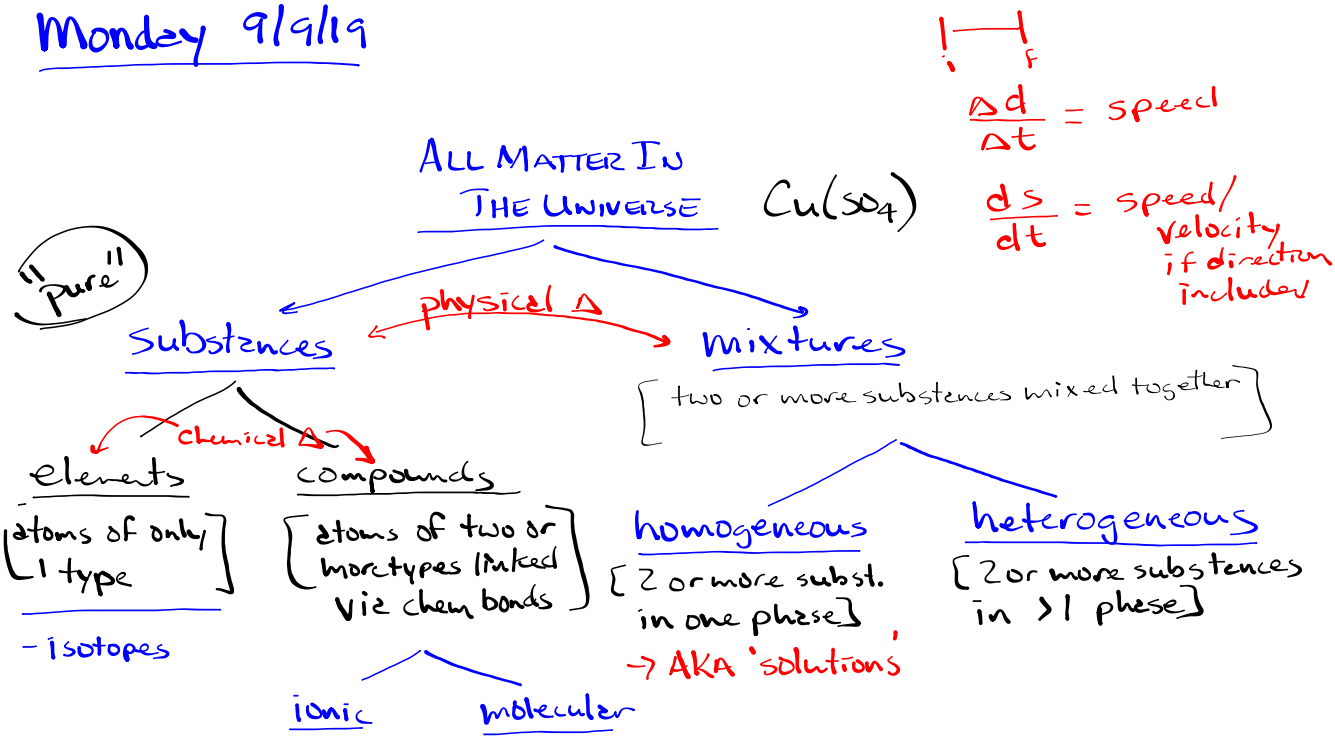
Monday 9/9/19

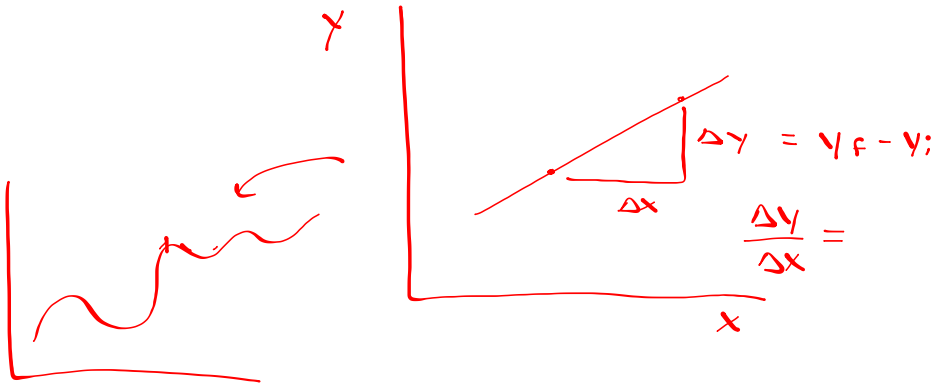


phase (def) - a region of constant composition in a mixture.

for Tues

Read: 2.1

Do: 1–4 p. 35


y
x
Δy = yf - yi
Δx
Δy/Δx =

Scientific Law – a concise statement that summarizes the results of many experiments.

FACT

Hypothesis – an educated prediction, with support of the outcome of an experiment. ← why

Theory (why?) – An extensively tested explanation of why experiments give the results they do.

- Can never be "proven".
- Must predict results of future experiments

Model – A helpful metaphor or construct that helps to provide the "why" for hypotheses & Theories

Forces in the Universe

exchange particle

1. Strong Internuclear Force — gluon
2. Electromagnetism
3. Electro/weak force

(2) and (3) < > photon

4. Gravity — graviton (the Higgs Boson)

Wed 9/11/19

Physical vs chemical changes

Physical characteristics of matter include:

- color
- size
- shape
- solubility
- melting point
- boiling point
- magnetic susceptibility
- smell/odor
- density

physical changes are facilitated by differences/similaritires of the physical characterstrics of the substences being mixed or seperated

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Physical seperations employ differences in phys. characteristics to seperate substences.

Some examples

physical characteristic	method
size	filtretron, chrometography
solubility	decantetron,
density	centrifugetron
boiling point	distilletion/evaporetion

Chemical characteristics of matter include:

- flammability
- acidity/basicity (pH)
- the class of chemicals it belongs to.
  ie.) alcohols, aminoacids
