

Lab #1 **Lab Techniques** **Week #2**
<https://aelp.smartsparrow.com/v/pjpjfed/j5jebi79>

Lab #1 **Doing: Lab Techniques**
<https://aelp.smartsparrow.com/v/pjpjfed/j5jebi79>

Must register using the exact same e-mail address that you provided in submitting the Introductory Survey. If you don't remember send an e-mail to Dr. R from that account

Lab #1 **Doing: Lab Techniques**
 Metric Measurements
 [Background Reading]
[http://chemconnections.org/general/chem108/Math & Measurement-2018.pdf](http://chemconnections.org/general/chem108/Math%20Measurement-2018.pdf)

Unit	Symbol	Abbreviation	Definition
meter	m	meter	the distance light travels in a vacuum in 1/299,792,458 of a second
kilogram	kg	kilogram	the mass of a platinum-iridium cylinder kept at the International Bureau of Weights and Measures
second	s	second	the duration of 919,263,177 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium-133 atom
ampere	A	ampere	the constant current which, if maintained in two straight parallel conductors of infinite length, one meter apart in a vacuum, would produce a force equal to 2 x 10 ⁻⁷ newton per meter between them
kelvin	K	kelvin	1/273.15 of the thermodynamic temperature of the triple point of water
candela	cd	candela	the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540 x 10 ¹² hertz and has a radiant intensity of (1/683) watt per steradian in that direction
newton	N	newton	the force that gives a mass of one kilogram an acceleration of one meter per second squared
joule	J	joule	the work done when a force of one newton moves an object through a distance of one meter in the direction of the force
watt	W	watt	the power that gives rise to an energy flow of one joule per second

Lab #1 **Doing: Lab Techniques**
 Metric Measurement [Adaptation of DVC Experiment #1]
 (DVC Chem 108 Lab Manual pp. 9-11; pp. 12-15 [Report Form])

1 cm lines provide a guide for your eye, NOT a significant figure! Object is certainly between 4 and 5 cm in length.

Object to Measure

Object's edge is a little closer to 5 cm than it is to 4.5 cm, so we might estimate 4.8 cm (where the 8 is an uncertain digit).

Figure 1. Using the centimeter ruler

Lab #1 **Doing: Lab Techniques**
 Metric Measurement: SI Units
 International Standards (SI)

The SI mass standard is the kilogram (kg) that is currently defined by a measurement of light, taking the fixed numerical value of the Planck constant h to be $6.62607015 \times 10^{-34}$ when expressed in the unit J s, which is equal to $\text{kg m}^2\text{s}^{-1}$, where the meter and the second are defined in terms of c and $\Delta\nu_{\text{Cs}}$. It is an "electronic" standard and is measured with the instrument on the right.

Lab #1 **Doing: Lab Techniques**
 Metric Measurement: SI Units
 International Standards (SI)

However, in the United States the primary standard of mass is the Prototype Kilogram 20, which is a platinum-iridium cylinder kept at the National Institute of Standards & Technology (NIST), which is part of the US Department of Commerce.

<https://www.nist.gov/pml/weights-and-measures/si-units-mass>

Units of Measurement

Base Units	U.S.	SI
Mass (weight)	Pound (lb)	Kilogram (kg)
Volume	Gallon (gal)	Liter (L)
Temperature	Fahrenheit (°F)	Kelvin (K)
Length	Mile (mi), Feet (ft), Inches (in)	Meter (m)
Time		Second (s)

<https://www.youtube.com/watch?v=7bUVJjWA6Vw>

International SI units are based on the metric system, not the British units commonly used in the U.S.

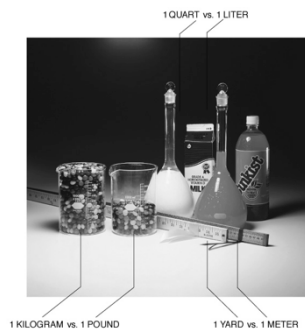
Countries using “British” Units in red

International Measuring System of Units by Country



All other countries use the metric system.

“British”/“Imperial”: Metric Comparisons



Measurement & Units

International SI units & common units in Chemistry

- MASS (Chem 108: gram; SI: kg; other mg)
- LENGTH (Chem 108: cm & mm; SI: m; other km)
- TEMPERATURE (Celsius & Kelvin; SI: K)
- VOLUME (Chem 108: mL; SI: Liter; other dL)
- CHEMICAL AMOUNT: mole (mol); SI: (mol); other (mmol)

The units used in Chem 108 are metric, but most are smaller than the standard SI units.

