***Basic Chemistry, 4e* (Timberlake)**
Chapter 2 Measurements

2.1 Multiple Choice Questions

1) 5.21 cm is the same distance as _____.
A) 0.0521 m
B) 52.1 dm
C) 5.21 mm
D) 0.000 521 km
E) 5210 m
Answer: A
Objective: 2.1
Global: G4

2) How many centimeters are there in 57.0 in?
A) 22 cm
B) 0.0445 cm
C) 145 cm
D) 22.4 cm
E) 140 cm
Answer: C
Objective: 2.1, 2.6, 2.7
Global: G4

3) The measurement of the gravitational pull on an object is its _____.
A) volume
B) weight
C) mass
D) length
E) size
Answer: B
Objective: 2.1
Global: G2

4) The amount of space occupied by a substance is its _____.
A) mass
B) density
C) weight
D) length
E) volume
Answer: E
Objective: 2.1
Global: G2

5) Which of the following is the basic unit of volume in the metric system?
A) liter
B) kilogram
C) meter
D) centimeter
E) gram
Answer: A
Objective: 2.1
Global: G2

6) Which of the following is the SI unit of mass?
A) milliliter
B) centimeter
C) kilogram
D) Celsius
E) meter
Answer: C
Objective: 2.1
Global: G2

7) A value of 25 °C is a measurement of _____.
A) distance
B) volume
C) temperature
D) mass
E) density
Answer: C
Objective: 2.1
Global: G2

8) Which of the following measurements are NOT equivalent?
A) 25 mg = 0.025 g
B) 183 L = 0.183 kL
C) 150. msec = 0.150 sec
D) 84 cm = 8.4 mm
E) 24 dL = 2.4 L
Answer: D
Objective: 2.1, 2.5
Global: G4

9) The measurement 0.000 043 m, expressed correctly using scientific notation, is _____.
A) 4.3×10^{-7} m
B) 4.3×10^{-6} m
C) 4.3×10^{6} m
D) 4.3×10^{-5} m
E) 4.3 m
Answer: D
Objective: 2.2
Global: G4

10) The number 680 000 000 expressed correctly using scientific notation is _____.
A) 6.8
B) 0.68×10^{6}
C) 6.8×10^{8}
D) 68×10^{7}
E) 680×10^{6}
Answer: C
Objective: 2.2
Global: G4

11) Which of the following numbers is the smallest?
A) 4.0×10^{-6}
B) 4.0×10^{-8}
C) 4.0×10^{-2}
D) 4.0×10^{15}
E) 4.0×10^{-12}
Answer: E
Objective: 2.2
Global: G4

12) Which of the following numbers is the largest?
A) 2.05×10^{3}
B) 2.05×10^{-12}
C) 2.05×10^{5}
D) 2.05×10^{8}
E) 2.05
Answer: D
Objective: 2.2
Global: G4

13) Which of the following conversion factors involves a measured number?
A) 10 cm/dm
B) 12 in/ft
C) 16 oz/lb
D) 25 miles/gallon
E) 12 eggs/dozen
Answer: D
Objective: 2.3, 2.6
Global: G4

14) Which of the following measured numbers has three significant figures?
A) 10.01 cm
B) 0.001 cm
C) 1.01 cm
D) 1.0×10^3 cm
E) 100 cm
Answer: C
Objective: 2.3
Global: G4

15) Which of the following measured numbers has two significant figures?
A) 0.2 mL
B) 0.002 mL
C) 20.0 mL
D) 2.0×10^3 mL
E) 200 cm
Answer: D
Objective: 2.3
Global: G4

16) Significant figures are important because they indicate _____.
A) a counted number
B) the number of digits on a calculator
C) the number of measurements
D) the number of digits in a measurement
E) the accuracy of the conversion factor
Answer: D
Objective: 2.4
Global: G2

17) Which of the following measurements has three significant figures?
A) 0.005 m
B) 510 m
C) 0.510 m
D) 0.051 m
E) 5100 m
Answer: C
Objective: 2.4
Global: G4

18) Which of the following numbers contains the designated CORRECT number of significant figures?
A) 0.043 00 5 significant figures
B) 0.00302 2 significant figures
C) 156 000 3 significant figures
D) 1.04 2 significant figures
E) 3.0650 4 significant figures
Answer: C
Objective: 2.4
Global: G4

19) The number of significant figures in the measurement of 45.030 mm is _____.
A) none
B) three
C) four
D) five
E) six
Answer: D
Objective: 2.4
Global: G4