  oxidizers, reducing agents
- flash point
- → and really, anything that relates to the substances reactivity

Evidence that a chemical change has taken place

- change in color
- heat absorbed or released
- light emitted
- formation of a new substance
  i.e. - bubbling, precipitation

Thursday 9/12/19

Conversion factor problems

~~1 = 12~~ vs 1ft = 12in

$\frac{1ft}{12in}$ A or $\frac{12in}{1ft}$ B

for example:

Convert 8.65 ft to inches

$8.65\cancel{ft} \times \frac{12\ in}{1\ \cancel{ft}} =$

ex 2: **What is the volume of a cube 10cm on a side?**

$V = 1{,}000{,}000\ cm^3$

ex 3 If you live to be 95 years old and your Heart beats, on averege, 80 beats per minute, how many times will your heart beat in your lifetime?

80bt = 1 min

95 yrs → beat

units I want: $\frac{beats}{1\ lifetime}$

$\frac{80\ beat}{1\ min} \times \frac{60\ min}{1\ hr} \times \frac{24\ hr}{1\ day} \times \frac{365\ day}{1\ yr} \times \frac{95\ yr}{1\ lifetime} =$

$\frac{95\ yr}{lifetime} \times \frac{365\ day}{1\ yr} \times \frac{24\ hr}{1\ day} \times \frac{60\ min}{1\ hr} \times \frac{80\ beat}{1\ min} =$

The are seven base units

length - meter (m)
mass - kilogram (kg)
time - seconds (s)
amount of substance - (mol)
temperature - (K) Kelvin

electric current - (A) amperes

luminous intensity - (cd) candelas

Metric Prefixes to memorize

Name	symbol	what it does	
kilo-	k	1000x —	+
[hecto	h	100x —]	×
[deka	da	10x —]	÷
base	—	1x —	·
deci	d	$\frac{1}{10}$ x —	—
centi	c	$\frac{1}{100}$ x —	
10^3 (milli	m	$\frac{1}{1000}$ x —	
10^3 (micro	μ	$\frac{1}{1,000,000}$ x —	
nano	n	$\frac{1}{1,000,000,000}$ x —	
pico	p	$\frac{1}{1,000,000,000,000}$ x —	