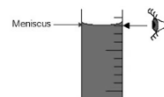


Exp. 1 – Metric Measurement Mass Measurement with an Electronic Balance:



<https://www.youtube.com/watch?v=QtnPiKSKKtI>

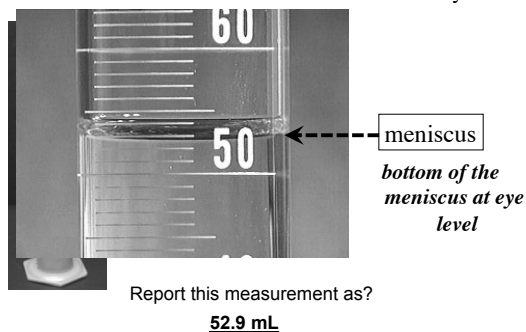
Exp. 1 – Metric Measurement Volume Measurement (Liquids)



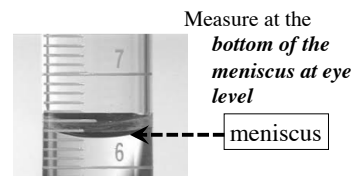
Measure at the
**bottom of the
meniscus at eye
level**

Measurements with a Graduated Cylinder:

Exp. 1 – Metric Measurement
Measurement with a 100 mL Graduated Cylinder:



Exp. 1 – Metric Measurement
Measurement with a 10 mL Graduated Cylinder:



Exp. 1 – Metric Measurement

- Important to record **measurements** to the correct limits of the equipment used (i.e. uncertainty/significant figures). NOTE: For this experiment the uncertainty limits (+/-) of the equipment is to be included.
- Uncertainty limits are not normally included in calculations but are inferred from the correctly reported significant figure in the experimental value.

- Estimating to 6.30 mL is ok if the meniscus is viewed to be exactly on the mark.

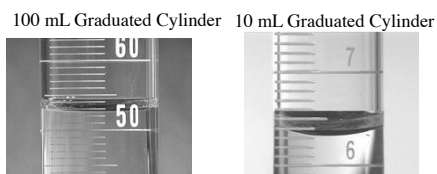


Report: 6.30 +/- 0.01 mL

- Estimating to 6.31 mL is also ok if the meniscus is viewed to be off the mark.

Report: 6.31 +/- 0.01 mL

Exp. 1 – Metric Measurement
Measurement with a Graduated Cylinder:



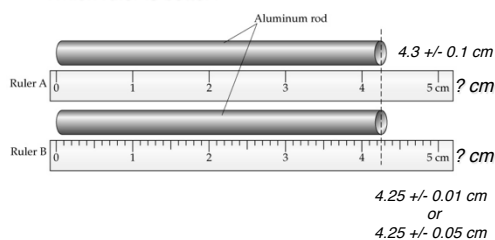
Measurement: 52.9 +/- 0.1mL

Measurement: 6.31 +/- 0.01mL

- Notice the difference in precision (uncertainty) with each instrument used and their maximum capacities

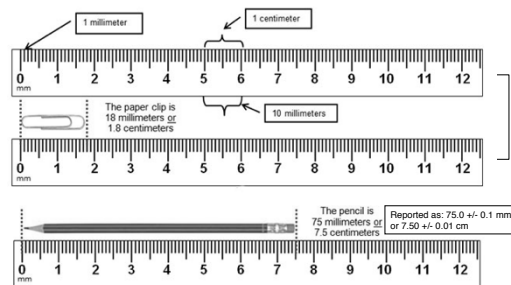
What is the length of the rod?

Different measurement tools give different numbers:
Which ruler is better?



Exp. 1 – Metric Measurement

Measurement with a centimeter/millimeter ruler (Length)



Exp. 1 – Metric Measurement

- When measuring the diameter of liquid containers with the ruler, the inner diameter is used, NOT the outer diameter. Why?
- When pouring water out of test tube into a graduated cylinder, some is always left in test tube; how does this systematic error affect accuracy of measured volume? *Higher or Lower?*
- Think about how equipment and handling relate to measurements and “systematic” errors.
- “Human Error” is **NOT** acceptable error. Using good lab practices reduce the risk of error, or of an “accident”, and they are **UNCONDITIONAL**, as is Lab Safety.

Exp. 1 – Metric Measurement

“Human Error” is **NOT** acceptable in scientific measurements..... as in aeronautics.

