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Name:_____ Class:_____ Date:_____

Chapter 1 - Chemical Foundations

1. Which of the following is an example of a quantitative observation?
   a. The piece of metal is longer than the piece of wood.
   b. Solution 1 is much darker than solution 2.
   c. The liquid in beaker A is blue.
   d. The temperature of the liquid is 60°C.
   e. At least two of these are quantitative observations.

ANSWER: d

2. A quantitative observation
   a. contains a number and a unit
   b. does not contain a number
   c. always makes a comparison
   d. must be obtained through experimentation
   e. is none of these

ANSWER: a

3. Generally, observed behavior that can be formulated into a statement, sometimes mathematical in nature, is called a(n)
   a. observation
   b. measurement
   c. theory
   d. natural law
   e. experiment

ANSWER: d

4. The statement "The total mass of materials is not affected by a chemical change in those materials" is called a(n)
   a. observation
   b. measurement
   c. theory
   d. natural law
   e. experiment

ANSWER: d

5. A chemical theory that has been known for a long time becomes a law.
   a. True
   b. False

ANSWER: False

6. Which of the following metric relationships is incorrect?
   a. 1 microliter = 10^{-6} liters

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b. 1 gram = 10^3 kilograms
c. 10^3 milliliters = 1 liter
d. 1 gram = 10^2 centigrams
e. 10 decimeters = 1 meter

ANSWER: b

7. For which pair is the SI prefix not matched correctly with its meaning?
a. mega = 10^6
b. centi = 0.01
c. kilo = 1000
d. nano = 10^{-9}
e. deci = 10

ANSWER: e

8. A metric unit for length is
a. gram
b. milliliter
c. yard
d. kilometer
e. pound

ANSWER: d

9. Which of the following is *not* a unit in the SI system?
a. ampere
b. candela
c. Kelvin
d. meter
e. calorie

ANSWER: e

10. Order the four metric prefixes from smallest to largest.
a. micro- < milli- < centi- < kilo-
b. milli- < micro- < centi- < kilo-
c. kilo- < centi- < micro- < milli-
d. kilo- < centi- < milli- < micro-
e. centi- < micro- < kilo- < milli-

ANSWER: a

11. 6.7 kilogram(s) contains this many grams.

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a. 6.7×10^{2}
b. 6.7×10^{3}
c. 67
d. 0.67
e. 6.7×10^{-3}

ANSWER: b

12. Convert 0.4089 m to mm.
a. 4.089×10^{-3}
b. 4.089×10^{-4}
c. 0.04089 mm
d. 408.9 mm
e. none of these

ANSWER: d

13. 3.9 seconds contain this many picoseconds.
a. 3.9×10^{12}
b. 3.9×10^{-12}
c. 3.9×10^{-9}
d. 3.9×10^{9}
e. 3.9×10^{15}

ANSWER: a

14. 4.44 seconds contain this many nanoseconds.
a. 4.44×10^{7}
b. 4.44×10^{9}
c. 4.44×10^{12}
d. 4.44×10^{10}
e. 4.44×10^{8}

ANSWER: b

15. The distance of 77 km equals
a. 7700 m
b. 0.77 m
c. 770 m
d. 0.077 m
e. 7.7×10^{4} m

ANSWER: e

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16. What is the measure of resistance an object has to a change in its state of motion?
    a. mass
    b. weight
    c. volume
    d. length
    e. none of these

ANSWER: a

17. The degree of agreement among several measurements of the same quantity is called _____. It reflects the reproducibility of a given type of measurement.
    a. accuracy
    b. error
    c. precision
    d. significance
    e. certainty

ANSWER: c

18. As part of the calibration of a new laboratory balance, a 1.000-g mass is weighed with the following results:

Trial	Mass
1	1.201 ± 0.001
2	1.202 ± 0.001
3	1.200 ± 0.001

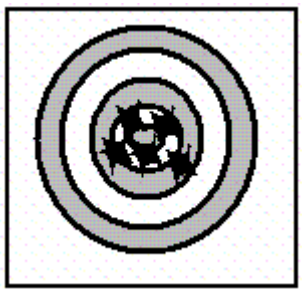
The balance is:
    a. Both accurate and precise.
    b. Accurate but imprecise.
    c. Precise but inaccurate.
    d. Both inaccurate and imprecise.
    e. Accuracy and precision are impossible to determine with the available information.

ANSWER: c

Consider the following three archery targets:

I. 

