

Chapter 2—The Chemist's Toolbox

MULTIPLE CHOICE

1. Significant figures represent the _____ of a measurement.
- accuracy
 - precision
 - both precision and accuracy
 - neither precision nor accuracy

ANS: B PTS: 1

2. When adding and subtracting the number of significant figures in the answer is determined by _____.
- the most precise number
 - the least precise number
 - the number with the most significant figures in the calculation
 - the number with the fewest significant figures in the calculation

ANS: B PTS: 1

3. When multiplying and dividing, the number of significant figures in the answer is determined by _____.
- the most precise number
 - the least precise number
 - the number with the most significant figures in the calculation
 - the number with the fewest significant figures in the calculation

ANS: D PTS: 1

4. How many significant figures are there in the number 10.00?
- 1
 - 2
 - 3
 - 4

ANS: D PTS: 1

5. How many significant figures are there in the number 10,100?
- 1
 - 3
 - 4
 - 5

ANS: B PTS: 1

6. Calculate the density with the correct number of significant figures of a 50.0 g sample of mercury with a volume of 3.66 mL.
- 13.66 g/mL
 - 13.7 mL
 - 183 g/mL
 - 0.0732 g/mL
 - 0.073 g/mL

ANS: B PTS: 1

7. Calculate the density to the correct number of significant figures of a 100.0 g sample of mercury which occupies a volume of 7.36 cm³.
- a. 13.7 g/mL
 - b. 13.66 g/mL
 - c. 183 g/mL
 - d. 0.0732 g/mL
 - e. 0.073 g/mL

ANS: A PTS: 1

8. Determine the mass in grams of a gold sample which occupies a volume of 16.39 mL? Gold has a density of 19.3 g/mL.
- a. 0.118 g
 - b. 0.316 g
 - c. 0.849 g
 - d. 1.18 g
 - e. 316 g

ANS: E PTS: 1

9. Determine the volume occupied by 1.5 g of ethyl alcohol. The density of ethyl alcohol is 0.789 g/mL.
- a. 1.9 mL
 - b. 1.3 mL
 - c. 0.53 mL
 - d. 0.526 mL
 - e. 1.331 mL

ANS: A PTS: 1

10. Chloroform is a commonly used anesthetic with a density of 1.483 g/mL. Determine the volume of chloroform needed to deliver a 9.37 g sample of the anesthetic.
- a. 0.158 g
 - b. 6.32 g
 - c. 13.9 g
 - d. 13.89 g
 - e. 0.0632 g

ANS: B PTS: 1

11. If 15.0 mL of a metal has a mass of 103.0 g, what is the density of the metal?
- a. 6.87 g/mL
 - b. 1550 g/mL
 - c. 0.146 g/mL
 - d. 1.46 g/mL
 - e. None of these.

ANS: A PTS: 1

12. The density of gold is 19.3 g/mL. If the current price of gold is \$56.75 per gram, what is the volume of a nugget of gold worth \$150.00?
- a. 1.15 mL
 - b. 0.868 mL
 - c. 1.72 mL
 - d. 1.27 mL
 - e. 0.137 mL

ANS: E PTS: 1

13. Which is the standard SI unit for mass?
- a. gram
 - b. pound
 - c. ounce
 - d. kilogram
 - e. ton

ANS: D PTS: 1

14. Which is the standard SI unit for length?
- a. meter
 - b. feet
 - c. mile
 - d. kilometer
 - e. centimeter

ANS: A PTS: 1

15. Which is the correct SI unit for time?
- a. meter
 - b. hour
 - c. second
 - d. minute
 - e. gram

ANS: C PTS: 1

16. Which of these represents the SI prefix for micro (μ)?
- a. 10^{-6}
 - b. 10^{-3}
 - c. 10^{-9}
 - d. 10^{-2}
 - e. 10^6

ANS: A PTS: 1

17. Which of these represents the SI prefix for centi (c)?
- a. 10^{-6}
 - b. 10^{-3}
 - c. 10^{-1}
 - d. 10^{-2}
 - e. 10^6