20) How many significant figures are in the number 0.00208?
A) six
B) two
C) three
D) four
E) five
Answer: C
Objective: 2.4
Global: G4

21) Which of the following examples illustrates a number that is correctly rounded to three significant figures?
A) 4.05438 grams to 4.054 grams
B) 0.03954 grams to 0.040 grams
C) 103.692 grams to 103.7 grams
D) 109 526 grams to 109 500 grams
E) 20.0332 grams to 20.0 grams
Answer: E
Objective: 2.4
Global: G4

22) A calculator answer of 423.6059 must be rounded off to three significant figures. What answer is reported?
A) 423
B) 424
C) 420
D) 423.6
E) 423.7
Answer: B
Objective: 2.4
Global: G4

23) Which of the answers for the following conversions contains the correct number of significant figures?
A) $2.543 \text{ m} \times \frac{39.37 \text{ in}}{1 \text{ m}} = 100.1942 \text{ in}$

B) $2 \text{ L} \times \frac{1.057 \text{ qt}}{1 \text{ L}} = 2.12 \text{ qt}$

C) $24.95 \text{ min} \times \frac{1 \text{ h}}{60 \text{ min}} = 0.4158 \text{ h}$

D) $12.0 \text{ ft} \times \frac{12 \text{ in.}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = 370 \text{ cm}$

E) $24.0 \text{ kg} \times \frac{1 \text{ lb}}{2.205 \text{ kg}} = 11 \text{ lb}$

Answer: C
Objective: 2.4
Global: G4

24) What is the correct answer for the calculation of a volume (in mL) with measured numbers $\frac{28.58}{16 \times 8.02}$?

A) 0.22 mL
B) 0.223 mL
C) 57 mL
D) 14 mL
E) 14.3 mL
Answer: A
Objective: 2.4
Global: G4

25) A researcher needed three samples of sodium chloride solution, each with a volume of 0.03510 mL. The total volume needed, if the three volumes are added together, should be reported as _____.
A) 0.105 mL
B) 0.0105 mL
C) 0.10 mL
D) 0.10530 mL
E) 0.1053 mL
Answer: D
Objective: 2.4
Global: G4

26) What is the answer, with the correct number of significant figures, for this problem?

4.392 g + 102.40 g + 2.51 g =

A) 109.302 g
B) 109 g
C) 109.3 g
D) 109.30 g
E) 110 g
Answer: D
Objective: 2.4
Global: G4

27) The correct answer for the addition of 7.5 g + 2.26 g + 1.311 g + 2 g is _____.
A) 13.071 g
B) 13 g
C) 13.0 g
D) 10 g
E) 13.1 g
Answer: B
Objective: 2.4
Global: G4

28) In which of the following is the metric unit paired with its correct abbreviation?
A) microgram / mg
B) milliliter / mL
C) centimeter / km
D) kilogram / cg
E) gram / gm
Answer: B
Objective: 2.5
Global: G2

29) Which of the following is the largest unit?
A) millimeter
B) micrometer
C) meter
D) decimeter
E) kilometer
Answer: E
Objective: 2.5
Global: G2

30) What is the metric relationship between grams and micrograms?
A) 1 g = 100 μg
B) 1 g = 1 000 000 μg
C) 1 g = 0.000001 μg
D) 1 g = 1000 μg
E) 1 g = 0.001 μg
Answer: B
Objective: 2.5
Global: G2

31) What is the conversion factor for the relationship between millimeters and centimeters?
A) 1 mm/1 cm
B) 10 mm/1 cm
C) 1 cm/1 mm
D) 100 mm/1 cm
E) 10 cm/1 mm
Answer: B
Objective: 2.5
Global: G2

32) Which of the following is the smallest unit?
A) gram
B) milligram
C) kilogram
D) decigram
E) microgram
Answer: E
Objective: 2.5
Global: G2

33) The cubic centimeter (cm^3 or cc) has the same volume as a _____.
A) cubic inch
B) cubic liter
C) milliliter
D) centimeter
E) cubic decimeter
Answer: C
Objective: 2.5
Global: G2

34) 9.31 g is the same mass as _____.
A) 931 μg
B) 931 kg
C) 93.1 cg
D) 9 310 mg
E) 0.0931 dg
Answer: D
Objective: 2.5
Global: G4

35) According to the United States Food and Drug Administration, the recommended daily requirement of protein is 44 g. This is _____ oz of protein.
A) 1248.5
B) 320 000
C) 1.6
D) 0.0605
E) 150 000
Answer: C
Objective: 2.5, 2.7
Global: G4

36) Which of the following setups would convert centimeters to feet?
A) $\text{cm} \times \frac{2.54 \text{ in.}}{1 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$