II. 

III. 

19. Which of the following figure(s) represent a result having high precision?
    a. Figure I only

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b. Figure II only
c. Figure III only
d. Figure I and Figure II
e. Figure II and Figure III

ANSWER: e

20. Which of the following statements concerning these figures is correct?
a. Figure I represents systematic error and Figure II represents random error.
b. Figure I represents random error and Figure II represents systematic error.
c. Figure I and Figure II represent random error.
d. Figure I and Figure II represent systematic error.
e. Figure III represents no errors.

ANSWER: b

21. Which of the following is the least probable concerning five measurements taken in the lab?
a. The measurements are accurate and precise.
b. The measurements are accurate but not precise.
c. The measurements are precise but not accurate.
d. The measurements are neither accurate nor precise.
e. All of these are equally probable.

ANSWER: b

22. You measure water in two containers: a 10-mL graduated cylinder with marks at every mL, and a 1-mL pipet marked at every 0.1 mL. If you have some water in each of the containers and add them together, to what decimal place could you report the total volume of water?
a. 0.01 mL
b. 0.1 mL
c. 1 mL
d. 10 mL
e. none of these

ANSWER: b

23. The agreement of a particular value with the true value is called
a. accuracy
b. error
c. precision
d. significance
e. certainty

ANSWER: a

24. The amount of uncertainty in a measured quantity is determined by:

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a. both the skill of the observer and the limitations of the measuring instrument
b. neither the skill of the observer nor the limitations of the measuring instrument
c. the limitations of the measuring instrument only
d. the skill of the observer only
e. none of these

ANSWER: a

25. A scientist obtains the number 0.045006700 on a calculator. If this number actually has four (4) significant figures, how should it be written?

a. 0.4567
b. 0.4501
c. 0.0450
d. 0.04500
e. 0.04501

ANSWER: e

26. Express 165,000 in exponential notation.

a. 1.65000×10^{5}
b. 1.65×10^{5}
c. 1.65000×10^{-5}
d. 1.65×10^{-5}
e. 165×10^{3}

ANSWER: b

27. Express the number 0.0200 in scientific notation.

a. 0.20×10^{3}
b. 20.0×10^{0}
c. 200×10^{-4}
d. 2.00×10^{-2}
e. 0.200×10^{-1}

ANSWER: d

28. Express the number 7.21×10^{-3} in common decimal form.

a. 0.00721
b. 7210
c. 7.21
d. 0.000721
e. 0.0721

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ANSWER: a

29. Express the number 1.28×10^4 in common decimal form.
    a. 128000
    b. 0.0000128
    c. 0.000128
    d. 12800
    e. 1280

ANSWER: d

30. We generally report a measurement by recording all of the certain digits plus ____ uncertain digit(s).
    a. no
    b. one
    c. two
    d. three
    e. four

ANSWER: b

31. You are asked to determine the perimeter of the cover of your textbook. You measure the length as 33.97 cm and the width as 24.83 cm. How many significant figures should you report for the perimeter?
    a. 1
    b. 2
    c. 3
    d. 4
    e. 5

ANSWER: e

32. Consider the numbers 23.68 and 4.12. The sum of these numbers has ____ significant figures, and the product of these numbers has ____ significant figures.
    a. 3, 3
    b. 4, 4
    c. 3, 4
    d. 4, 3
    e. none of these

ANSWER: d

33. Using the rules of significant figures, calculate the following:

$$\frac{6.167 + 88}{5.10}$$

    a. 19
    b. 19

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c. 18
d. 110
e. 18

ANSWER: c

34. Using the rules of significant figures, calculate the following: 4.0021 –1.594
a. 2
b. 2.408
c. 2.4
d. 2.41
e. 2.4081

ANSWER: b

35. How many significant figures are there in the number 0.04560700?
a. 4
b. 5
c. 7
d. 8
e. 9

ANSWER: c

36. How many significant figures are there in the number 0.0002414?
a. 7
b. 3
c. 8
d. 4
e. 0

ANSWER: d

37. How many significant figures are there in the number 3.1400?
a. 1
b. 2
c. 3
d. 4
e. 5

ANSWER: e

38. How many significant figures should be reported for the difference between 18.8807 mL and 18.57 mL?
a. 1
b. 2
c. 3

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d. 4
e. 6

ANSWER: b

39. What is the best answer to report for $\frac{3.478\ \text{g} \times 1.164\ \text{g}}{2.00\ \text{mL}} - 0.321\ \text{g/mL}\ \text{g/mL}$?

