed as
A) 46×10^{-3}.
B) 4.6×10^{-3}.
C) 4.6×10^{-2}.
D) 4.6×10^{-1}.
E) 46×10^{-1}.
Answer: B
Diff: 2
Section: 1.10

95) What is 2.1×10^{-5} written in decimal notation?
A) 2,100,000
B) 210,000
C) 210
D) 0.00021
E) 0.000021
Answer: E
Diff: 2
Section: 1.10

96) What is 0.0970 written in scientific notation?
A) 970×10^{-4}
B) 97×10^{-3}
C) 9.70×10^{-2}
D) 97.0×10^{-2}
E) 0.97×10^{-1}
Answer: C
Diff: 2
Section: 1.10

97) What is the numerical value of $(2.1 \times 10^{4})(4.0 \times 10^{-2})$?
A) 8.4
B) 8.4×10^{2}
C) 8.4×10^{-2}
D) 8.4×10^{-8}
E) none of the above
Answer: B
Diff: 2
Section: 1.10

98) What is the numerical value of $(8.0 \times 10^3)(2.0 \times 10^2)$?
A) 16.0
B) 16×10^6
C) 1.6×10^6
D) 1.6×10^5
E) 1.6×10^1
Answer: C
Diff: 2
Section: 1.10

99) What is the numerical value of $\frac{1.00 \times 10^5}{8.00}$?

A) 0.125
B) 1.25×10^{-5}
C) 1.25×10^{-4}
D) 1.25×10^4
E) 1.25×10^5
Answer: D
Diff: 2
Section: 1.10

100) What is the numerical value of $\frac{(3.00 \times 10^6)(2.0 \times 10^{-3})}{5.0 \times 10^{-2}}$?

A) 1.2
B) 1.2×10^{11}
C) 1.2×10^7
D) 1.2×10^5
E) 1.2×10^3
Answer: D
Diff: 3
Section: 1.10

101) How many centimeters are contained in 12.5 inches?
A) 4.92 cm
B) 5.10 cm
C) 31.8 cm
D) 492 cm
E) none of the above
Answer: C
Diff: 1
Section: 2.7

102) How many grams are contained in 1.20 pounds?
A) 545 g
B) 378 g
C) 264 g
D) 2.2 g
E) 1.20 g
Answer: A
Diff: 1
Section: 1.12

103) How many inches are contained in 25.4 cm?
A) 100 inches
B) 64.5 inches
C) 25.4 inches
D) 10.0 inches
E) 0.10 inches
Answer: D
Diff: 1
Section: 1.12

104) How many centimeters are there in one kilometer?
A) 10^{5} cm
B) 10^{2} cm
C) 10^{1} cm
D) 10^{-2} cm
E) 10^{-5} cm
Answer: A
Diff: 1
Section: 1.12

105) An analysis showed a sample to contain 0.00471 grams of lead. How many micrograms is this?
A) 0.471 μg
B) 4.71×10^{3} μg
C) 4.71×10^{6} μg
D) 4.71×10^{-2} μg
E) 4.71×10^{-6} μg
Answer: B
Diff: 1
Section: 1.12

106) The conversion factor used to convert 15.0 inches to cm is

A) $\frac{2.54 \text{ cm}}{1 \text{ in}}$

B) $\frac{2.54 \text{ in}}{1 \text{ cm}}$

C) $\frac{1 \text{ in}}{2.54 \text{ cm}}$

D) $\frac{1 \text{ cm}}{2.54 \text{ in}}$

E) $\frac{1 \text{ cm}}{100 \text{ mm}}$

Answer: A
Diff: 2
Section: 1.12

107) The conversion factor used to convert 55.6 km to miles is

A) $\frac{1.61 \text{ km}}{1 \text{ mile}}$

B) $\frac{1.61 \text{ miles}}{1 \text{ km}}$

C) $\frac{1 \text{ mile}}{1.61 \text{ km}}$

D) $\frac{1 \text{ km}}{1.61 \text{ miles}}$

E) $\frac{1 \text{ km}}{1000 \text{ m}}$

Answer: C
Diff: 2
Section: 1.12

108) An extra-strength aspirin contains 0.500 g of aspirin. How many grains is this? (1 grain = 64.8 mg)
A) 7.72 grains
B) 13.0 grains
C) 32.4 grains
D) 65.3 grains
E) 3.24×10^4 grains
Answer: A
Diff: 2
Section: 1.12

109) How many quarts are contained in 450. mL?
A) 0.426 quart
B) 2.10 quarts
C) 426 quarts
D) 475 quarts
E) 0.475 quarts
Answer: E
Diff: 2
Section: 1.12

110) How many pounds are contained in 84.0 kg?
A) 0.038 lb
B) 0.084 lb
C) 38.0 lb
D) 185 lb
E) 380 lb
Answer: D
Diff: 2
Section: 1.12