ANS: D PTS: 1

18. Which of these represents the SI prefix for mega (M)?

- a. 10^9
- b. 10^6
- c. 10^3
- d. 10^{-2}
- e. 10^{-6}

ANS: B PTS: 1

19. The diameter of the nucleus of an atom is approximately 1×10^{-13} meters. If 1 nm is equal to 10 Angstroms, what is the diameter of the nucleus in Angstroms? (1 nm = 1×10^{-9} meter)

- a. 1×10^{-21} A
- b. 1×10^{-6} A
- c. 1×10^{-5} A
- d. 1×10^{-4} A
- e. 1×10^{-3} A

ANS: E PTS: 1

20. Convert 89.5 meters to millimeters.

- a. 8.95×10^4 mm
- b. 8.95×10^{-4} mm
- c. 8.95×10^2 mm
- d. 8.95×10^{-2} mm
- e. None of these.

ANS: A PTS: 1

21. Which of the following is not true.

- a. 1 cm = .01 m
- b. 100 cm = 1 m
- c. 1 cm = 100m
- d. .01 cm = .0001m
- e. 10000 cm = 100 m

ANS: C PTS: 1

22. Given that 1 in = 2.54 cm, which of the following is true?

- a. $1 \text{ in}^2 = 2.54 \text{ cm}^2$
- b. $1 \text{ in}^2 = 5.08 \text{ cm}^2$
- c. $1 \text{ in}^2 = 6.45 \text{ cm}^2$
- d. $1 \text{ in}^2 = 1.27 \text{ cm}^2$
- e. None of these.

ANS: C PTS: 1

23. One m^3 equals _____.

- a. 1000 mm^3
- b. $1,000,000 \text{ mm}^3$
- c. $1,000,000,000 \text{ mm}^3$
- d. $1,000,000,000,000 \text{ mm}^3$

ANS: C PTS: 1

24. One milliliter is equal to _____.
a. 2.54 cubic inches
b. 1000 liters
c. 1 cubic centimeter
d. 16.39 cubic inches

ANS: C PTS: 1

25. 1.00 in^3 equals _____.
a. 2.54 cm^3
b. 7.62 cm^3
c. 16.4 cm^3
d. $.394 \text{ cm}^3$

ANS: C PTS: 1

26. The long jump record is 8.90 m. What is the length in inches? (1 m = 39.37 inches)
a. 9.73 inches
b. 293 inches
c. 350 inches
d. 4204 inches
e. 5000 inches

ANS: C PTS: 1

27. The long jump record is 8.90 m. What is the length in yards? (1 yd = 0.9144 m)
a. 9.73 inches
b. 293 inches
c. 350 inches
d. 4204 inches
e. 5000 inches

ANS: A PTS: 1

28. A football field is 100.0 yards long. What is its length in meters? (1 yd = 0.9144 m)
a. 0.09144 m
b. 91.44 m
c. 274.32 m
d. 334 m
e. $9.144 \times 10^3 \text{ m}$

ANS: B PTS: 1

29. A football field is 100 yards long. What is its length in centimeters? (1 yd = 0.9144 m)
a. 0.09144 cm
b. 91.44 cm
c. 274.32 cm
d. 334 cm
e. $9.144 \times 10^3 \text{ cm}$

ANS: E PTS: 1

30. How many kilograms of calcium are there in a 173 pounds of calcium?(1 pound = 454 grams)
- a. 1.1 kg
 - b. 78.54 kg
 - c. 1.1×10^2 kg
 - d. 3.8×10^4 kg
 - e. 7.85×10^4 kg

ANS: E PTS: 1

31. Most races are now measured in kilometers. What is the distance in miles a runner must complete in a 10 kilometer run. (1 km = 0.62137 mile)
- a. 3.1 miles
 - b. 6.2 miles
 - c. 16.1 miles
 - d. 32.2 miles
 - e. 62.137

ANS: B PTS: 1

32. Convert 2.50×10^4 meters to miles (1 mile = 5280 feet).
- a. 76.2 miles
 - b. 6.35 miles
 - c. 15.5 miles
 - d. 155 miles
 - e. 186 miles

ANS: C PTS: 1

33. Convert 10.5 mm/s to ft/hr.
- a. 124 ft/hr
 - b. 9.57×10^{-6} ft/hr
 - c. .0344 ft/hr
 - d. 37800 ft/hr
 - e. None of these.