SFO July 6, 2013



Lab
#1

Lab Techniques

Week
#2

<https://aelp.smartsparrow.com/v/pjpfede/5jeb179>

Language describes numerical scale (prefixes)

Shorthand Prefixes

Table: SI prefixes

Factor	Name	Symbol	Factor	Name	Symbol
10 ²⁴	yocto	Y	10 ¹	deci	d
10 ²¹	zetta	Z	10 ⁻²	centi	c
10 ¹⁸	exa	E	10 ⁻³	milli	m
10 ¹⁵	peta	P	10 ⁻⁶	micro	μ
10 ¹²	tera	T	10 ⁻⁹	nano	n
10 ⁹	giga	G	10 ⁻¹²	pico	p
10 ⁶	mega	M	10 ⁻¹⁵	femto	f
10 ³	kilo	k	10 ⁻¹⁸	atto	a
10 ²	hecto	h	10 ⁻²¹	zepto	z
10 ¹	deka	da	10 ⁻²⁴	yocto	y

Hella is a prefix associated with Northern California: UC Davis, UC Berkeley, LBL, LLNL & adopted by Google (2010) & Wolfram Alpha (2011)

"hella-" = 10²⁷

Commonly Used Prefixes in Chemistry

Metric Prefixes		
Prefix	Symbol	Multiple/Fraction
giga-	G	1,000,000,000 = 1 × 10 ⁹
mega-	M	1,000,000 = 1 × 10 ⁶
kilo-	k	1,000 = 1 × 10 ³
Basic unit: meter, gram, liter, second		
deci-	d	0.1 = 1 × 10 ⁻¹
centi-	c	0.01 = 1 × 10 ⁻²
milli-	m	0.001 = 1 × 10 ⁻³
micro-	μ	0.000 001 = 1 × 10 ⁻⁶
nano-	n	0.000 000 001 = 1 × 10 ⁻⁹

Measurement & Numbers

The Importance of Units

Measurement - quantitative observation consisting of 2 parts

- Part 1 - number
- Part 2 – unit
- Relates to the instrument (tool) used for the measurement.

Examples:

- 20.0 grams
- 6.63 × 10⁻³⁴ joules / second

1 Joule (J):

• The heat required to raise the temperature of 1 g of water by 0.24 K; 1 J = 0.24 calories ^[1]

• The heat released as heat by a person at rest every 1/60 second (~17 ms); ^[2]

• The kinetic energy of a 50 kg (110 lb) human moving at 0.43 m/hr.

• The amount of electricity required to light a 1 watt LED for 1 s.

Measurements & Numbers

- Any number determined by any method of measurement: **MUST ALWAYS INCLUDE the UNIT being measured.**

Example: 20.0 grams

- Short Hand expression translates the number to **Scientific Notation**

Example: 2.00×10^1 grams



Converting a Number to Scientific Notation

units are not included in the examples

$$\begin{array}{c} 5983 = 5.983 \times 10^3 \\ \underbrace{\quad\quad\quad}_{321} \end{array}$$

- If the decimal point is moved to the left, the exponent is positive.

$$\begin{array}{c} 0.00034 = 3.4 \times 10^{-4} \\ \underbrace{\quad\quad\quad}_{1234} \end{array}$$

- If the decimal point is moved to the right, the exponent is negative.

Powers of Ten: Scale

base number 10^n exponent

Powers of 10		
Exponential Number		Ordinary Number
$1 \times 10^6 = 10 \times 10 \times 10 \times 10 \times 10 \times 10$		1,000,000
$1 \times 10^3 = 10 \times 10 \times 10$		1,000
$1 \times 10^2 = 10 \times 10$		100
$1 \times 10^1 = 10$		10
$1 \times 10^0 = 1$		1
$1 \times 10^{-1} = \frac{1}{10}$		0.1
$1 \times 10^{-2} = \frac{1}{10} \times \frac{1}{10}$		0.01
$1 \times 10^{-3} = \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}$		0.001
$1 \times 10^{-6} = \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}$		0.000 001

Powers of Ten (GQ)

Measurements & Relative Scale

<http://chemconnections.org/general/chem108/Powers%20of%20Ten-Guide.html>

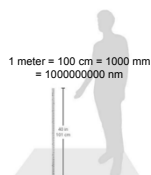
Refer to:

Video in the previous Guiding Question (GQ) class assignment



Math S.

Calderwood
Glasgow,
Scotland



1 meter = 100 cm = 1000 mm
= 1000000000 nm

Lori: But the whale is 800cm, not just 100cm.

Toby: We can't measure it with that stick.

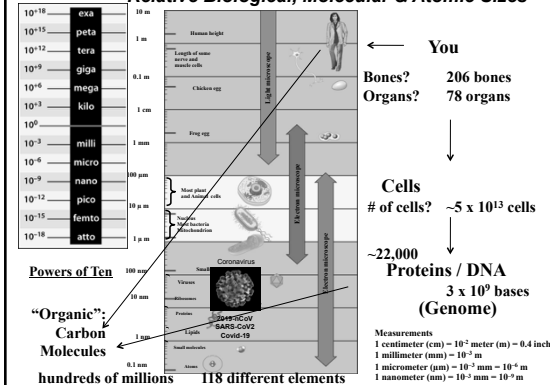
Miss Dunn: I wonder what we could do then...?