a. 1.6990 g/mL
b. 1.699 g/mL
c. 1.70 g/mL
d. 1.7 g/mL
e. 2 g/mL

ANSWER: c

40. What is the best answer to report for (535 × 0.0025) + 24.27?

a. 25.607
b. 25.61
c. 25.6075
d. 26
e. 25.6

ANSWER: e

41. Convert 7436.7 g to mg.

a. 7.4367 mg
b. 74.367 mg
c. 743.67 mg
d. 7.4367×10^3 mg
e. 7.4367×10^6 mg

ANSWER: e

42. Express the volume 116.4 cm^3 in liters.

a. 116.4 L
b. 11.64 L
c. 1.164 L
d. 0.1164 L
e. 0.01164 L

ANSWER: d

43. Convert 79.1 m^3 to mm^3.

a. 7.91×10^7 mm^3
b. 7.91×10^{10} mm^3

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c. 7.91×10^{4} mm^3

d. 7.91×10^{-5} mm^3

e. 7.91×10^{-8} mm^3

ANSWER: b

44. The pressure of the earth's atmosphere at sea level is 14.7 lb/in^2. What is the pressure when expressed in g / m^2? (2.54 cm = 1 in., 2.205 lb = 1 kg)

a. 2.62×10^{5} g / m^2

b. 1.03×10^{7} g / m^2

c. 5.02×10^{4} g / m^2

d. 4.3×10^{0} g / m^2

e. 2.09×10^{-5} g / m^2

ANSWER: b

45. Convert 4301 mL to qt. (1 L = 1.06 qt)

a. 4559 qt

b. 4.058 qt

c. 4.058×10^{-3} qt

d. 4058 qt

e. 4.559 qt

ANSWER: e

46. Convert 78.2 lb to g. (1 lb = 453.6 g)

a. 1.72×10^{-1} g

b. 3.55×10^{3} g

c. 1.72×10^{5} g

d. 3.55×10^{2} g

e. 3.55×10^{4} g

ANSWER: e

47. Convert 11.5 mi to km. (1 m = 1.094 yd, 1 mi = 1760 yd)

a. 1.26×10^{1} km

b. 7.15×10^{0} km

c. 1.85×10^{7} km

d. 1.05×10^{1} km

e. 1.85×10^{1} km

ANSWER: e

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48. The density of liquid ethanol is 0.789 g/mL. What is its density in units of lb / in^3? (2.54 cm = 1 in., 2.205 lb = 1 kg)

a. 9.09×10^{-4} lb / in^3

b. 2.85×10^{-2} lb / in^3

c. 5.86×10^{-3} lb / in^3

d. 4.42×10^{-3} lb / in^3

e. 0.106 lb / in^3

ANSWER: b

49. Convert 0.0838 ft^3 to L. (2.54 cm = 1 in., 1 L = 1 dm^3)

a. 2.37×10^{1} L

b. 2.37 L

c. 2.55×10^{-3} L

d. 2.96×10^{-3} L

e. 2.75 L

ANSWER: b

50. In March 2008, gold reached a milestone value of $1000 per troy ounce. At that price, what was the cost of a gram of gold? (1 troy ounce = 31.10 g)

a. less than $1

b. between $1 and $10

c. between $10 and $50

d. between $50 and $100

e. over $100

ANSWER: c

51. It is estimated that uranium is relatively common in the earth's crust, occurring in amounts of 4 g / metric ton. A metric ton is 1000 kg. At this concentration, what mass of uranium is present in 1.8 mg of the earth's crust?

a. 7 μg

b. 7 mg

c. 7 ng

d. 7 cg

e. 7×10^{-5} g

ANSWER: c

52. A 20.0 mL sample of glycerol has a mass of 25.0 grams. What is the density of glycerol in ounces/quart? (1.00 ounce = 28.4 grams, and 1.00 liter = 1.06 quarts)

a. 41.5 oz/qt

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b. 4.15×10^{-2} oz/qt
c. 830 oz/qt
d. 46.7 oz/qt
e. 26.6 oz/qt

ANSWER: a

53. In the spring of 2008, petrol cost £1.059 per litre in London. On the same day, the exchange rate was $1 = £0.485. What was the price of London petrol in dollars ($) per gallon? (1 gal = 3.7854 L)
a. $4.01 /gal
b. $1.94 /gal
c. $8.27 /gal
d. $1.73 /gal
e. $7.80 /gal

