Practice 1-1

Express each of the following values in scientific notation:

a) There are 33,000,000,000,000,000,000 molecules of water in one milligram of water.

b) A single molecule of sucrose weighs 0.000 000 000 000 000 000 000 57 g.

Answer

a) 3.3×10^{19} (coefficient = 3.3, exponent = 19)

b) 5.7×10^{-22} (coefficient = 5.7, exponent = -22)

Practice 1-2

Convert each the following scientific notation to decimal notation.

a) 8.54×10^{3} b) 6.7×10^{-5} c) 1.29×10^{4} d) 1.000×10^{-2}

Answer

a) 8540 **b) 0.000067** **c) 12900** **d) 0.01000**

Practice 1-3

Give the metric prefix that corresponds to each of the following

a) 1,000,000,000 b) 10^{-6} c) 1000 d) 0.01 e) 10^{-9} f)10^{12}

Answer

a) giga **b) micro** **c) kilo**

d) centi **e) nano** **f) tera**

Practice 1-4

Round off each of the following to three significant figures.

a) 9.174 b) 9.175 c) 9.176
d) 5 e) 0.0040 f) 8000
g) 2.4×10^{-5} h) 670

Answer

a) 9.17 **b) 9.18** **c) 9.18**

d) 5.00 **e) 0.00400** **f) 8.00×10^{3}**

g) 2.40×10^{-5} **h) 670.**

Practice 1-5

Perform each of the following calculations to the correct number of significant figures.

a) 33.56×1.9483 b) $(2.50 \times 10^{-3}) \times (1.8500 \times 10^{5})$
c) $47.5301 \div 2.30$ d) $(6.56 \times 10^{10}) \div (7.8 \times 10^{9})$

Answer

a) 65.38 **b) 4.63×10^{2}**

c) 20.7 **d) 8.4**

Practice 1-6

Perform each of the following calculations to the correct number of significant figures:

a) 73.498 + 2.2 b) 63.81 + 205.4

c) 191.000 - 188.0 d) 124.08 - 39.1740

e) $(6.8 \times 10^{-2}) + (2.04 \times 10^{-2})$ f) $(5.77 \times 10^{-4}) - (3.6 \times 10^{-4})$

Answer

a) 75.7 **b) 269.2**

c) 3.0 **d) 84.91**

e) 8.8×10^{-2} **f) 2.2×10^{-4}**

Practice 1-7

Perform each of the following conversions:

a) Convert 14.7 lb to ounces. b) Convert 19.8 lb to kilograms.

c) Convert 23 m/sec to mi/hr.

Answer

a) $14.7 \text{ lb} \times \frac{16 \text{ oz}}{1 \text{ lb}} = 235 \text{ oz}$

b) $19.8 \text{ lb} \times \frac{1 \text{ kg}}{2.20 \text{ lb}} = 9.00 \text{ kg}$

c) $\frac{23 \text{ m}}{1.0 \text{ sec}} \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{1.0 \text{ mi}}{1.61 \text{ km}} \times \frac{3600 \text{ sec}}{1 \text{ hr}} = 51 \text{ mi/hr}$

Practice 1-8

The density of rubbing alcohol is 0.786 g/mL. What volume of rubbing alcohol would you use if you needed 32.0 g?

Answer

We use the density as a conversion factor:

$$V = 32.0\ \cancel{g} \times \frac{1.00\ mL}{0.786\ \cancel{g}} = 40.7\ mL$$

Practice 1-9

A 50.0 mL sample of blood has a mass of 53.2 g.
a) Calculate the density of the blood.
b) Calculate the specific gravity of the blood.

Answer

$$d = \frac{m}{V} \qquad a) \quad d = \frac{53.2\ g}{50.0\ mL} = 1.06\ g/mL$$

$$b)\ \text{specific gravity} = \frac{\text{density of blood}}{\text{density of water}} = \frac{1.06\ \cancel{g/mL}}{1.00\ \cancel{g/mL}} = 1.06$$

Practice 1-10

Complete the following table.

Fahrenheit	Celsius	Kelvin
88°F		
	-55°C	
		469K

Answer

Fahrenheit	Celsius	Kelvin
88°F	**31°C**	**304 K**
-67°F	-55°C	**218 K**
385°F	**196°C**	469 K

Practice 1-11

What mass of lead is needed to absorb 348 J of heat if the temp of the sample rises from 35.2°C to 78.0°C? The specific heat of lead is 0.129 J/g·°C.

Answer

$$q = m \times SH \times \Delta T$$

$$\text{so} \qquad m = \frac{q}{SH \times \Delta T}$$

$$m = \frac{348\ J}{0.129\ J/g{\cdot}°C \times 42.8°C} = 63.0\ g$$

Practice 1-12

It takes 87.6 J of heat to raise the temp of 51.0 g of a metal by 3.9°C. Calculate the specific heat of the metal.

Answer

$$q = m \times SH \times \Delta T$$

$$\text{so} \quad SH = \frac{q}{m \times \Delta T}$$

$$SH = \frac{87.6\ \text{J}}{51.0\ \text{g} \times 3.9\ ^\circ\text{C}} = 0.44\ \text{J/g}\cdot^\circ\text{C}$$

Practice 1-13

4.00×10^3 J of energy is transferred to 56.0 g of water at 19°C. Calculate the final temperature of water. SH = 4.18 J/g·°C.

Answer

$$q = m \times SH \times \Delta T$$

$$\text{so} \quad \Delta T = \frac{q}{m \times SH}$$

$$\Delta T = \frac{4.00 \times 10^3\ \text{J}}{56.0\ \text{g} \times 4.18\ \text{J/g}\cdot^\circ\text{C}} = 17.1\ ^\circ\text{C}$$

$$\Delta T = T_{final} - T_{initial}$$

$$\text{so} \quad T_{final} = \Delta T + T_{initial}$$

$$T_{final} = 17.1\ ^\circ\text{C} + 19\ ^\circ\text{C} = 36\ ^\circ\text{C}$$