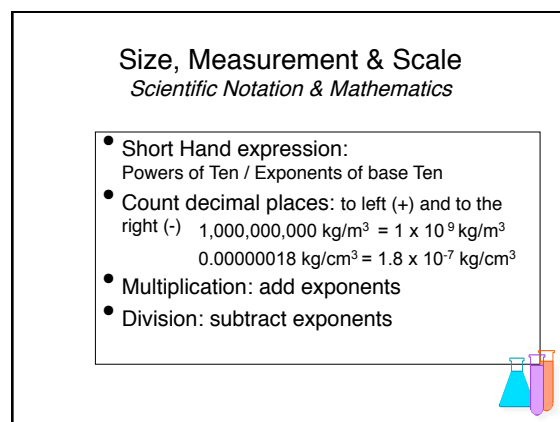
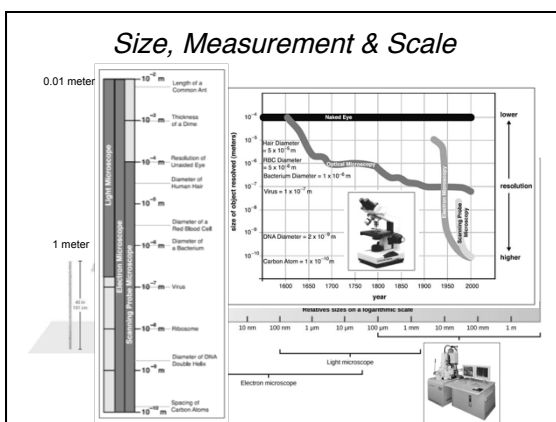
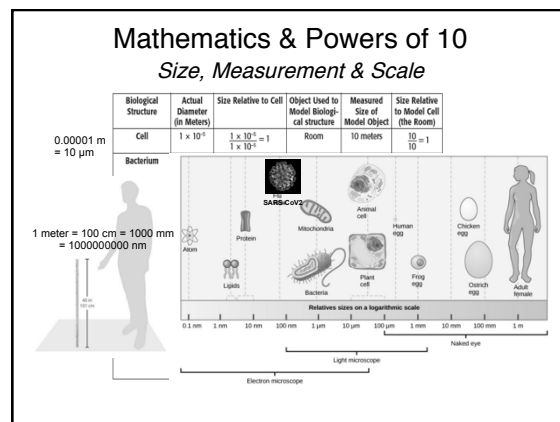
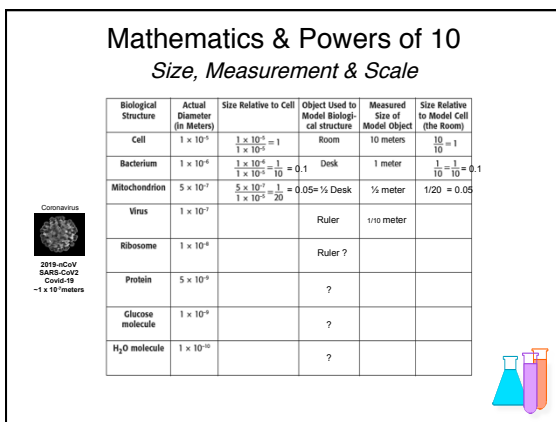
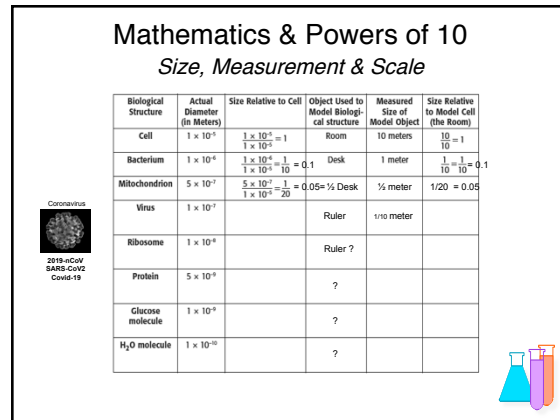
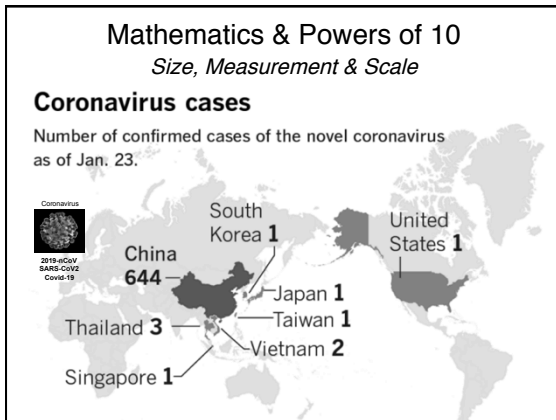
Lucy: We will have to just use that one. Like over and over.

Noah: One stick is 100cm. There are 800cm. I think we could use the stick 8 times or something.