ANSWER: c

54. For spring break you and some friends plan a road trip to a sunny destination that is 2845 miles away. If you drive a car that gets 28 miles per gallon and gas costs $3.499/gal, about how much will it cost to get to your destination?
a. $710
b. $230
c. $360
d. $810
e. $1000

ANSWER: c

55. Convert 5.4 kg to lb. (1 kg = 2.205 lb)
a. 12 lbs
b. 1.2 lbs
c. 2.4 lbs
d. 0.012 lbs
e. 11.91 lbs

ANSWER: a

56. Manganese makes up 1.3×10^{-4} percent by mass of the elements found in a normal healthy body. How many grams of manganese would be found in the body of a person weighing 256 lb? (2.205 lb = 1 kg)
a. 0.73 g
b. 0.15 g
c. 15 g
d. 73 g
e. 1.5×10^{-4} g

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ANSWER: b

57. In 1928, 58.9 g of a new element was isolated from 660 kg of the ore molybdenite. The percent by mass of this element in the ore was:

a. 89 %
b. 6.6 %
c. 58.9 %
d. 0.0089 %
e. 38.9 %

ANSWER: d

58. 421 Kelvin equals

a. 148°F
b. 273°F
c. 694°F
d. 148°C
e. 694°C

ANSWER: d

59. The melting point of a certain element is 323°C. What is this on the Fahrenheit scale?

$$\left(T_{°F} = T_{°C} \times \left(\frac{9°F}{5°C}\right) + 32°F\right)$$

a. 452°F
b. 211°F
c. 854°F
d. 613°F
e. 549°F

ANSWER: d

60. Convert: –34.7°C = _____ °F. $\left(T_{°F} = T_{°C} \times \left(\frac{9°F}{5°C}\right) + 32°F\right)$

a. -62.5°F
b. -94°F
c. -30.5°F
d. 94°F
e. 238.3°F

ANSWER: c

61. As warm water sits in a cool room, you measure the temperature change ($\Delta T = T_{final} - T_{initial}$). Which of the following is true?

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a. The temperature change (ΔT) is bigger if you are measuring in °F.
b. The temperature change (ΔT) is bigger if you are measuring in °C.
c. The temperature change (ΔT) will be the same regardless of the scale you use.
d. "The temperature change (ΔT) is bigger if you are measuring in °F" or "The temperature change (ΔT) is bigger if you are measuring in °C" is correct, depending on the difference in temperature between the water and the room.
e. None of these.

ANSWER: a

62. The melting point of dimethyl sulfoxide is 18.6°C. What is the melting point of dimethyl sulfoxide on the Fahrenheit scale?

$$\left(T_{°F} = T_{°C} \times \left(\frac{9°F}{5°C}\right) + 32°F\right)$$

a. 42.3°F
b. 33.5°F
c. 50.6°F
d. 291.6°F
e. 65.5°F

ANSWER: e

63. In 1984, some drums of uranium hexafluoride were lost in the English Channel, which is known for its cold water (about 16°C). The melting point of uranium hexafluoride is 148°F. In what physical state is the uranium hexafluoride in these drums?

$$\left(T_{°F} = T_{°C} \times \left(\frac{9°F}{5°C}\right) + 32°F\right)$$

a. solid
b. liquid
c. gas
d. a mixture of solid and liquid
e. not enough information

ANSWER: a

64. The melting point of indium is 156.2°C. At 323°F, what is the physical state of indium?

$$\left(T_{°F} = T_{°C} \times \left(\frac{9°F}{5°C}\right) + 32°F\right)$$

a. Solid.
b. Liquid.
c. Gas.
d. Not enough information.
e. At 323°F, the indium is partially solid and partially liquid; there is an equilibrium between the two

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states.