ANS: A PTS: 1

34. Which of these numbers has the most significant figures?
- a. 0.5071
 - b. 0.201
 - c. 6.02×10^{23}
 - d. 51
 - e. 103

ANS: A PTS: 1

35. Solve the problem.

$$3.728 + 6.272$$

- a. 10
- b. 10.0
- c. 10.00
- d. 10.000
- e. 10.0000

ANS: D PTS: 1

36. Solve the problem.

$$3.72 \times 10^8 \times 9.26 \times 10^{-3}$$

- a. 3.44×10^6
- b. 4.02×10^{10}
- c. 3.45×10^5
- d. 3.44×10^{-4}
- e. 4.02×10^{-10}

ANS: A PTS: 1

37. Solve the problem.

$$1.5 \times 10^3 + 3.14 \times 10^4 - 1.21 \times 10^2 = ?$$

- a. 3.28×10^4
- b. 3.30×10^3
- c. 3.3×10^{-4}
- d. 3.30×10^5
- e. 3.43×10^9

ANS: A PTS: 1

38. Solve the problem.

$$(5.46 \times 10^7 + 3.13 \times 10^6) \times (7.65 \times 10^5)$$

- a. 65.7×10^{18}
- b. 130.7×10^{18}
- c. 4.42×10^{13}
- d. 2.39×10^{12}
- e. 65.7×10^8

ANS: C PTS: 1

39. Solve the problem.

$$(3.21 \times 10^{10} - 3.13 \times 10^{12}) \div (7.65 \times 10^5)$$

- a. 4.13×10^6
- b. 2.37×10^{18}
- c. 65.7×10^{18}
- d. -23.7×10^{17}
- e. -4.04×10^6

ANS: E PTS: 1

40. Solve the problem.

$$(12.67 \times 4.23) \div 23.42$$

- a. 2.3
- b. 2.29
- c. 2.228
- d. 2.88
- e. 2.2884

ANS: B PTS: 1

41. 0.01% is equivalent to which of the following?

- a. 100 ppm
- b. 100 ppb
- c. 0.000001 ppm
- d. 0.000001 ppb
- e. None of these.

ANS: A PTS: 1

42. Which of these is the correct scientific notation for 6,000,220?

- a. 6.022×10^5
- b. 6.00022×10^5
- c. 6.00022×10^6
- d. 6.00022×10^{-5}
- e. 6.00022×10^{-6}

ANS: C PTS: 1

43. Which of the following is correctly written in scientific notation?

- a. 50.0×10^6
- b. 4.02×10^{216}
- c. $1 \times 10^{-6.8}$
- d. $1.005 \times 10^{-9.05}$
- e. 10^{-5}

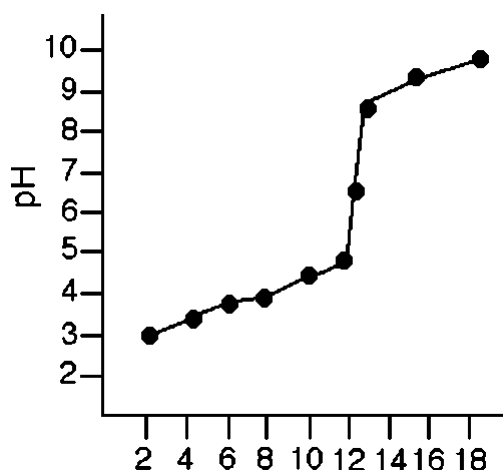
ANS: B PTS: 1

44. Which of these is **incorrectly** matched?

- a. centi c 10^{-2}
- b. mega M 10^6
- c. milli m 10^{-3}
- d. nano n 10^9
- e. micro μ 10^{-6}

ANS: D PTS: 1

Figure 2-1



45. Refer to Figure 2-1. What is the pH of the solution after 8 mL of base have been added.
- 3
 - 4
 - 6
 - 7
 - 8
- ANS: B PTS: 1
46. Refer to Figure 2-1. What affect was there on the pH of the solution when the volume of base added was increased from 8 mL to 13 mL?
- The pH dropped by a value of 4.
 - The pH increased by a value of 4.
 - The pH remained relatively unchanged.
 - The pH increased by a value of 10.
 - The pH increased by a value of 20.
- ANS: B PTS: 1
47. Refer to Figure 2-1. Which of these statements is **true** based on the data provided by the graph.
- The pH of the solution is must be determined algebraically.
 - The pH of the solution is relatively unaffected by the addition of base.
 - The pH of the solution is 7 when approximately 12 mL of base have been added.
 - The pH of the solution is relatively constant with addition of the first 14 mL of base.
 - The pH of the solution rises significantly when the volume is increased from 14 mL to 18 mL.
- ANS: C PTS: 1
48. Which of these numbers has the four significant figures?
- 0.3211
 - 0.201
 - 6.02×10^{23}
 - 5100
 - 0.0103