111) A sample of an experimental medication was calculated to contain 0.392 g of active drug. How many milligrams is this?
A) 392 mg
B) 0.0392 mg
C) 3.92×10^{3} mg
D) 3.92×10^{-1} mg
E) 3.92×10^{-4} mg
Answer: A
Diff: 2
Section: 1.12

112) How many ng are there in 5.2 mg?
A) 1.9×10^{2} ng
B) 1.9×10^{5} ng
C) 5.2×10^{3} ng
D) 5.2×10^{6} ng
E) 5.2×10^{9} ng
Answer: D
Diff: 2
Section: 1.12

113) The dosage of quinine when a 145-lb adult takes a 200.-mg tablet is _____ μg drug per kg of body weight.
A) 1.38×10^6
B) 1.60×10^3
C) 3.04×10^3
D) 4.41×10^5
E) 15.2
Answer: C
Diff: 3
Section: 1.12

114) An object weighs 37.4 kg. What does the object weigh in the English system?
1 lb = 453.6 g
A) 82.5 lb
B) 16,965 lb
C) 0.0824 lb
D) 169.65 lb
Answer: A
Diff: 2
Section: 1.12

115) If gasoline sells for 95.4 cents per liter, what is its cost on a per gallon basis?
1 L = 1.06 qt
A) $3.60
B) $4.04
C) $3.82
D) $404.50
Answer: A
Diff: 2
Section: 1.12

116) Is 25 kilometers per liter good gas mileage for a VW Rabbit diesel? Hint: How do we measure mileage in the English system?
Answer: It's good: 59 miles/gal.
Diff: 3
Section: 1.12

117) If an automobile gets 24.5 miles to the gallon and the cost of gasoline is $2.75 a gallon, how much will it cost to drive 975 km?
Answer: $68.00
Diff: 3
Section: 1.12

118) 68°C is the same as
A) 341 K.
B) 321 K.
C) 285 K.
D) 205 K.
E) 158 K.
Answer: A
Diff: 1
Section: 1.13

119) What temperature is 325 K on the Celsius scale?
A) 52°C
B) 126°C
C) 344°C
D) 598°C
E) 617°C
Answer: A
Diff: 1
Section: 1.13

120) 95.0°F is the same as
A) 21°C.
B) 35°C.
C) 85°C.
D) 171°C.
E) 203°C.
Answer: B
Diff: 2
Section: 1.13

121) What temperature is -10.°C on the Fahrenheit scale?
A) 263°F
B) 26°F
C) 14°F
D) -6°F
E) -18°F
Answer: C
Diff: 2
Section: 1.13

122) What temperature is 75°F on the Kelvin scale?
A) 24 K
B) 43 K
C) 215 K
D) 297 K
E) 348 K
Answer: D
Diff: 2
Section: 1.13

123) What temperature do the Celsius and Fahrenheit scales read the same?
A) -40
B) 100
C) 25
D) -100
E) Never
Answer: A
Diff: 3
Section: 1.13

124) Why is the number 32 (and not some other value) used in the formula for converting between Celsius and Fahrenheit temperatures?
Answer: The 32 compensates for the fact that the Celsius scale uses zero as its reference point for the freezing point of water, but the Fahrenheit scale uses 32 as this reference point.
Diff: 2
Section: 1.13

125) Why is the number 1.8 (and not some other value) used in the formula for converting between Celsius and Fahrenheit temperatures?
Answer: This value compensates for the different size of the two degrees. In the Celsius scale there are 100 degrees between the freezing point and the boiling point of water, but in the Fahrenheit scale there are 180 degrees to cover the same interval. The ratio of 180 to 100 is 1.8, so this correction factor is used in the formula.
Diff: 2
Section: 1.13

126) Why is the number 273.15 (and not some other value) used in the formula for converting between Celsius and Kelvin temperatures?
Answer: This value compensates for the fact that the freezing point of water on the Celsius scale is 273.15 degrees lower than on the Kelvin scale. Since kelvins are the same size as Celsius degrees, no other correction factors are needed.
Diff: 2
Section: 1.13

127) How many calories are released when 500 g of water cools from 95.0°C to 25.0°C?
A) 35.0 cal
B) 70.0 cal
C) 1.25×10^4 cal
D) 3.50×10^4 cal
E) 4.75×10^4 cal
Answer: D
Diff: 1
Section: 1.13

128) If 55.0 g of olive oil has 877 cal of heat added to it at a room temperature of 26.0°C, what will be the *final temperature* of the olive oil? The specific heat of olive oil is 2.19 cal/g°C.
A) 33.3°C
B) 7.3°C
C) 19.0°C
D) 26.0°C
Answer: A
Diff: 3
Section: 1.13