Friday 9/13/19

16.) **known** **want**

Volume (m^3)

$V = 6.1m \times 0.25m \times 4.9m = 7.4725\ m^3$

$7.5\ m^3$

17) **known** **want** mi per hr

$m = 5.03g$ Density $\frac{mi}{1hr}$

$V = 3.24mL$

$D = \frac{m}{V} = \frac{5.03g}{3.24mL} = 1.55\ \frac{g}{mL}$

$D = \frac{m}{V}$ $m = VD$

$V = \frac{m}{D}$

18) **known** **want**

m of sample (g)

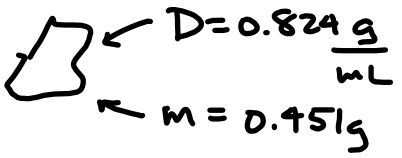
$V = \frac{m}{D} \curvearrowright m = V \cdot D$

$m = 55.1cm^3 \cdot \frac{6.72g}{1cm^3} =$

Dimensional Analysis

$\frac{6.72g}{1cm^3} \times \frac{55.1cm^3}{} =$

19) Known $0.824\,g = 1.0\,mL$ Want



Volume = mL

$D = \frac{m}{V}$

$V = \frac{m}{D}$

$0.451\,g \rightarrow mL$

$0.451\,g \times \frac{1\,mL}{.824\,g} = 0.547\,mL$

20) Convert $882\,\mu g \rightarrow g$

Known

$1 \times 10^6\,\mu g = 1\,g$

Want

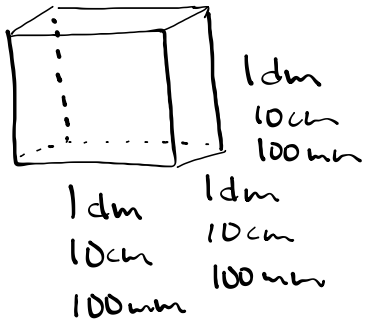
g

$882\,\mu g \times \frac{1\,g}{10^6\,\mu g} = 882 \times 10^{-6}\,g$ $\quad 8.82 \times 10^{-4}$

$0.000882\,g$

The 1-Liter (dm^3) cube

$(10^2)^3$



$V = 1\,dm^3 = 1\,L$

$V = 1000\,cm^3 = 1\,L$

$V = 1000{,}000\,mm^3 = 1\,L$

$1000\,cm^3 = 1000\,mL$

$\therefore 1\,cm^3 = 1\,mL$

exponential math

$10^A \cdot 10^B = 10^{A+B}$

$\frac{10^A}{10^B} = 10^{A-B}$

$(10^A)^B = 10^{A \cdot B}$

19) Known

$d = 0.824\ g/mL$

$m = 0.451\ g$

Went

$V =$ mL

$D = \frac{m}{V}$ $m = VD$

$V = \frac{m}{D}$

$\frac{1}{2}$

$0.451\ g \times \frac{1\ mL}{0.824\ g} = 0.547\ mL$

$\frac{1\ mL}{0.824\ g} \times \frac{0.451\ g}{1} = 0.547\ mL$

$\frac{0.824\ g}{1\ mL} \times \frac{1}{0.451\ g} = \frac{1}{1.83\ \frac{1}{mL}}$