ANS: A PTS: 1

49. Solve the problem.

$$131.7 \times 1.05$$

- a. 1.38×10^3
- b. 1.38×10^2
- c. 1.3×10^3
- d. 1.3×10^3
- e. 1.3×10^{-3}

ANS: B PTS: 1

50. Solve the problem.

$$33.5 \div 3.011$$

- a. 1.11×10^1
- b. 1.11×10^3
- c. 1.113×10^1
- d. 1.11×10^2
- e. 1.112587×10^1

ANS: A PTS: 1

51. Which of these is the correct normal decimal notation for 5.23×10^{-4} ?

- a. 0.0523
- b. 0.00523
- c. 0.0000523
- d. 0.000523
- e. 52,300

ANS: D PTS: 1

52. Which of these is the correct normal notation for 7.77×10^7 ?

- a. 0.000000777
- b. 0.0777
- c. 7,770
- d. 7,770,000
- e. 77,700,000

ANS: E PTS: 1

53. Which of these is the correct normal notation for 8.14×10^5 ?

- a. 0.0000814
- b. 0.000814
- c. 81.400
- d. 814,000
- e. 81,400,000

ANS: D PTS: 1

54. Which of these series correctly orders the values given from smallest to largest?

- I. 100 cm
- II. 1 km
- III. 10 m
- IV. 100,000 mm

- a. $I < II < III < IV$
- b. $II < I < IV < III$
- c. $I < II = III < IV$
- d. $I < IV < III < II$
- e. $I < III < IV < II$

ANS: E PTS: 1

55. Which of these series correctly orders the values given from smallest to largest?

- I. 0.001 Mg
- II. 2,000,000 ng
- III. 1 Gg
- IV. 100,000 cg

- a. $III < II < I < IV$
- b. $II < I < IV < III$
- c. $II < I = IV < III$
- d. $I < IV = III < II$
- e. $I < III < IV < II$

ANS: C PTS: 1

56. Because of the high heat and humidity in the summer in Death Valley, California, a hiker requires about 1 quart of water for every two miles traveled on foot. If the density of water is 0.999 g/mL at 45°C, how many kilograms of water are required for a person to walk 30 kilometers in Death Valley? (1 L = 1.0567 qt; 1 km = 0.62317 mi)

- a. 8.8 kg
- b. 70 kg
- c. 350 kg
- d. 700 kg
- e. 8.8×10^3 kg

ANS: A PTS: 1

57. A sample of molten iron occupies a volume of 7.11×10^{-3} L. If the density of iron is 7.86 g/cm³, what is the mass of iron in grams in the sample?

- a. 0.000904 g
- b. 0.0559 g
- c. 0.904 g
- d. 1.105 g
- e. 55.85 g

ANS: E PTS: 1

58. An irregular shaped piece of metal with a mass of 220 g was placed in a graduated cylinder that contained 35.00 mL of water. This raised the water level to 52.50 mL. What is the density of the metal?
- a. 0.285 g/mL
 - b. 4.19 g/mL
 - c. 17.5 g/mL
 - d. 12.6 g/mL
 - e. 38.5 g/mL

ANS: D PTS: 1

59. An irregular shaped piece of metal with a mass of 105 g was placed in a graduated cylinder that contained 25.00 mL of water. This raised the water level to 45.35 mL. What is the density of the metal?
- a. 0.238 g/mL
 - b. 2.3 g/mL
 - c. 4.2 g/mL
 - d. 5.16 g/mL
 - e. 20.35 g/mL

ANS: D PTS: 1

60. Convert 4.5 inches to **meters**. (2.54 cm = 1 inch)
- a. 0.1143 m
 - b. 1.77 m
 - c. 11.43 m
 - d. 0.0177 m
 - e. 1143 m