B) $\text{cm} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{12 \text{ in.}}{1 \text{ ft}}$

C) $\text{cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$

D) $\text{cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{12 \text{ in.}}{1 \text{ ft}}$

E) $\text{cm} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$

Answer: C
Objective: 2.6, 2.7
Global: G4

37) A conversion factor set up correctly to convert 15 inches to centimeters is _____.
A) 100 cm/1 m
B) 1 inch/2.54 cm
C) 1 cm/10 mm
D) 2.54 cm/1 inch
E) 10 cm/1 inch
Answer: D
Objective: 2.6, 2.7
Global: G4

38) How many pounds are in 3.5 kg?
A) 7.7 lb
B) 1.59 lb
C) 0.629 lb
D) 1.6 lb
E) 7.70 lb
Answer: A
Objective: 2.6, 2.7
Global: G4

39) How many liters of soft drink are there in 5.25 qt?
A) 4950 L
B) 55.7 L
C) 4.97 L
D) 5.57 L
E) 5.0 L
Answer: C
Objective: 2.6, 2.7
Global: G4

40) What is 6.5 m converted to inches?
A) 1700 in
B) 1651 in
C) 39 in
D) 260 in
E) 255.9 in
Answer: D
Objective: 2.6, 2.7
Global: G4

41) How many kilograms are in 30.4 lb?
A) 13.8 kg
B) 14 kg
C) 67 kg
D) 66.88 kg
E) 66.9 kg
Answer: A
Objective: 2.6, 2.7
Global: G4

42) A dose of aspirin of 5.0 mg per kilogram of body weight has been prescribed to reduce the fever of an infant weighing 8.5 pounds. The number of milligrams of aspirin that should be administered is _____.
A) 19 mg
B) 53 mg
C) 1.6 mg
D) 5.0 mg
E) 0.59 mg
Answer: A
Objective: 2.6, 2.7
Global: G4

43) An alloy of iron contains 75.0% iron and 25.0% other elements. How many grams of iron are present in 150. g of the alloy?
A) 37.5 g
B) 113 g
C) 11 300 g
D) 3 750 g
E) 2.00 g
Answer: B
Objective: 2.6, 2.7
Global: G4

44) One form of stainless steel contains 18.0% nickel. How much nickel is present in 200. g of this alloy?
A) 36.0 g
B) 164 g
C) 11.1 g
D) 0.0122 g
E) 18.0 g
Answer: A
Objective: 2.6, 2.7
Global: G4

45) A 100.0 g sample of eighteen karat gold is contains 75.0 g of gold and 25.0 g of other metals. What is the percent of gold in the sample?
A) 125%
B) 50%
C) 100.0%
D) 25.0%
E) 75.0%
Answer: E
Objective: 2.6, 2.7
Global: G4

46) An sample of hamburger had a total mass of 200. g, of which 30.0 g was found to be fat. What is the percent of fat in this hamburger sample?
A) 30.0%
B) 6.00%
C) 15.0%
D) 6.67%
E) 13.3%
Answer: C
Objective: 2.6, 2.7
Global: G4

47) If 5.00 lb of potatoes costs $3.60, how much would 1.30 kilograms of potatoes cost?
A) $2.06
B) $10.30
C) $0.43
D) $3.97
E) $0.86
Answer: A
Objective: 2.6, 2.7
Global: G4

48) If a car travels 23 miles on 1.0 gal of gas, how many liters of gasoline are needed for a 135 mile trip?
A) 14 L
B) 5.9 gal
C) 22 L
D) 25 L
E) 32 L
Answer: C
Objective: 2.6, 2.7
Global: G4

49) The mercury level in cod was measured at 0.11 ppm. How many mg of mercury are present in a 150 g serving of cod?
A) 0.11 mg
B) 0.17 mg
C) 0.017 mg
D) 0.14 mg
E) 150 mg
Answer: C
Objective: 2.6, 2.7
Global: G4

50) The herbicide level in the soil in a corn field was measured at 3.0 ppb. How many μg of herbicide are present in 1.0 lb of soil?
A) 0.7 μg
B) 1.4 μg
C) 3.0 μg
D) 4.5 μg
E) 0.44 μg
Answer: B
Objective: 2.6, 2.7
Global: G4

51) A nugget of gold with a mass of 521 g is added to 50.0 mL of water. The water level rises to a volume of 77.0 mL. What is the density of the gold?
A) 10.4 g/mL
B) 6.77 g/mL
C) 1.00 g/mL
D) 0.0518 g/mL
E) 19.3 g/mL
Answer: E
Objective: 2.8
Global: G4