ANSWER: d

65. On a new temperature scale (°Z), water boils at 120.0°Z and freezes at 40.0°Z. Calculate the normal human body temperature using this temperature scale. On the Celsius scale, normal human body temperature could typically be 37.5°C, and water boils at 100.0°C and freezes at 0.00°C.

a. 3000°Z
b. 12.5°Z
c. 70ºF
d. 113°Z
e. 30°Z

ANSWER: c

66. The calibration points for the linear Reaumur scale are the usual melting point of ice and boiling point of water, which are assigned the values 0°R and 80°R, respectively. The boiling point of benzene is 80.1°F. What is this temperature in °R?

a. 160.1°R
b. 49.8ºR
c. 26.7ºR
d. 212.2°R
e. 21.4°R

ANSWER: e

67. A monolayer containing 3.18×10^{-6} g of oleic acid has an area of 20.0 cm^2. The density of oleic acid is 0.895 g / mL. What is the thickness of the monolayer (the length of an oleic acid molecule)?

a. 5.69×10^{-5} cm
b. 7.11×10^{-5} cm
c. 1.78×10^{-7} cm
d. 1.42×10^{-7} cm
e. 5.63×10^{-6} cm

ANSWER: c

68. The density of gasoline is 0.7025 g/mL at 20°C. When gasoline is added to water:

a. It will float on top.
b. It will sink to the bottom.
c. It will mix so, you can't see it.
d. The mixture will improve the running of the motor.
e. None of these things will happen.

ANSWER: a

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69. A piece of cadmium with a mass of 19.90 g is submerged in 46.3 cm^3 of water in a graduated cylinder. The water level increases to 48.6 cm^3. The correct value for the density of cadmium from these data is:

a. 8.652 g/cm^3

b. 8.7 g/cm^3

c. 0.12 g/cm^3

d. 0.409 g/cm^3

e. 2.44 g/cm^3

ANSWER: b

The density of a liquid is determined by successively weighing 25, 50, 75, 100, and 125 mL of the liquid in a 250-mL beaker.

70. If volume of liquid is plotted along the horizontal axis, and total mass of beaker plus liquid is plotted on the vertical axis:

a. The *x*, or horizontal, intercept is the negative value of the weight of the beaker.

b. The *y*, or vertical, intercept is the weight of the empty beaker.

c. The slope of the line is 1.0.

d. The line will pass through the origin.

e. The slope of the line is independent of the identity of the liquid.

ANSWER: b

71. Considering the plot of total mass (*y*-axis) versus volume (*x*-axis), which of the following is true?

a. The plot should be rather linear because the slope measures the density of a liquid.

b. The plot should be curved upward because the slope measures the density of a liquid.

c. The plot should be curved upward because the mass of the liquid is higher in successive trials.

d. The plot should be linear because the mass of the beaker stays constant.

e. None of these.

ANSWER: a

72. A 20.0 mL sample of glycerol has a mass of 25.2 grams. What is the mass of a 55-mL sample of glycerol?

a. 9.2 g

b. 44 g

c. 2.8×10^4 g

d. 69 g

e. 69.3 g

ANSWER: d

73. Suppose that you purchased a water bed with the dimensions 2.55 m × 2.53 dm × 238 cm. What mass of water does this bed contain?

a. 1.54×10^3 g

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b. 1.54×10^{4} g
c. 1.54×10^{5} g
d. 1.54×10^{8} g
e. 1.54×10^{6} g

ANSWER: e

74. A freighter carrying a cargo of uranium hexafluoride sank in the English Channel in late August 1984. The cargo of uranium hexafluoride weighed 2.254×10^{8} kg and was contained in 30 drums, each containing 1.47×10^{6} L of UF_6. What is the density (g/mL) of uranium hexafluoride?
a. 51.1 g/mL
b. 0.196 g/mL
c. 5.11 g/mL
d. 1.53 g/mL
e. 2.25 g/mL

ANSWER: c

75. The boiling of water is a
a. physical change because the water merely disappears
b. physical change because the gaseous water is chemically the same as the liquid
c. chemical change because heat is needed for the process to occur
d. chemical change because a gas (steam) is given off
e. chemical and physical damage

ANSWER: b

76. The state of matter for an object that has a definite volume but not a definite shape is
a. solid state
b. liquid state
c. gaseous state
d. elemental state
e. mixed state

ANSWER: b

77. The state of matter for an object that has both definite volume and definite shape is
a. solid state
b. liquid state
c. gaseous state
d. elemental state
e. mixed state

ANSWER: a

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78. _____ are substances with constant composition that can be broken down into elements by chemical processes.

a. Solutions
b. Mixtures
c. Compounds
d. Quarks
e. Heterogeneous mixtures

ANSWER: c

79. A method of separation that employs a system with two phases of matter, a mobile phase and a stationary phase, is called

a. filtration
b. chromatography
c. distillation
d. vaporization
e. homogenization

ANSWER: b

80. Which of the following statements is false?

a. Solutions are always homogeneous mixtures.
b. The terms “atom” and “element” can have different meanings.
c. Elements can exist as atoms or molecules.
d. Compounds can exist as atoms or molecules.
e. At least two of these statements are false.