Relative Biological, Molecular & Atomic Sizes





Mathematics & Powers of 10 Relative Size, Measurement & Scale (Proportionalities)

$$\frac{1,000,000,000 \text{ kg/m}^3 = 1 \times 10^9 \text{ kg/m}^3}{0.00000018 \text{ kg/cm}^3 = 1.8 \times 10^{-7} \text{ kg/cm}^3} =$$

How much larger is the red object than the blue?
 0.55×10^{16}

- Multiplication: add exponents
- Division: subtract exponents

How much smaller is the blue object than the red?

$$\frac{0.00000018 \text{ kg/cm}^3 = 1.8 \times 10^{-7} \text{ kg/cm}^3}{1,000,000,000 \text{ kg/m}^3 = 1 \times 10^9 \text{ kg/m}^3} = 1.8 \times 10^{-16}$$

Mathematics & Powers of 10 Relative Size, Measurement & Scale (Proportionalities)

Chem 108 (Dr. Hany) Relative Size, Measurement & Scale (Proportionalities)

Group Names (Last name, First name):
1) _____
2) _____

Complete the following table:

Biological Structure	Actual Diameter (in Meters)	Size Relative to Cell	Object Used to Model Biological Structure	Measured Size of Model Object	Size Relative to Model Cell (the Room)
Cell	1×10^{-5}	$\frac{1 \times 10^{-5} \text{ m}}{1 \times 10^{-5} \text{ m}} = 1$	Room	10 meters	$\frac{1}{10} = 0.1$
Bacterium	1×10^{-6}	$\frac{1 \times 10^{-6} \text{ m}}{1 \times 10^{-5} \text{ m}} = 0.1$	Desk	1 meter	$\frac{1}{10} = 0.1$
Mitochondrion	5×10^{-7}	$\frac{5 \times 10^{-7} \text{ m}}{1 \times 10^{-5} \text{ m}} = 0.05$	1/2 desk	1/2 meter	$0.05 \times 0.05 = 0.025$
Virus	1×10^{-7}		Ruler	1/10 meter	
Ribosome	1×10^{-8}		Ruler ?		
Protein	5×10^{-9}		?		
Glucose molecule	1×10^{-9}		?		
H ₂ O molecule	1×10^{-10}		?		

Recommended:
Group
Collaboration

Form your own
groups: starting
with your zoom
breakout
classmates

<http://chemconnections.org/general/chem108/Relative%20Sizes-Group.WKS.pdf>

Mathematics & Powers of 10 Relative Size, Measurement & Scale (Proportionalities)

Groups:

@ End of today's session:
Introduce yourself to the group and exchange contact information.

Arrange to complete Worksheet as a Group if you choose to.
Check answers.

Chem 108 (Dr. Hany) Relative Size, Measurement & Scale (Proportionalities)

Group Names (Last name, First name):
1) _____
2) _____

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Bacterium	1×10^{-6}	$\frac{1 \times 10^{-6} \text{ m}}{1 \times 10^{-5} \text{ m}} = 0.1$	Desk	1 meter	$\frac{1}{10} = 0.1$
Mitochondrion	5×10^{-7}	$\frac{5 \times 10^{-7} \text{ m}}{1 \times 10^{-5} \text{ m}} = 0.05$	1/2 desk	1/2 meter	$0.05 \times 0.05 = 0.025$
Virus	1×10^{-7}		Ruler	1/10 meter	
Ribosome	1×10^{-8}		Ruler ?		
Protein	5×10^{-9}		?		
Glucose	1×10^{-9}		?		

4/10 meters

Fisher Scientific Company

Mathematics & Powers of 10 Relative Size, Measurement & Scale (Proportionalities)

Group
Collaboration

Recommended

Check answers.

Group.KEY.pdf

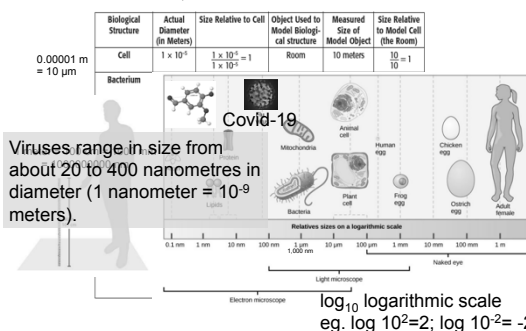
Chem 108 (Dr. Hany) Relative Size, Measurement & Scale (Proportionalities)

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1) _____
2) _____

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Bacterium	1×10^{-6}	$\frac{1 \times 10^{-6} \text{ m}}{1 \times 10^{-5} \text{ m}} = 0.1$	Desk	1 meter	$\frac{1}{10} = 0.1$
Mitochondrion	5×10^{-7}	$\frac{5 \times 10^{-7} \text{ m}}{1 \times 10^{-5} \text{ m}} = 0.05$	1/2 desk	1/2 meter	$0.05 \times 0.05 = 0.025$
Virus	1×10^{-7}		Ruler	1/10 meter	
Ribosome	1×10^{-8}		Ruler ?		
Protein	5×10^{-9}		?		
Glucose molecule	1×10^{-9}		?		
H ₂ O molecule	1×10^{-10}		?		

