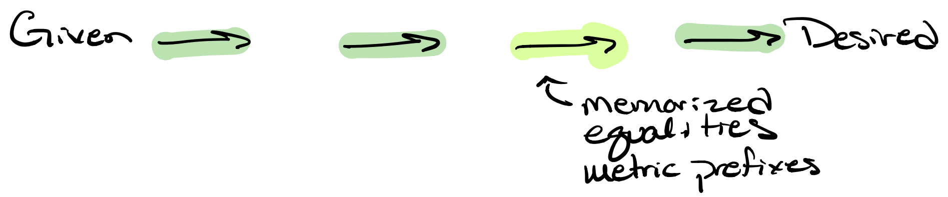
Review for Exam 1

- Conversions (Dimensional Analysis problems)

Process

- parse the problem - word problem
  - * identify the given
  - * identify the desired
  - * identify any equalities (conversion factors)

- Build a road map

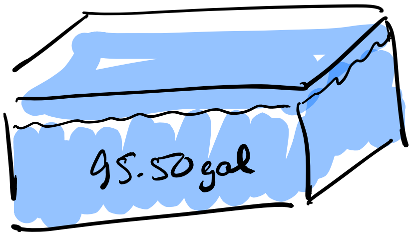


- Write out the calculation with equalities as conversion factors
- Calculate answer
- Apply Sig figs Rules
- Check Units
- Write answer w/ proper units

A fish tank hold ~~not needed~~

A fish tank hold 100 gallons of water. Salt water has a density of 1.035 g/mL. How many pounds of water will the fish tank weigh if filled to 95.50 gallons?

not needed (100 gallons) · Equality (1.035 g/mL) · Desired (How many pounds) · Given (95.50 gallons)



⇒ Coversion factors usually have 2 or more units (g/mL)

$$\underset{\substack{\text{volume}\\ \text{English}}}{\text{gal}} \xrightarrow{②} \text{L} \xrightarrow{⑤} \text{mL} \xrightarrow[\text{Volume}\,|\,\text{mass}]{①} \text{g} \xrightarrow{④} \underset{\substack{\text{mass}\\ \text{English}}}{\text{lbs}}$$

Equalities

① ~~1.035 g = 1 mL~~ Density

mass SI — volume SI

3 key Equalities everyone should memorize

② ~~1 gal = 3.785 L~~ volume

③ 1 in = 2.54 cm length ×

④ ~~1 lb = 453.6 g mass~~

SI Conversions

⑤ ~~1 L = 1000 mL~~

1.035 g = 1 mL

1 mL = 1.035 g

$$\begin{tikzcd} \text{gal} \arrow[r, "②"] & \text{L} \arrow[r, "⑤"] & \text{mL} \arrow[r, "①"] & \text{g} \arrow[r, "④"] & \text{lbs} \end{tikzcd}$$

$\frac{\text{volume}}{\text{English}}$ Volume | mass $\frac{\text{mass}}{\text{English}}$

$$\overset{4}{95.50\,\cancel{\text{gal}}} \times \frac{\overset{4}{3.785\,\cancel{\text{L}}}}{1\,\cancel{\text{gal}}} \times \frac{\overset{\text{def}}{1000\,\cancel{\text{mL}}}}{1\,\cancel{\text{L}}} \times \frac{\overset{4}{1.035\,\cancel{\text{g}}}}{1\,\cancel{\text{mL}}} \times \frac{\overset{4}{1\,\boxed{\text{lbs}}}}{453.6\,\cancel{\text{g}}} = \text{lbs}$$

$$95.50 \times 3.785 \times 1000 \times 1.035 \div 453.6 = 824.77703373\ \text{lbs}$$

$$= \boxed{824.8\ \text{lbs}}$$

$$\frac{8.63\ \text{cm} \times 92.7\ \text{cm} \times 6.06\ \text{cm}}{72.68 \times 301.7\ \text{m}} =$$