ANSWER: d

81. An example of a pure substance is

a. elements
b. compounds
c. pure water
d. carbon dioxide
e. all of these

ANSWER: e

82. A solution is also called a

a. homogeneous mixture
b. heterogeneous mixture
c. pure mixture
d. compound
e. distilled mixture

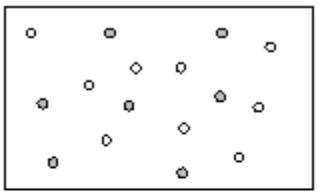
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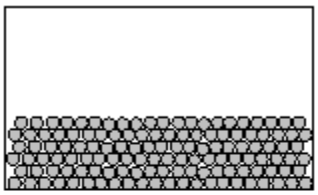
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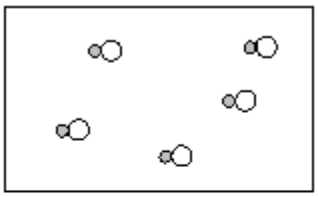
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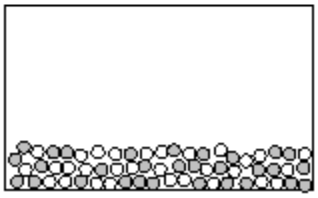
Chapter 1 - Chemical Foundations

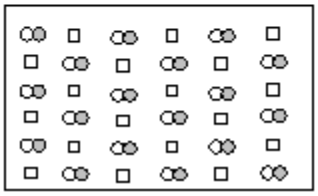
Consider the following choices when answering questions 86-89.

a) 

b) 

c) 

d) 

e) 

83. Which best represents a homogeneous mixture of an element and a compound?
    a. option a
    b. option b
    c. option c
    d. option d
    e. option e

ANSWER: e

84. Which best represents a gaseous compound?
    a. option a
    b. option b
    c. option c
    d. option d
    e. option e

ANSWER: c

85. Which best represents a solid element?
    a. option a
    b. option b
    c. option c
    d. option d
    e. option e

ANSWER: b

86. Which best represents a heterogeneous mixture of two elements?
    a. option a
    b. option b
    c. option c

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d. option d
e. option e

ANSWER: d

87. All physical changes are accompanied by chemical changes.
a. True
b. False

ANSWER: False

88. Color changes always indicate a chemical change.
a. True
b. False

ANSWER: False

89. What are the components of the scientific method?

ANSWER: 1) Making observations (collecting data)
2) Suggesting a possible explanation (formulating a hypothesis)
3) Doing experiments to test the possible explanation (testing the hypothesis)
Depending on the data from the experiments, the hypothesis may be modified and retested.
See Sec. 1.2 of Zumdahl, *Chemistry*.

90. Garfield (weighing 24 lbs) took a flight to the moon on the space shuttle. As usual, he stuffed himself with lasagna during the entire flight and napped when he wasn't eating. Much to his delight when he got to the moon he found he weighed only 6 lbs. He immediately proclaimed a quick weight loss diet. Explain the fallacy in his reasoning. Assume gravity on the moon to be about one-sixth that of Earth.

ANSWER: Garfield (the cartoon cat) may have a different weight on the moon, but he has the same mass. He has apparently forgotten that weight is the response of mass to gravity, and since the moon has a smaller gravitational field his weight there is less.
See Sec. 1.3 of Zumdahl, *Chemistry*.

91. Contrast the terms precision and accuracy.

ANSWER: Precision refers to the agreement among several measurements of the same quantity.
Accuracy refers to the agreement of a measurement with the true value.
Measurements may often be precise without being accurate.
See Sec. 1.4 of Zumdahl, *Chemistry*.

92. What data would you need to estimate the money you would spend on gas to drive your car from Los Angeles to Chicago? Provide a sample calculation.

ANSWER: Data would include: average price per gallon of gasoline, average MPG of the car, mileage of trip.

$$\$ = \text{miles} \times \frac{\text{gal}}{\text{miles}} \times \frac{\$}{\text{gal}}$$

93. On a new temperature scale (°Y), water boils at 155.0°Y and freezes at 0.00°Y. Calculate the normal human body temperature using this temperature scale. On the Fahrenheit scale, normal human body temperature is

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98.6°F, and water boils at 212.0°F and freezes at 32.0°F.