$=$ mL

Monday 9/16/19

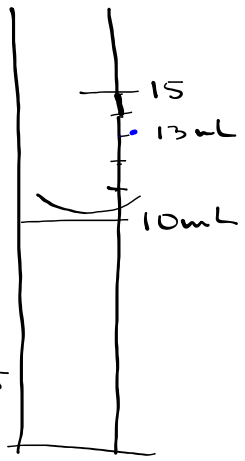
Significant Digits

Rules

Volume (mL)

vol. 12.5 mL

10.0mL



① All nonzeros are significant

② Placeholder zeros are not significant

ex: 1 sf
100,000 mL 0.00345g

6050 kg 6.05×10^3 kg

③ Trapped zeros are always significant

ex: 1001 m 60.056 ng 3.5706 L

④ Zeros occurring to the right of significant digits AND also to the right of the decimal point are significant.

ex. 3.00 ft^2 3.4500 mL 0.006500 kg

TWO EXCEPTIONS

① Counting numbers (AKA 'EXACT NUMBERS')

ex: 12 eggs 14 protons 39 students

② Conversion factors used in dimensional analysis

2.54cm = 1in 1000m = 1km 12in = 1ft

Arithmetic Rules using sig figs

X / ÷	+ / −
The value reported should have as many sf as did the value used in calculation having THE FEWEST SIG FIGS.	The value reported should have as many DIGITS TO THE RIGHT of the DECIMAL PLACE as did the value used in calculation that had the fewest.

Example:

$3.63\,m \times 6.7\,m = 24.321\,m^2$

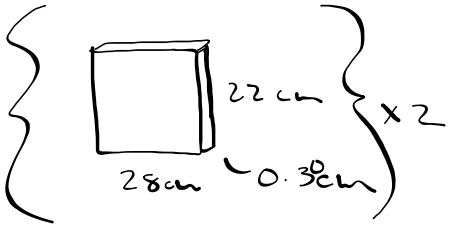
3.63 m
6.7 m

Homework for Thesday

Read: 2.3 p. 54 → END

DO: 1-10 p. 61

$3.0\,mm \times \frac{1\,cm}{10\,mm} = 0.30\,cm$



$D = \frac{1.2\,g}{1\,cm^3}$ → $D = \frac{m}{V}$

$m = V \cdot D$

V D

$369.6\,cm^3$ or $370\,cm^3 \times \frac{1.2\,g}{1\,cm^3} =$

$370\,cm^3$

Pretest Quiz #1

① How many significant digits are expressed in each of the following values?

a) 1.00 cm (3 sf) b) 2,050 m (3 sf)

c) 6.02×10^{23} particles (3 sf) d) 0.007750 cm^3

e) 35.06507 L (7 sf)

Tuesday 9/17/19

from homework (1-10 p. 61)

5) a) $(1.54 \times 10^{-2}\ g) + (2.86 \times 10^{-1}\ g)$

$0.154 \times 10^{-1}\ g + 2.86 \times 10^{-1}\ g$

$2.86 + .154 = 3.014$

3.014×10^{-1}

$3.01 \times 10^{-1}\ g$

8)

Known

Au — $V = 5.0 \times 10^{-3}\ cm^3$

$D_{Au} = 19.3\ g/cm^3$

Want

$m = (g)$

$D = \frac{m}{V}$

$\frac{19.3\ g}{1\ cm^3} \times 5.0 \times 10^{-3}\ cm^3 =$

$m = V \cdot D = 5.0 \times 10^{-3}\ cm^3 \times \frac{19.3\ g}{1\ cm^3} = 0.0965$

0.097 g

2.54cm = 1 inch

Tuesday 9/17/19

~~Carat~~ ^

5) a) $(1.54 \times 10^{-2}\,g) + (2.86 \times 10^{-1}\,g)$

$(1.54 \times 10^{-2}\,g) + (28.6 \times 10^{-2}\,g)$

28.6
1.54
30.1 g x10^-2 → $3.01 \times 10^{-1}\,g$

EEx
EE
10^x
} X 10^-

b) $(7.023 \times 10^{9}\,g) - (6.62 \times 10^{7}\,g)$

$7.023 \times 10^{9} - 0.0662 \times 10^{9}\,g$

$6.957 \times 10^{9}\,g$

c) $(8.99 \times 10^{-4}\,m) \times (3.57 \times 10^{4}\,m) = 32.0943 \times 10^{0}\,m^2$

