

Dimensional Analysis Problems

1. The density of lead (Pb) is 11.4 g/cm^3 . What is the mass (in kg) of a lead brick with the dimensions 2.0 in. by 4.0 in. by 8.0 in? (12 kg)
2. If gasoline cost \$3.79/gallon, compare the expense of driving 10,000 miles in a big SUV that gets 14 mi/gal with that of a compact car that gets 15 km/L. (Given: $1.06 \text{ qt} = 1.0 \text{ L}$) (\$2707 compared to \$1080)
3. In order to walk 3.5 miles, the average adult consumes 270 kcal. A can of pop contains 150 kcal. If you plan to walk a distance of 105 km, how many cans of pop should you take along for fuel? (34 cans)
4. The radius of an aluminum (Al) atom is 0.125 nm ($1 \text{ nm} = 10^{-9} \text{ m}$). How many Al atoms would be lined up in a row to form a line 1.0 cm in length? (4×10^7 atoms)
5. Seawater is 4% salts, and the density of seawater is 62.4 lb/ft^3 . How many pounds of salt are there in 100.0 gallons of seawater? (Given: $1 \text{ ft}^3 = 7.5 \text{ gallons}$) (33.28 lbs)

6. Copper (Cu) is a trace element that is essential for nutrition. Newborn infants require $80 \mu\text{g}$ of Cu per kilogram of body weight per day. ($1 \mu\text{g} = 10^{-6} \text{g}$) The Cu content of a popular baby formula is $0.48 \mu\text{g}$ of Cu per milliliter. How many milliliters of formula should a 7.0-lb baby consume per day to obtain the minimum daily Cu requirement? (530 mL)
7. A certain automobile engine has a displacement of 5.74 L. Convert this volume to cubic inches. (350 in^3)
8. How many seconds are required to run a 100 yard dash at an average speed of 10.0 m/s ? (9.14s)
9. Calculate the density of mercury (Hg), given that a spherical droplet of Hg with radius of 0.328 cm has a mass of 2.00g and the volume of a sphere = $\frac{4}{3}\pi r^3$. (13.5 g/cm^3)
10. On a certain day the concentration of carbon monoxide (CO) in the air over Detroit reached $1.8 \times 10^{-5} \text{ g/L}$. Convert this concentration to milligrams per cubic meter. (18 mg/m^3)