Mathematics & Powers of 10 Size, Measurement & Scale



Mathematics & Powers of 10

Chlorhexidine Disinfectant
Gallon
\$32.99
(29)

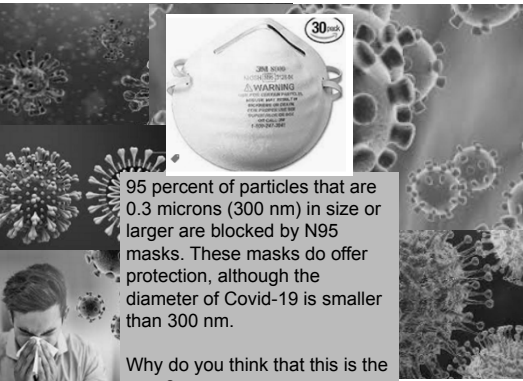
Chlorhexidine Solution
Revival Animal Health
★★★★★ (71)

3M Avagard D Instant Hand
Antiseptic 16 fl oz. 9200
\$55.23
VitalityMedical.com

and can be effectively inactivated by lipid solvents, and ether (75%), ethanol (>60%), chlorine-containing disinfectants, peroxyacetic acid and chloroform, (but not chlorhexidine).

COVID-19

CDC



95 percent of particles that are 0.3 microns (300 nm) in size or larger are blocked by N95 masks. These masks do offer protection, although the diameter of Covid-19 is smaller than 300 nm.

Why do you think that this is the case?

5300. mL
5300 mL
0.01 kg
0.0100 kg

Group
Collaboration

Recommended

What are significant figures?

Scientific notation?

5.300 x 10³ mL
5.3 x 10³ mL
1 x 10⁻² kg
1.00 x 10⁻² kg

<http://chemconnections.org/general/chem108/Math%20%26%20Measurements-WKS.f18.pdf>

Doing: Lab Experiments
Metric Measurement
Units & Conversions Worksheet

<http://chemconnections.org/general/chem108/Math & Measurements-WKS.f18.pdf>

Group
Collaboration

Recommended

Worksheet: Units, Measurements, & Conversions

1. How many significant figures are there in the following numbers?

at 42.000 L, _____ by 6.400 g _____

2. Complete the table. Provide ordinary decimal forms or scientific notation and the type of unit. The first two have been completed as an example for you.

Ordinary Decimal Form	Scientific Notation
0.000123456	1.23456 x 10 ⁻⁵
1234.567	1.234567 x 10 ³
0.000123456	1.23456 x 10 ⁻⁵
1.23456 x 10 ⁻⁵	1.23456 x 10 ⁻⁵

3. How many significant figures in the numbers below would be appropriate for each of the following values using the specified unit?

The speed of a car in miles per hour as read from a speedometer when traveling at the speed limit on VA-88 (27 mph): _____

Unit Conversions—Dimensional Analysis

It is necessary to convert a measurement from one system of units to another, particularly for chemical and physical data. The International System of Units (SI) is the most common system of units used in science and engineering. The SI system is based on seven base units: meter, kilogram, second, ampere, kelvin, mole, and candela. The SI system is a decimal system, which means that units are related by powers of ten. The SI system is a decimal system, which means that units are related by powers of ten. The SI system is a decimal system, which means that units are related by powers of ten.

For example, when your physician prescribes medication, he or she needs to convert your body weight to kilograms because dosages are usually expressed in milligrams of medication per kilogram of body weight. To convert a quantity from one system of units to another, medical personnel, scientists, and engineers frequently use a procedure called dimensional analysis.

Measured quantities are always represented by a number and its associated unit, such as 1.5 pounds or 5 inches. If you think of the number as a factor that multiplies the unit, you can apply standard algebraic conventions when you convert a measured quantity from one system of units to another. For example, to convert 1.5 kilograms to pounds, you multiply the given unit, kilograms, by a conversion factor that algebraically cancels the kilogram unit and yields pounds. Here is the conversion:

$$1.5 \text{ kg} \times \frac{2.205 \text{ lb}}{1 \text{ kg}} = 3.3075 \text{ lb}$$

Dimensional analysis works because the given unit is always multiplied by a conversion factor that is equal to one. The conversion factor comes from an equation that relates the given unit to the wanted, or desired, unit. For example, the equation

$$1 \text{ kg} = 2.205 \text{ lb}$$

defines the relationship between kilograms and pounds. If we divide both sides of this equation by 1 kg, we get a fraction that is equivalent to one:

$$\frac{1 \text{ kg}}{1 \text{ kg}} = \frac{2.205 \text{ lb}}{1 \text{ kg}}$$

The expression 2.205 lb/1 kg is a **conversion factor** that changes kilograms to pounds or vice versa. The "1 kg" quantity in the conversion factor is exactly 1 kilogram. Therefore, when you use this conversion factor, the number of significant figures is determined by the number of significant figures in 2.205.