52) A solution has a density of 1.22 g/mL. What volume of the solution has a mass of 48.2 g?
A) 0.00253 mL
B) 58.8 mL
C) 39.5 mL
D) 49.4 mL
E) 1.22 mL
Answer: C
Objective: 2.8
Global: G4

53) Which one of the following substances will float in gasoline, which has a density (d) of 0.66 g/mL?
A) table salt (d = 2.16 g/mL)
B) balsa wood (d = 0.16 g/mL)
C) sugar (d = 1.59 g/mL)
D) aluminum (d = 2.70 g/mL)
E) mercury (d = 13.6 g/mL)
Answer: B
Objective: 2.8
Global: G4

54) What is the mass of 2.00 L of a solution with a density of 1.15 g/mL?
A) 0.023 kg
B) 2.30 kg
C) 1.15 kg
D) 0.015 kg
E) 0.58 kg
Answer: B
Objective: 2.8
Global: G4

55) Mercury has a density of 13.6 g/mL. How many milliliters of mercury have a mass of 0.35 kg?
A) 0.0257 mL
B) 0.026 mL
C) 25.7 mL
D) 26 mL
E) 4760 mL
Answer: D
Objective: 2.8
Global: G4

56) What is the density of a substance with a mass of 45.00 g and a volume of 26.4 mL?
A) 1.70 g/mL
B) 1.7 g/mL
C) 0.59 g/mL
D) 0.587 g/mL
E) 45.0 g/mL
Answer: A
Objective: 2.8
Global: G4

57) What is the mass of 53 mL of ethyl alcohol, which has a density of 0.79 g/mL?
A) 67.1 g
B) 41.9 g
C) 42 g
D) 67 g
E) 53 g
Answer: C
Objective: 2.8
Global: G4

58) The density of a solution is 1.18 g/mL, and its volume is 25.0 mL. The mass of the sample is _____.
A) 29.5 g
B) 21.2 g
C) .0472 g
D) 1.18 g
E) 25.0 g
Answer: A
Objective: 2.8
Global: G4

59) Diamond has a density of 3.52 g/mL. What is the volume in cubic centimeters of a diamond with a mass of 15.1 g?
A) 4.3 cm^3
B) 4.29 cm^3
C) 0.233 cm^3
D) 53 cm^3
E) 53.2 cm^3
Answer: B
Objective: 2.8
Global: G4

60) The ratio of the mass of a substance to its volume is its _____.
A) specific gravity
B) density
C) buoyancy
D) weight
E) conversion factor
Answer: B
Objective: 2.8
Global: G4

61) A 50.0 mL liquid sample has a mass of 50.7 g. The density of the sample is _____.
A) 1.01 g/mL
B) 0.986 g/L
C) 1.01
D) 0.986
E) 50.7
Answer: A
Objective: 2.8
Global: G4

2.2 Matching Questions

Are the numbers in each of the following statements measured or exact?

A) exact
B) measured

1) In the U.S. system there are 5280 feet in one mile.
Objective: 2.3
Global: G2

2) A lab test showed a blood sugar level is 350 mg/dL.
Objective: 2.3
Global: G2

3) There are 452 pages in a book.
Objective: 2.3
Global: G2

4) The rabbit weighs 2.5 pounds.
Objective: 2.3
Global: G2

5) There are 100 aspirin in a bottle.
Objective: 2.3
Global: G2

6) You feel ill and your temperature is 100.1 °F.
Objective: 2.3
Global: G2

Answers: 1) A 2) B 3) A 4) B 5) A 6) B

Match the type of measurement to the unit given below.

A) volume
B) mass
C) distance
D) density
E) temperature

7) milliliter
Objective: 2.1
Global: G2

8) mm
Objective: 2.1
Global: G2

9) gram
Objective: 2.1
Global: G2

10) 125 K
Objective: 2.1
Global: G2

11) kilometer
Objective: 2.1
Global: G2

Answers: 7) A 8) C 9) B 10) E 11) C

Select the correct prefix to complete the equality.