129) If 75.0 g of water at 30.0°C absorbs 900 calories, the new temperature will be
A) 18.0°C.
B) 22.0°C.
C) 42.0°C.
D) 105°C.
E) 160°C.
Answer: C
Diff: 3
Section: 1.13

130) What is the specific heat of a metal if it takes 26.5 calories to raise the temperature of a piece weighing 50.0 g by 5.00 Celsius degrees?
A) 250 cal/g °C
B) 133 cal/g °C
C) 6.63 cal/g °C
D) 1.89 cal/g °C
E) 0.106 cal/g °C
Answer: E
Diff: 3
Section: 1.13

131) What is the specific heat of a metal if it takes 48.4 calories to raise the temperature of a 45.0 g sample by 5.0°C?
A) 0.186 cal/g °C
B) 0.215 cal/g °C
C) 5.34 cal/g °C
D) 225 cal/g °C
E) 242 cal/g °C
Answer: B
Diff: 3
Section: 1.13

132) What is the density of a 6.0×10^2 mL liquid sample that weighs 450 g?
A) 1050 g/mL
B) 270 g/mL
C) 1.33 g/mL
D) 0.75 g/mL
E) 0.37 g/mL
Answer: D
Diff: 1
Section: 1.14

133) In a density determination, a student measured 11.46 mL of a liquid. How many liters is this?
A) 11,460 L
B) 1.146 L
C) 0.1146 L
D) 0.01146 L
E) 1.146×10^{-3} L
Answer: D
Diff: 1
Section: 1.14

134) Calculate the density of cyclohexane if a 50.0 g sample has a volume of 64.3 mL.
A) 114.3 g/mL
B) 14.3 g/mL
C) 1.29 g/mL
D) 0.778 g/mL
E) 0.322 g/mL
Answer: D
Diff: 1
Section: 1.14

135) A 35.0 mL sample of a liquid weighs 27.2 g. What is the density of the liquid?
A) 62.2 g/mL
B) 7.80 g/mL
C) 1.29 g/mL
D) 0.952 g/mL
E) 0.777 g/mL
Answer: E
Diff: 1
Section: 1.14

136) What is the specific gravity of a liquid sample with a mass of 35.0 g and a volume of 14.00 mL?
A) 14.0 g/mL
B) 2.50 g/mL
C) 21.0
D) 14.0
E) 2.5
Answer: E
Diff: 1
Section: 1.14

137) What is the volume of a gold nugget that weighs 2.20 kg? The density of gold is 19g/cm^3.
A) 8.60×10^3 cm^3
B) 116 cm^3
C) 11.6 cm^3
D) 8.60 cm^3
E) 0.116 cm^3
Answer: B
Diff: 2
Section: 1.14

138) What is the mass of 30.0 mL of a solution with a density of 1.60 g/mL?
A) 53.3 g
B) 48.0 g
C) 31.6 g
D) 18.8 g
E) none of the above
Answer: B
Diff: 2
Section: 1.14

139) A 2.36 cm^3 sample of an unknown metal weighs 18.5 g. What is the sample's density?
A) 7.84 g/cm^3
B) 0.127 cm^3/g
C) 15.75 g/cm^3
D) 0.784 g/cm^3
Answer: A
Diff: 2
Section: 1.14

140) Gasoline has a density of about 0.65 g/mL. How much does 34.0 L weigh in pounds?
Answer:
Convert 34.0 L to mL then multiply by the density to obtain the grams.
Convert grams to pounds: 34,000 mL × 0.65 g/mL × 1 lb/454 g = **48.7 lbs.**
Diff: 2
Section: 1.14

141) A gas at 25°C exactly fills a container previously determined to have a volume of 1.05×10^3 cm^3. The container plus gas are weighed and found to have a mass of 837.6 g. The container, when emptied of all gas, has a mass of 836.2 g. What is the density of the gas at 25°C?
Answer: 1.3×10^{-3} g/cm^3
Diff: 2
Section: 1.14

142) Which of the following statements is true of specific gravity?
A) It has the units of g/cm^3
B) Specific gravity is constant at any temperature.
C) Specific gravity is unitless because it is the density of one substance divided by the density of water.
D) Specific gravity is a measure of the reactivity index of a substance.
Answer: C
Diff: 2
Section: 1.14

143) Explain how density can be used to determine the volume of carbon tetrachloride (which is a liquid at room temperature) needed to make a mixture using 37.2 of carbon tetrachloride.
Answer: Notice that the student is not asked to solve the problem, but to explain the reasoning. Density can be used as a conversion factor because the definition essentially states that x g of substance is equivalent to y mL of the substance. Therefore, the two conversion factors, $\frac{\text{x g}}{\text{y mL}}$ and $\frac{\text{y mL}}{\text{x g}}$,

can be written and the appropriate one used to make the desired conversion.
Diff: 3
Section: 1.14