$32.1 \times 10^{0}\,m^2$

$3.21 \times 10^{1}\,m^2$

8) Known

Au — $V = 5.0 \times 10^{-3}\ cm^3$

$D_{Au} = 19.3\ g/cm^3$

Want

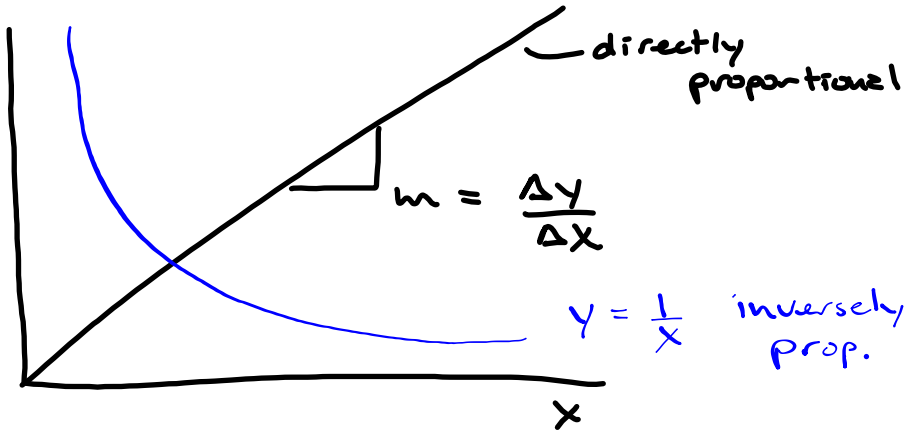
$m = ?\ g$

$D = \frac{m}{V}$ $\quad m = VD$

$$\frac{19.3\ g}{1\ cm^3} \times \frac{5.0 \times 10^{-3}\ cm^3}{1} = 0.0965\ g\ Au$$

$0.097\ g\ Au$

9)



3sf

500.

5.0×10^2

$D_{Cu} = 8.94\ g/cm^3$

1)

Student A

Ver	Density
1.6	7.3 g/mL
0.5	9.4 g/mL
.5	8.3 g/mL

range $9.4 - 7.3\ g/mL = 2.1\ g/mL$

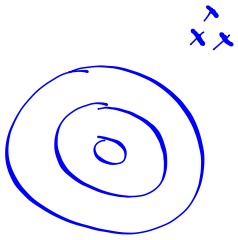
Avg 8.3

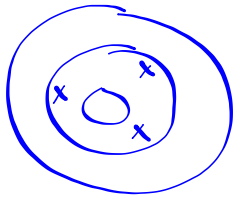
Student B

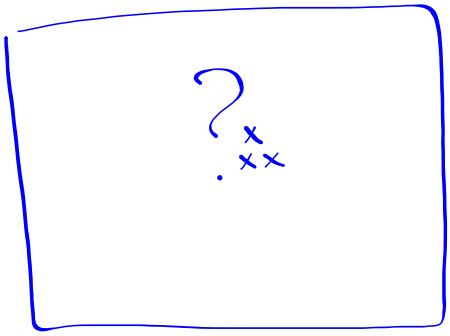
8.4 g/mL	.5
8.8 g/mL	.1
8.0 g/mL	.9

range $= 8.8 - 8.0 = 0.8\ g/mL$

AVG $= 8.4\ g/mL$







5) a) $(1.54 \times 10^{-2}\,g) + (2.86 \times 10^{-1}\,g)$

$1.54 \times 10^{-2}\,g + 28.6 \times 10^{-2}\,g$

$$\begin{array}{r} {}^{1}\,{}^{1}1.54 \\ 28.6 \\ \hline 30.14\,g \end{array}$$

$30.1 \times 10^{-2}\,g$

$3.01 \times 10^{-1}\,g$

3x

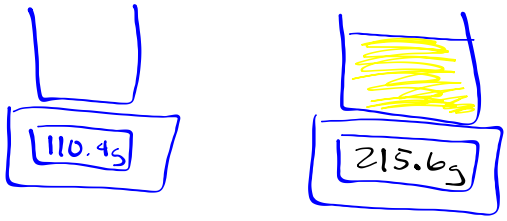
6) 560000 5.6×10^5

33,400 3.34×10^4

0.0004120 4.120×10^{-4}

7)

