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PROBLEM \(\PageIndex{1}\) 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 \(\PageIndex{2}\) 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 $\frac{2.0\text{ L}}{67.6\text{ fl oz}} = \frac{\text{mL}}{1\text{ fl oz}}$ 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 $\frac{978\text{ g}}{34.5\text{ oz}} = \frac{\text{g}}{1\text{ oz}}$ Click here to see a video of the solution 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 Click here to see a video of the solution PROBLEM \(\PageIndex{6}\) A barrel of oil is exactly 42 gal. How many liters of oil are in the barrel? Answer 159 L PROBLEM \(\PageIndex{7}\) The diameter of a red blood cell is about 3 x 10-4 inches. What is the diameter in centimeters? Answer 7.6 x 10-4 cm Click here to see a video of the solution PROBLEM \(\PageIndex{8}\) The distance between the centers of two oxygen atoms in an oxygen molecule is 1.21 x 10-8 cm. What is this distance in inches? Answer 4.76 x 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) Click here to see a video of the solution 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 Answer e 4180 g Answer f 0.0278 km Answer g 1.3 x 10-4 L Answer h 1,738,000 m Answer i 1.9 x 109 g 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 cm2 (d) The displacement volume of an automobile engine, 161 in3, to L (e) the estimated mass of the atmosphere, 5.6 x 1015 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) Answer a 8.96 m Answer b 10.46 km Answer c 603.22 cm2 Answer d 2.64 L Answer e 5.08 x 1018 kg Answer f 14.52 kg Answer g 324 mg Click here to see a video of the solution(s). 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 x 10-10 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 Click here to see a video of the solution 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 mi/h; 63.8 m/s; 209 ft/s PROBLEM \(\PageIndex{15}\) Calculate these masses. (a) what is the mass of 6.00 cm3 of mercury (density = 13.5939 g/cm3)? (b) what is the mass of 25.0 mL octane (density = 0.702 g/cm3)? (c) what is the mass of 4.00 cm3 of sodium (density = 0.97 g/cm3)? (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 Click here to see a video of the solution. PROBLEM \(\PageIndex{16}\) Calculate the following volumes. (a) What is the volume of 25 g of iodine (density = 4.93 g/cm3)? (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/cm3)? (d) What is the volume of 39.657 g bromine (density = 2.928 g/cm3)? 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 in2 to m2. Answer 0.126 m2 Click here to see a video of the solution. Contributors PROBLEM \(\PageIndex{1}\) 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 \(\PageIndex{2}\) 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 $\frac{2.0\text{ L}}{67.6\text{ fl oz}} = \frac{\text{mL}}{1\text{ fl oz}}$ 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 $\frac{978\text{ g}}{34.5\text{ oz}} = \frac{\text{g}}{1\text{ oz}}$ Click here to see a video of the solution 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. 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