ANSWER: 57.3°Y
The formula derived from the data is Y=(155/180)(F-32).

94. Explain how Archimedes might have used the concept of density to determine whether the king's crown was pure gold. (density of gold = 19.32 g/cm^3)

ANSWER: If the density of gold was known to Archimedes, he could weigh the crown to determine its mass and then submerge the crown in water to measure the volume by displacement. By comparing the density of the crown calculated from this data to the known density of gold, he could find out if the crown was made of gold.
Archimedes' Principle is slightly different, and not specifically addressed in this text.
See Sec. 1.8 of Zumdahl, *Chemistry*.

95. Explain the main differences between a compound and a mixture.

ANSWER: A mixture may be separated into pure substances by physical means, while a compound requires chemical means to separate it into elements.
A compound has constant composition (always the same ratio of elements), while a mixture may have varying composition.
See Sec. 1.10 of Zumdahl, *Chemistry*.

96. Give three physical methods used by chemists to separate mixtures and identify the type of mixture best suited for each process.

ANSWER: Three common methods are distillation, filtration, and chromatography.
Distillation is useful for mixtures of volatile liquids (or mixtures of gases that can be condensed).
Filtration is useful to separate a mixture of a solid and a liquid.
Chromatography may be used for mixtures of volatile substances (gas chromatography) or soluble substances (paper chromatography).
See Sec. 1.10 of Zumdahl, *Chemistry*.

97. Name three methods for the separation of mixtures.

ANSWER: Three common methods are distillation, filtration, and chromatography.
See Sec. 1.10 of Zumdahl, *Chemistry*.

98. How many significant figures are in 0.00110

a. 2
b. 3
c. 4
d. 5

ANSWER: b

99. Which of the following unit factors is incorrect?

a. 1 microliter/1000 nL
b. 1 cg/100 g
c. 1 L/1000 mL

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d. 1000 m/1 km

ANSWER: b

100. Which of the following is not a fundamental metric unit?

a. meter
b. second
c. gram
d. mole

ANSWER: c

101. Which of the following is not a fundamental metric unit?

a. meter
b. second
c. kilogram
d. liter

ANSWER: d

102. Which of the following has a different value on the moon compared to earth?

a. mass
b. weight
c. time
d. moles

ANSWER: b

103. How should the number 1.230×10^3 be properly expressed as a decimal?

a. 1230
b. 0.001230
c. 1230.0
d. 1230.

ANSWER: d

104. Calculate $5.1234 + 0.033 \div 1.650$ and report to the correct number of significant figures.

a. 3.1
b. 3.125
c. 5.143
d. 5.1

ANSWER: c

105. When 87.7 is added to 73.841, the result should be reported with _____ significant figures. And when 87.7 is divided by 73.841 the result should be reported with _____ significant figures.

a. 3,3

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b. 3,5
c. 4,3
d. 4,4

ANSWER: c

106. A wavelength of red light is measured at 655 nm. What is this measurement in cm?
a. 6.55 cm
b. 0.00655 cm
c. 6.55×10^{-5} cm
d. 6.55×10^{-7} cm

ANSWER: c

107. Which separation technique is based on differences in the volatility of the substances to be separated?
a. filtration
b. distillation
c. solvent extraction
d. paper chromatography

ANSWER: b

108. Express the number 0.00068 in scientific notation.
a. 680×10^{-6}
b. 6.8×10^{2}
c. 6.8×10^{4}
d. 6.8×10^{-4}
e. 0.68×10^{-3}

ANSWER: d

109. During a physics experiment, an electron is accelerated to 85 percent of the speed of light. What is the speed of the electron in miles per hour? (speed of light = 3.00×10^{8} m/s, 1 km = 0.6214 mi)
a. 5.7×10^{11} mi/h
b. 9.5×10^{6} mi/h
c. 6.7×10^{8} mi/h
d. 5.7×10^{8} mi/h
e. 2.6×10^{8} mi/h

ANSWER: d

110. Convert: –30.8°C = _____ °F. $\left(T_{°F} = T_{°C} \times \left(\frac{9°F}{5°C}\right) + 32°F\right)$

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a. -55.4°F
b. -87°F
c. -23.4°F
d. 87°F
e. 242.2

ANSWER: c

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