a)



mass of cornoil = 215.6g − 110.4

b) Known

V = 114 cm³

m = 105.2g

want 105.2g

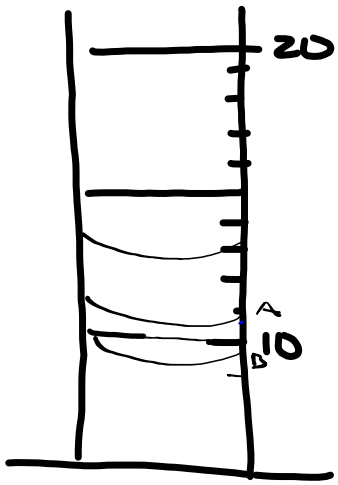
Density

$$D = \frac{m}{V} = \frac{105.2\text{g}}{114\text{cm}^3} =$$

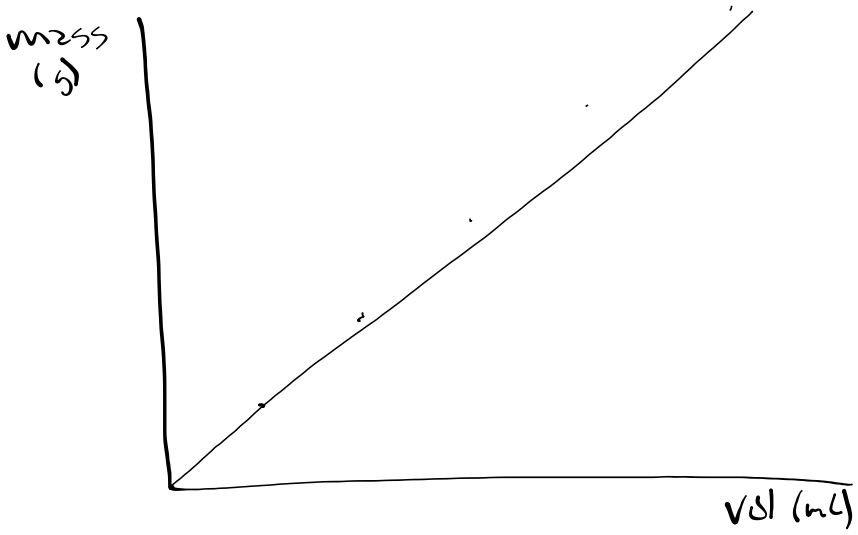
B
9.3mL

Volume (mL)

A
10.4mL
20
30
40
50
60



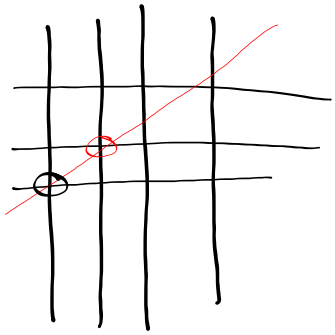
mass A = 9.3469 g


mass
(g)
vol (mL)

Thursday 9/19/19

Homework for Friday

DO: 35-41 p.65



Monday 9/23/19

from the hmk

#46) Known

$m = 2.03 \times 10^{-3}\ g$

$D = 9.133 \times 10^{-1}\ g/cm^3$

want

$V = ?\ cm^3$

$$2.03 \times 10^{-3}\ g \times \frac{1\ cm^3}{9.133 \times 10^{-1}\ g} =$$

$$\frac{1}{\frac{1}{x}} = x$$

$$D = \frac{m}{V}$$

$$V = \frac{m}{D} = \frac{2.03 \times 10^{-3}\ g}{9.133 \times 10^{-1}\ g/cm^3} =$$

How many liters are there in $1.00\ mi^3$ of seawater?