$$\frac{A \times B \times C}{D \times E} = \frac{(A \times B \times C)}{(D \times E)} = (A \times B \times C) \times \frac{1}{(D \times E)}$$

$$= \boxed{(A \times B \times C) \div (D \times E)}$$

$$\frac{A \times B \times C}{D \times E} = \frac{A}{1} \times \frac{B}{1} \times \frac{C}{1} \times \frac{1}{D} \times \frac{1}{E}$$

$$= A \times B \times C \div \frac{D}{1} \div \frac{E}{1}$$

$$= \boxed{A \times B \times C \div D \div E}$$

A certain medication has a dose of 1.62 μg/kg·day of body weight. If a patient weighs 165 lbs, how many μg of medication should be perscribed?

Given: 165 lbs

desired: μg

M = Mega × 10^6
k = kilo × 10^3

c = centi × 10^{-2}
m = milli × 10^{-3}
μ = micro × 10^{-6}

Road Map

$$\begin{tikzcd} \text{lbs of person} \arrow[r] & g \arrow[r] & \text{kg} \arrow[r] & \mu g \text{ meds} \end{tikzcd}$$

mass Eng person — kg person — person | med — mass SI med

mass key

4SF: 1 lb = 453.6 g

2SF: ~~1 lb = 2.2 kg~~

1000 g = 1 kg

3 — 4 — def — 3

$$165\,\cancel{lbs} \times \frac{453.6\ \cancel{g}}{1\ \cancel{lbs}} \times \frac{1\ \cancel{kg}}{1000\ \cancel{g}} \times \frac{1.62\ \mu g\ \text{med}}{1\ \cancel{kg}\ \text{person}} =$$

165 × 453.6 ÷ 1000 × 1.62 = 121.24728 μg medication

or

165 × 453.6 × 1.62 ÷ 1000

$$= \boxed{121\ \mu g \text{ medication needed}}$$

Exact

Definitions
or
Counted

Have infinite sig figs in the way we apply sig figs.

1 ft = 12 in
3ft = 1 yard

1000 mm = 1 m

1000 L = 1 kL

units of measure within the same system

How the system is defined

⇒ Definition.

** exception

1 in = 2.54 cm Definition

Experiment in 1970

1 in = 2.5400000 x cm ⇒ made it a definition

Not Exact (Contain precision)

measured

Have sig figs

Eng → SI

4SF

1 lb = 453.6 g

4SF

1 gal = 3.785 L

SI System

T = Tera $\times 10^{12}$

G = Giga $\times 10^{9}$

M = Mega $\times 10^{6}$

k = kilo $\times 10^{3}$

Base $\times 10^{0}$ = $\times 1$

c = centi $\times 10^{-2}$

m = milli $\times 10^{-3}$

μ = micro $\times 10^{-6}$

n = nano $\times 10^{-9}$

T = Tera $\times 10^{12}$

G = Giga $\times 10^{9}$

M = Mega $\times 10^{6}$

k = kilo $\times 10^{3}$

c = centi $\times 10^{-2}$

m = milli $\times 10^{-3}$

μ = micro $\times 10^{-6}$

n = nano $\times 10^{-9}$

1 Mbase = 1×10^{6} base = 1,000,000 base

1 kbase = 1×10^{3} base = 1000 base

1 cbase = 1×10^{-2} base = 0.01 base

100 cbase = 1 base

1 mbase = 1×10^{-3} base = 0.001 base

1000 mbase = 1 base

Convert 36.2 mm into meters

$36.2\text{ mm} \times \frac{1\times10^{-3}\text{ m}}{1\text{ mm}}$ = 36.2 × 1 E(-) 3 = $\boxed{0.0362\text{ m}}$
EE

$36.2\text{ mm} \times \frac{1\text{ m}}{1000\text{ mm}}$ = $36.2 \div 1000$ = $\boxed{0.0362\text{ m}}$

$36.2\text{ mm} \times \frac{0.001\text{ m}}{1\text{ mm}}$ = 36.2×0.001 = $\boxed{0.0362\text{ m}}$