A) 0.001
B) 100
C) 1
D) 10
E) 1000

12) 1 g = _____ kg
Objective: 2.5
Global: G4

13) 1 m = _____ mm
Objective: 2.5
Global: G4

14) 1 cm = _____ mm
Objective: 2.5
Global: G4

15) 1 dL = _____ mL
Objective: 2.5
Global: G4

16) 1 mL = _____ cc
Objective: 2.5
Global: G4

Answers: 12) A 13) E 14) D 15) B 16) C

2.3 True/False Questions

1) A kilogram is a unit of volume.
Answer: FALSE
Objective: 2.1
Global: G2

2) A liter is a unit of volume.
Answer: TRUE
Objective: 2.1
Global: G2

3) The number 1.2×10^{-5} is larger than the number 1.2×10^{-4}.
Answer: FALSE
Objective: 2.2
Global: G4

4) The number 1.3×10^4 is smaller than the number 1.3×10^5.
Answer: TRUE
Objective: 2.2
Global: G4

5) The measurement 1.230 cm has 4 significant figures.
Answer: TRUE
Objective: 2.3
Global: G2

6) The measurement 0.03550 has 4 significant figures.
Answer: TRUE
Objective: 2.3
Global: G2

7) When the measurement 3.32 cm is multiplied by the measurement 0.02 cm, the answer will have three significant figures.
Answer: FALSE
Objective: 2.4
Global: G2

8) When the measurement 13.36 cm is added to the measurement 0.02 cm, the answer will 13.38 cm.
Answer: TRUE
Objective: 2.4
Global: G2

9) A microgram is larger than a gram.
Answer: FALSE
Objective: 2.5
Global: G2

10) A 1-cup measuring cup holds about 240 mL.
Answer: TRUE
Objective: 2.5
Global: G2

11) One conversion factor for cm and m is 100 m/1 cm.
Answer: FALSE
Objective: 2.6
Global: G2

12) One conversion factor for mL and L is 1000 mL/1 L.
Answer: TRUE
Objective: 2.6
Global: G2

13) Water (density = 1.00 g/mL) will float on hexane (density = 0.95 mL).
Answer: FALSE
Objective: 2.8
Global: G2

14) The mass of 10.0 mL of water is approximately 10.0 kg.
Answer: FALSE
Objective: 2.8
Global: G2

2.4 Short Answer Questions

Round off each of the following to three significant figures.
1) 504.85
Answer: 505
Objective: 2.3
Global: G2

2) 8.3158
Answer: 8.32
Objective: 2.3
Global: G2

3) 25 225
Answer: 25 200
Objective: 2.3
Global: G2

4) 58.5422
Answer: 58.5
Objective: 2.3
Global: G2

5) 0.003 408 8
Answer: 0.00341
Objective: 2.3
Global: G2

Express each of the following numbers using scientific notation.

6) 351 000 000 000
Answer: 3.51×10^{11}
Objective: 2.2
Global: G4

7) 0.000 860
Answer: 8.60×10^{-4}
Objective: 2.2
Global: G4

8) 5 207 000
Answer: 5.207×10^{6}
Objective: 2.2
Global: G4

9) 0.000 000 050
Answer: 5.0×10^{-8}
Objective: 2.2
Global: G4

State the number of significant figures in each of the following measurements.

10) 0.705 m
Answer: 3
Objective: 2.3
Global: G2

11) 680 000 km
Answer: 2
Objective: 2.3
Global: G2

12) 28.050 km
Answer: 5
Objective: 2.3
Global: G2

13) 0.0005 L
Answer: 1
Objective: 2.3
Global: G2

14) 75.00 m
Answer: 4
Objective: 2.3
Global: G2

15) 2.043×10^4 mm
Answer: 4
Objective: 2.3
Global: G2

16) 6.1×10^{-5} mL
Answer: 2
Objective: 2.3
Global: G2

17) 9.00×10^6 g
Answer: 3
Objective: 2.3
Global: G2

18) The unit of volume in the SI system is the _____.
Answer: cubic meter
Objective: 2.1
Global: G2

19) The unit of mass in the metric system is the _____.
Answer: gram
Objective: 2.1
Global: G2

20) The number 0.000 056 can be expressed in scientific notation as _____.
Answer: 5.6×10^{-5}
Objective: 2.2
Global: G4

21) Ten karat gold is 41.7% gold. How many grams of pure gold are there in a ring made of 70.0 g of ten karat gold?
Answer: 29.2 g
Objective: 2.6, 2.7
Global: G4

22) To calculate the density of a solid object, two measurements are needed, its _____ and _____.
Answer: mass, volume
Objective: 2.8
Global: G2

23) Rubbing alcohol (isopropyl alcohol) has a density of 0.79 g/mL. How many mL of isopropyl alcohol contain 45 g of alcohol?
Answer: 57 mL
Objective: 2.8
Global: G4

24) The density of gold is 19.3 g/mL. How many grams of gold are in a medal that has a volume of 15.0 mL?
Answer: 290. g of gold
Objective: 2.8
Global: G4