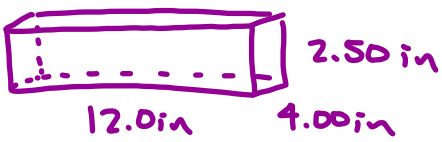
[1 ft = 12 in; 1 in = 2.54 cm; 1 mi = 5280 ft]

$$1.00\ mi^3 \times \left(\frac{5280\ ft}{1\ mi}\right)^3 \times \left(\frac{12\ in}{1\ ft}\right)^3 \times \left(\frac{2.54\ cm}{1\ in}\right)^3 \times \frac{1\ L}{10^3\ cm^3} =$$

$$147197452000 \qquad 1728 \qquad 16.387 \qquad \frac{1}{1000} = 4.17 \times 10^{12}$$

Dimensional Analysis Practice ws #1

#24 Known Want



Weight in lbs

$D = 19.3\ g/cm^3$ $1\ lb = 454\ g$

$V = 12.0\ in \times 2.50\ in \times 4.00\ in = 120.\ in^3$

Convert V → m (weight)

$$120.\ in^3 \times \left(\frac{2.54\ cm}{1\ in}\right)^3 \times \frac{19.3\ g}{1\ cm^3} \times \frac{1\ lbs}{454\ g} = 83.6\ lbs$$

From hmk #35–41 p 65

#35

mass = 9.67g ← experimental value

Accepted value is 9.82g

$$\% \text{ error} = \left| \frac{\text{experimental} - \text{actual}}{\text{actual}} \right| \times 100\% =$$

$$= \left| \frac{9.67\text{g} - 9.82\text{g}}{9.82\text{g}} \right| \times 100\% = 1.53\%$$

103m 1.0×10^2

(1) $3.54\,g \times \frac{1\ kg}{10^3\ g} = 3.54\times10^{-3}\,kg$

→ kg

(2) $1.20\,L \times \frac{10^3\ mL}{1\ L} = 1.20\times10^{3}\,mL$

→ mL

(3) $3500\,\mu g \times \frac{1\ g}{10^6\ \mu g} \times \frac{10^1\ dg}{1\ g} = 3500\times10^{-5}$

$3.5\times10^{-2}\,dg$

→ dg

(4) $19.3\,g \times \frac{10^9\ ng}{1\ g} = 19.3\times10^{9}\,ng$

$1.93\times10^{10}\,ng$

→ ng

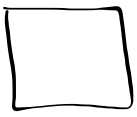
9) $2500\,cm^2 \times \left(\frac{1\ m}{10^2\ cm}\right)^2 = 2500\times10^{-4}\,m^2$

$2.5\times10^{-1}\,m^2$

$0.25\,m^2$

→ m^2

$\frac{1\ m^2}{10^4\ cm^2}$



50cm

0.5m

$1\times10^{-4} = \frac{10^0}{10^4}$

$V = \frac{\text{Mass}}{\text{Density}}$

$$\frac{2.03 \times 10^{-3}\ g}{9.135 \times 10^{-1}\ g/cm^3}$$

$V = 0.0022222709$

$V = 2.22 \times 10^{-3}\ cm^3$

1.) $3.54\,g \times \frac{1\,kg}{10^3\,g} =$
→ kg

2) $1.20\,L \times$ ____
→ mL L

3) $3500\,\mu g \times$ ____
→ dg μg

4) $19.3\,g \times$ ____
→ ng g

3500 μg → dg

(1) $3500\,\mu g \times \frac{1\ g}{10^6\,\mu g} \times \frac{10^1\ dg}{1\ g}$

$\frac{10^{-6}\ g}{1\ \mu g}$ $\qquad 1 \times 10^{-6} = \frac{1}{10^6}$