

Chapter 1 Questions

Sections 1.1 - 1.3

1) Explain the difference between the following terms:

- a) qualitative and quantitative
- b) hypothesis and experiment
- c) theory (model) and law

2) Perform the following conversions:

- a) 454 mg to g
- b) 5.0×10^{-9} m to pm
- c) 3.5×10^{-2} mL to μ L
- d) 0.0023 km to cm

e) 6.25×10^{-4} ms to ns

f) 1900 cL to ML

g) 0.0045 g to μ g

h) 2578 dm to hm

3) What type of quantity (for example: length, density, volume) is measured by the following units?

- | | |
|------------------|-----------------------|
| a) ns | e) K |
| b) kg/L | f) cm^3 |
| c) pm | g) $^{\circ}\text{F}$ |
| d) km^2 | h) cL |

Section 1.4 & 1.5

4) Describe a situation (that doesn't involve a dartboard) where a set of measurements can be accurate, but not precise.

5) Indicate which of the following are exact numbers:

- a) the mass of a paper clip
- b) the surface area of a dime
- c) the number of inches in a mile
- d) the number of dice in a game of Yahtzee
- e) *the temperature on the surface of the sun*
- f) *the number of students in your chemistry classroom*
- g) *the amount of lumens given off by a bulb on a dimmer switch*
- h) *the number of ounces in a pound*

6) List the number of significant figures in each of the following measured quantities:

- a) 1200 kg
- b) 0.00296 s
- c) 8.070 mm
- d) 0.0105040 L
- e) 1.689×10^{-3} km
- f) \$1,000,000

7) Round each of the following numbers to 4 significant figures and express in scientific notation:

- a) 300.235800
- b) 456570
- c) 0.0350000
- d) 9.050352
- e) 501076
- f) 0.0000198692

8) Express the following numbers in regular notation:

- a) 1.340×10^{-6}
- b) 5.98×10^5
- c) 1×10^{-3}
- d) 6.500×10^2
- e) 6.02×10^{23}
- f) 9.5720×10^3

9) Carry out the following operations and express the answers with the appropriate number of significant figures.

- a) 19.67×907
- b) $405.6 - 98.234$
- c) $320.55 - (6104.2/2.3)$
- d) $[(285.3 \times 10^5) - (1.200 \times 10^3)] \cdot 2.8954$
- e) $(0.0045 \times 20000.0) + (2813 \cdot 12)$
- f) $863 \cdot [1255 - (3.45 \cdot 108)]$

Section 1.7

10) Perform the following conversions:

- a) 8.60 mi to m
- b) 3.00 days to s
- c) \$2.55/gal to dollars per liter
- d) 5.0 pm/ms to m/s
- e) 75.00 mi/hr to m/s

f) 55.35 ft^3 to cm^3

g) 16.2 ft to m

h) 5.44 qt to mL

i) 23.5 yd^2 to m^2

j) \$2.99/lb to dollars per kg

k) 7.85 g/mL to kg/m^3

Section 1.8 & 1.9

- 11a) A cube of ruthenium metal is 1.5 cm on a side and has a mass of 42.0 g. What is the density?
- b) The density of bismuth is 9.8 g/cm^3 . What is the mass of a sample of bismuth that displaces 65.8 mL of water?
- c) *The density of oxygen is 0.56 g/L . How many liters of gas would need to be present to mass 1.23 kg ?*
- d) *A metal sphere has a diameter of 4.5 cm and a mass of 340 g. What is the density of the sphere?*

Section 1.10

- 14) Identify each of the following substances as a gas, a liquid or a solid under ordinary conditions of temperature and pressure:
- a) oxygen
 - b) sodium chloride
 - c) mercury
 - d) carbon dioxide
 - e) *zinc*
 - f) *neon*
 - g) *ethyl alcohol*
 - h) *butane*
- 15) In the process of attempting to characterize a substance, a chemist makes the following observations: The substance is a silvery-white, lustrous metal. It melts at 649°C and boils at 1105°C . Its density at 20°C is 1.738 g/cm^3 . The substance burns in air, producing an intense white light. It reacts with chlorine to give a brittle white solid. The substance can be pounded into thin sheets or drawn into wires. It is a good conductor of electricity. Which of the characteristics are physical properties and which are chemical properties?

- 12) The density of air at ordinary atmospheric pressure and 25°C is 1.19 g/L . What is the mass, in kilograms, of the air in a room that measures $12.5 \times 15.5 \times 8.0 \text{ ft}$? (Hint: Determine the volume in ft^3 first)

- 13) Make the following conversions:

- a) 62°F to $^\circ\text{C}$
- b) 233 K to $^\circ\text{F}$
- c) 216.7°C to $^\circ\text{F}$
- d) 2500°F to K

- 16) Classify each of the following as a pure substance (element or compound) or a mixture (solution, colloid or suspension):

- a) concrete
- b) seawater
- c) magnesium
- d) gasoline
- e) *air*
- f) *grapefruit juice*
- g) *a penny*
- h) *yogurt*

- 17) Label each of the following as either a physical process or a chemical process:

- a) corrosion of aluminum metal
- b) melting of ice
- c) pulverizing an aspirin
- d) digesting a candy bar
- e) *explosion of nitroglycerin*
- f) *a burning match*
- g) *water condensing on a cold drink cup*
- h) *disappearance of moth balls over time*

- 18) For each of the following systems, draw a picture of what the system would look like on the molecular level:

- a) a pure compound
- b) a homogeneous mixture of two elements, one monatomic and one diatomic.
- c) a homogeneous mixture of a 4 atom compound and a 3 atom compound.
- d) a heterogeneous mixture of a diatomic element and a 2 atom compound.