<http://chemconnections.org/general/chem108/WKS%20Reading%20Unit%20Conversion%20-%20Dimensional%20A.pdf>

Dimensional Analysis
Conversion/Unit Factor Calculations

An average adult needs at least 150 grams (1.50×10^2 g) of carbohydrates in the diet each day. A can of vegetarian refried beans has 19 g of carbohydrate per serving. Each serving is 128 g of beans.

If your only dietary source of carbohydrate were vegetarian refried beans, how many pounds of beans would you need to eat today to satisfy your carbohydrate dietary needs?

$$\frac{? \text{ lb beans}}{\text{day}} = \frac{1.50 \times 10^2 \text{ g carbo}}{1 \text{ day}} \times \frac{1 \text{ serving}}{19 \text{ g carbo}} \times \frac{1 \text{ lb}}{454 \text{ g}}$$

Dimensional Analysis
Conversion/Unit Factor Calculations

An average adult needs at least 150 grams (1.50×10^2 g) of carbohydrates in the diet each day. A can of vegetarian refried beans has 19 g of carbohydrate per serving. Each serving is 128 g of beans.

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Dimensional Analysis Conversion/Unit Factor Calculations

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Dimensional Analysis Conversion/Unit Factor Calculations

An average adult needs at least 150 grams (1.50×10^2 g) of carbohydrates in the diet each day. A can of vegetarian refried beans has 19 g of carbohydrate per serving. Each serving is 128 g of beans.

If your only dietary source of carbohydrate were vegetarian refried beans, how many pounds of beans would you need to eat today to satisfy your carbohydrate dietary needs?

$$\frac{? \text{ lb beans}}{\text{day}} = \frac{1.50 \times 10^2 \text{ g carbo}}{1 \text{ day}} \left(\frac{1 \text{ serving}}{19 \text{ g carbo}} \right) \left(\frac{128 \text{ g beans}}{1 \text{ serving}} \right) \left(\frac{1 \text{ lb}}{453.6 \text{ g}} \right)$$



Dimensional Analysis Conversion/Unit Factor Calculations

An average adult needs at least 150 grams (1.50×10^2 g) of carbohydrates in the diet each day. A can of vegetarian refried beans has 19 g of carbohydrate per serving. Each serving is 128 g of beans.

If your only dietary source of carbohydrate were vegetarian refried beans, how many pounds of beans would you need to eat today to satisfy your carbohydrate dietary needs?

$$\frac{? \text{ lb beans}}{\text{day}} = \frac{1.50 \times 10^2 \text{ g carbo}}{1 \text{ day}} \left(\frac{1 \text{ serving}}{19 \text{ g carbo}} \right) \left(\frac{128 \text{ g beans}}{1 \text{ serving}} \right) \left(\frac{1 \text{ lb}}{453.6 \text{ g}} \right)$$

$$= 2.23 \text{ lb beans/day}$$



Caution

A natural side effect of eating beans, which is caused by raffinose sugars being broken up by the flora in our lower intestine.



Even vegetarians!

Science & Chem 108

Metric Values Only

How many grams of beans are there in 2.23 lbs of beans (454 grams = 1 lb)?

$$\frac{2.23 \text{ lb}}{1 \text{ lb}} \times \frac{454 \text{ g}}{1 \text{ lb}} = ?$$



Science & Chem 108

Metric Values Only

How many grams of beans are there in 2.23 lbs of beans (454 grams = 1 lb)?

$$\frac{2.23 \text{ lb}}{1 \text{ lb}} \times \frac{454 \text{ g}}{1 \text{ lb}} = 1012.42 \text{ g (grams)}$$

$$1010 \text{ g (grams)}$$




Science & Chem 108*Metric Values Only*

How many kilograms (kg) of beans are there in 1120 g of beans (1000 g = 1 kg)?

$$\frac{1120 \cancel{\text{g}}}{1000 \cancel{\text{g}}} = 1.12 \text{ kg}$$

"International SI Unit of mass"



