PROBLEM 1

Write the conversion factors (as ratios) for the number of:

(a) kilometers in 1 mile
(b) liters in 1 liquid quart
(c) grams in 1 ounce

Answer a
1.6093 km : 1 mi

Answer b
0.94635 L : 1 qt

Answer c
28.35 g : 1 oz

PROBLEM 2

The label on a soft drink bottle gives the volume in two units: 2.0 L and 67.6 fl oz. Use this information to derive a conversion factor between the English and metric units.

Answer
$$\frac{2.0 L}{67.6 \text{ fl oz}} = \frac{0.030 L}{1 \text{ fl oz}}$$
PROBLEM \(\PageIndex{3}\))

The label on a box of cereal gives the mass of cereal in two units: 978 grams and 34.5 oz. Use this information to find a conversion factor between the English and metric units.

**Answer**

$$\frac{978 \text{ g}}{34.5 \text{ oz}} = \frac{28.35 \text{ g}}{1 \text{ oz.}}$$

PROBLEM \(\PageIndex{4}\))

Soccer is played with a round ball having a circumference between 27 and 28 inches and a mass between 14 and 16 oz. What are these specifications in cm and g?

**Answer**

68.6 cm to 71.1 cm

396.9 g to 453.6 g

PROBLEM \(\PageIndex{5}\))

How many milliliters are in a 12 oz soda can?

**Answer**

354.9 mL
PROBLEM \(\PageIndex{6}\)

A barrel of oil is exactly 42 gal. How many liters of oil are in the barrel?

Answer

159 L

Click here to see a video of the solution.

PROBLEM \(\PageIndex{7}\)

The diameter of a red blood cell is about \(3 \times 10^{-4}\) inches. What is the diameter in centimeters?

Answer

\(7.6 \times 10^{-4}\) cm

PROBLEM \(\PageIndex{8}\)

The distance between the centers of two oxygen atoms in an oxygen molecule is \(1.21 \times 10^{-8}\) cm. What is this distance in inches?

Answer

\(4.76 \times 10^{-9}\) in
PROBLEM \(\PageIndex{9}\)

Is a 197-lb weight lifter light enough to compete in a class limited to those weighing 90 kg or less?

**Answer**

Yes (They weigh 89.35 kg)

PROBLEM \(\PageIndex{10}\)

Complete the following conversions between SI units.

(a) 612 g = ? mg
(b) 8.160 m = ? cm
(c) 3779 µg = ? g
(d) 781 mL = ? L
(e) 4.18 kg = ? g
(f) 27.8 m = ? km
(g) 0.13 mL = ? L
(h) 1738 km = ? m
(i) 1.9 Gg = ? g

**Answer a**

612,000 mg

**Answer b**

816.0 cm

**Answer c**

3.779 x 10^{-3} g

**Answer d**

0.781 L
PROBLEM ${\PageIndex{11}}$

Make the conversion indicated in each of the following:

(a) the men's world record long jump, 29 ft 4.5 in, to meters

(b) the greatest depth of the ocean, about 6.5 mi, to kilometers

(c) the area of an 8.5 by 11 inch sheet of paper in cm$^2$

(d) The displacement volume of an automobile engine, 161 in$^3$, to L

(e) the estimated mass of the atmosphere, 5.6 x $10^{15}$ tons, to kilograms (1 ton = 2000 lbs)

(f) the mass of a bushel of rye, 32.0 lb, to kilograms

(g) the mass of a 5.00 grain aspirin tablet to milligrams (1 grain = 0.00229 oz)
PROBLEM \(\PageIndex{12}\)

Many chemistry conferences have held a 50-Trillion Angstrom (Å) Run. How long is this run in kilometers and in miles?
(1 Å = 1 \times 10^{-10} \text{ m})

**Answer**

5 kilometers or 3.1 miles

**PROBLEM (PageIndex{13})**

As an instructor is preparing for an experiment, he requires 225 g phosphoric acid. The only container readily available is a 150-mL Erlenmeyer flask. Is it large enough to contain the acid, the density of which is 1.83 g/mL?

**Answer**

Yes, because the acid's volume will be 122.95 mL

**PROBLEM (PageIndex{14})**

In a recent Grand Prix, the winner completed the race with an average speed of 229.8 km/h. What was the speed in miles per hour, meters per second, and feet per second?

**Answer**

142.8 \text{ mi/h}; 63.8 \text{ m/s}; 209 \text{ ft/s}
PROBLEM

Calculate these masses.

(a) what is the mass of 6.00 cm$^3$ of mercury (density = 13.5939 g/cm$^3$)?

(b) what is the mass of 25.0 mL octane (density = 0.702 g/cm$^3$)?

(c) what is the mass of 4.00 cm$^3$ of sodium (density = 0.97 g/cm$^3$)?

(d) What is the mass of 125 mL gaseous chlorine (density = 3.16 g/L)?

Answer a
81.5634 g

Answer b
17.55 g

Answer c
3.88 g

Answer d
0.395 g
PROBLEM (PageIndex{16})

Calculate the following volumes.

(a) What is the volume of 25 g of iodine (density = 4.93 g/cm$^3$)?

(b) What is the volume of 3.28 g gaseous hydrogen (density = 0.089 g/L)?

(c) What is the volume of 11.3 g graphite (density = 2.25 g/cm$^3$)?

(d) What is the volume of 39.657 g bromine (density = 2.928 g/cm$^3$)?

Answer a
5.07 mL

Answer b
36.9 L

Answer c
5.02 mL

Answer d
13.54 mL
PROBLEM \( \PageIndex{17} \)

Convert 195.7 \( \text{in}^2 \) to \( \text{m}^2 \).

Answer

0.126 \( \text{m}^2 \)