ANS: A PTS: 1

61. Determine the volume in liters of a 1.00 ounce bottle. (1.06 qt = 1 L; 32 ounces = 1 qt)
- a. 0.0295 L
 - b. 0.03125 L
 - c. 0.03313 L
 - d. 30.2 L
 - e. 33.9 L

ANS: A PTS: 1

62. A regulation soccer field is 110.0 yards in length. Calculate the length in millimeters. (1.094 yards = 1 m)
- a. 0.101 mm
 - b. 1.01 mm
 - c. 100.5 mm
 - d. 1.01×10^4 mm
 - e. 1.01×10^5 mm

ANS: E PTS: 1

63. A 5 foot 7 inch track athlete weighs 110 pounds. What is her height in cm and her weight in kilograms? (2.54 cm = 1 inch; 454 g = 1 pound)
- a. 14.5 cm 242 kg
 - b. 152 cm 49.9 kg
 - c. 170 cm 49.9 kg
 - d. 154 cm 242 kg
 - e. 152 cm 4.99×10^4 kg

ANS: C PTS: 1

64. Chemical waste is often shipped in 55-gallon drums. What is the weight in pounds of a 55-gallon drum if the density of the waste is 1.5942 g/cm^3 ? (454 g = 1 pound; 0.9463 L = 1 quart; 4 quarts = 1 gallon)
- a. 130 lbs
 - b. 730 lbs
 - c. 810 lbs
 - d. 4.5×10^4 lbs
 - e. 5.9×10^4 lbs

ANS: B PTS: 1

65. Solve the problem.

$$5.6 \times 10^2 \times 7.41 \times 10^3 = ?$$

- a. 232×10^1
- b. 7.55×10^5
- c. 2.32×10^5
- d. 4.1×10^6
- e. 232×10^5

ANS: D PTS: 1

66. What is the mass in kilograms of a 25.00 pound dumbbell? (454 g = 1 pound)
- a. 1.377×10^{-3} kg
 - b. 1.377 kg
 - c. 11.35 kg
 - d. 1.377×10^3 kg
 - e. 1.135×10^7 kg

ANS: C PTS: 1

67. An international group of zookeepers with successful breeding programs made the following animal exchanges last year. Using the same bartering system, how many monkeys can a zoo obtain in exchange for 15 flamingos?

3 oryxes = 1 tiger	2 flamingos = 1 anteater
1 camel = 6 anteaters	5 lemurs = 1 rhino
1 rhino = 4 monkeys	3 lemurs = 1 camel
3 monkeys = 1 tiger	1 rhino = 4 oryxes

- a. 3 monkeys
- b. 5 monkeys
- c. 8 monkeys
- d. 12 monkeys
- e. 15 monkeys

ANS: A PTS: 1

68. Which of these samples of aluminum will occupy the **greatest** volume?(Density of aluminum = 2.70 g/cm³; 454 g = 1 pound)
- a. 10,000 g
 - b. 25 pounds
 - c. 1 kg
 - d. 5×10^{-2} L
 - e. 2,000 mL

ANS: B PTS: 1

69. Which of these samples of water will have the **greatest** mass?(Density of water = 1.00 g/cm³; 454 g = 1 pound)
- a. 10,000 g
 - b. 25 pounds
 - c. 1 kg
 - d. 5×10^{-2} L
 - e. 2,000 mL

ANS: B PTS: 1

70. Solve the following equation for y.

$$3y + 24 = 6y - 3$$

- a. 3
- b. 6
- c. 7
- d. 8
- e. 12

ANS: C PTS: 1

71. Solve the following equation for y.

$$3y = 24$$

- a. 3
- b. 6
- c. 7
- d. 8
- e. 12

ANS: D PTS: 1

72. Solve the following equation for z.

$$2(z + 6) - 10 = 42$$

- a. 6
- b. 10
- c. 12
- d. 20
- e. 40

ANS: D PTS: 1

73. Solve the following equation for z.

$$4z \div 2z + 3 = 30$$

- a. 2
- b. 6.25
- c. 10
- d. 11
- e. 13.5

ANS: E PTS: 1

74. Solve the following equation for x: $13x = x + 156$

- a. 13
- b. 20
- c. 1
- d. 7
- e. 12

ANS: A PTS: 1