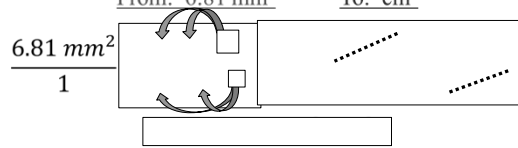
Converting to squared or to cubic units

➤ When using linear factors conversion factors to "square" or "cube" be sure to square or cube the factor

e.g.) Convert 6.81 mm² to cm²

$$10 \text{ mm} = 1 \text{ cm}$$

From: 6.81 mm² To: cm²

$$\frac{6.81 \text{ mm}^2}{1} = 6.81 \times 10^{-2} \text{ cm}^2$$


Converting to squared or cubic units

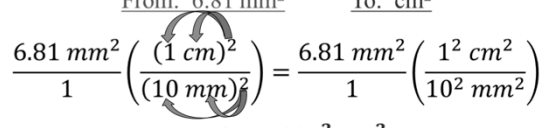
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$$= 6.81 \times 10^{-2} \text{ cm}^2$$

To: m²

$$\begin{aligned} 1 \text{ m} &= 1000 \text{ mm} \\ 1 \text{ m}^2 &= (1000 \text{ mm})^2 = 10^6 \text{ mm}^2 \\ 1 \text{ m}^3 &= (1000 \text{ mm})^3 = 10^9 \text{ mm}^3 \end{aligned} = 6.81 \times 10^{-6} \text{ m}^2$$

Critical
Chemistry

Tutorials

<https://aelp.smartparrow.com/c/ls/ndmw2ybz>



Can you calculate how many tablets of ibuprofen a patient should take?

Calculating doses in hospitals isn't so different from following a recipe. Many times, a doctor will prescribe a medication in one unit, although the medicine is distributed in a different unit.

For example, let's say your doctor recommends you take 400 mg of ibuprofen in a certain amount of time. The problem is ibuprofen is given out in tablets and not in milligrams.

So, how many tablets should you take? In other words, how many tablets equates to 400 mg?



1 tablet = 200 mg
Each tablet of ibuprofen weighs 200 milligrams.

<https://aelp.smartparrow.com/c/ls/ndmw2ybz>

inspark

A Case Study

In this course, you'll learn chemistry though seeing it applied to the world around you.

In this lesson, you'll learn a skill called dimensional analysis which hospital staff uses on a daily basis to measure out medication. To learn this important skill, we're going to take you through a real case study involving a mother and her twins that took place in 1998.

By the end of this lesson, you'll not only learn a valuable skill, but you'll also help solve this case. Good luck!

<https://aelp.smartsparrow.com/c/ls/ndmw2ybz>



Critical Chemistry

Tutorial Lessons

<https://aelp.smartsparrow.com/c/ls/ndmw2ybz>

Must register using the exact same e-mail address that you provided in submitting the Introductory Survey. If you don't remember, send an e-mail from that account to Dr. R

class
Chem 108 Critical Chemistry Fall 2020

TEACHER
Ron Rukay

Email Address

Password

Forgot your password?

Separate account from Lab:

Must register for both.

<https://aelp.smartsparrow.com/v/ndmw2ybz/hu4i4v3f>

inspark

Tutorial Lesson (Graded)

Dimensional Analysis

<https://aelp.smartsparrow.com/v/ndmw2ybz/hu4i4v3f>

Score: 0 Ron Rukay Google Cx

Contents

- 1 CASE STUDY: TIFFANY GREEN
- 2 WHAT IS DIMENSIONAL ANALYSIS?
- 3 CALCULATE THE CORRECT DOSAGE

Consult course calendar for Due Date

Metric Measurement Units & Conversions Worksheet

Check Answers:

<http://chemconnections.org/general/chem108/Math%2520%26%2520Measurement-2018.KEY.pdf>

Worksheet 2: Metric Measurements & Conversions

1. How many significant figures are there in the following numbers?

a) 0.0001 _____ b) 0.0001 _____ c) 0.0001 _____

2. Convert the following units. Show your work and include units in your answer.

Convert From	Convert To
1.0000 g	1.0000 kg
1.0000 L	1.0000 m ³
1.0000 m	1.0000 km
1.0000 s	1.0000 min
1.0000 min	1.0000 h

3. How many significant figures in the answer must be reported for each of the following calculations?

The speed of a car is 100 km/h. How long will it take to travel 100 km at this speed?

4. Using your height in feet and inches, convert to centimeters (cm), and to meters (m). Express the answers in scientific notation.

5. Using your height in feet and inches, convert to centimeters (cm), and to meters (m). Express the answers in scientific notation.

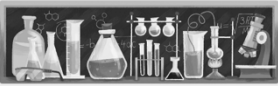

[Lab Techniques & Measurement Quiz]

To Be Posted at a later date: Refer to Calendar

Quiz: Measurement, Units & Conversions

Refer to the presentation & linked materials:
<http://chemconnections.org/general/chem108/measurement.html>

* Required

Quizzes and exams are to be completed individually without consulting anyone & submitted individually.