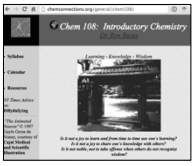
Chem 108
Introductory Chemistry
http://chemconnections.org/general/chem108/



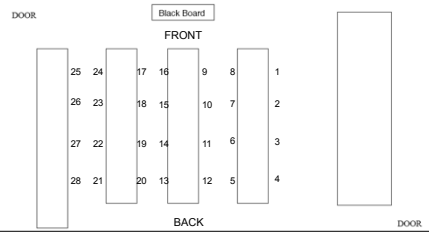
Class: MW 11:10-12:35 (PS 277)

Discussion/Lab:
12:45-3:55 M (PS 221) *sec. 2341*
12:45-3:55 W (PS 221) *sec. 2343*

Dr. Ron Rusay
E-mail: rrusay@chemconnections.org (preferred)
or rrusay@dvc.edu

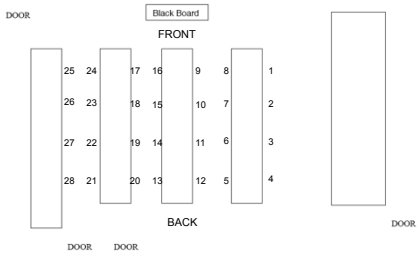
- Please sign the roster next to your name on the clipboard that is at the front of lab.
- If your name does not appear, please stand at the back of the lab.

Chem 108
Lab Map



Class size is limited to a maximum of 28 due to lab safety. Anyone on the roster who is absent today will be placed at the end of the wait list and any new sign-ins. **28 lab drawers** will be assigned today to the first 28 signed in on today's roster. **If needed, add codes will be provided today; DO NOT leave until you have seen Dr. R @ the end of lab. The codes are ONLY VALID for 48 hours.**

Chem 108
Lab Map



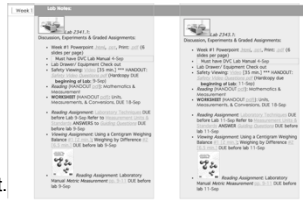
- If you are on the roster & signed in, select one of the numbered lab stations in the above lab map and then move to that location. (1 per station)
- Introduce yourself to one or more of the classmates around your station; Describe what other courses you are taking this semester to them and learn what your classmate(s) is (are) taking.

Chem 108: Lab
http://chemconnections.org/general/chem108/calendar-108-f19.html

Take out your smart phone or get a laptop from the front of the lab.

Open DVC wifi.
Connect to the Internet.
Go to:
http://chemconnections.org/general/chem108/

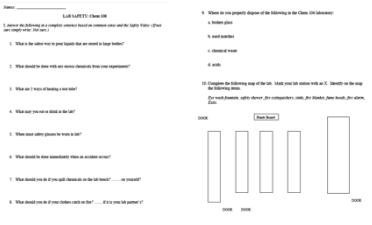
Monday Wednesday



Click on Calendar link

Refer to [***Lab Notes:*** Week #1 Powerpoint link] for today's lab.
Links for subsequent labs will be provided throughout the semester.

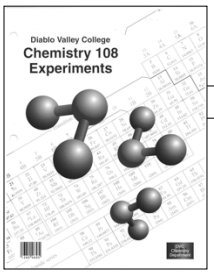
Doing: Lab Experiments
Safety
(Video & Handout)
http://chemconnections.org/general/chem108/Lab/Safety_focus_ques-18.pdf



Have map page signed by Dr. R. before leaving Lab today.
Completed handout due before beginning experiment.

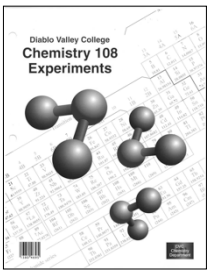
Doing: Lab Experiments
Safety
(Video & Handout)
http://chemconnections.org/general/movies/Safety_Video.mp4/

Lab Drawer Check Out



Follow instructions

Lab Drawer Check Out



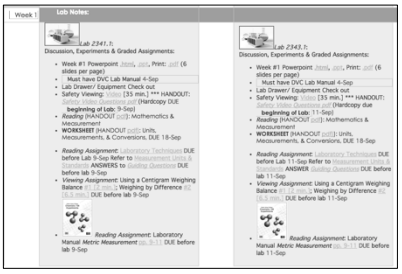
PURCHASE a copy of the Lab Manual @ the DVC Bookstore before the next lab.

If there are no copies on the shelf, ask at the service desk and they should re-stock for you.

Doing: Lab Experiments

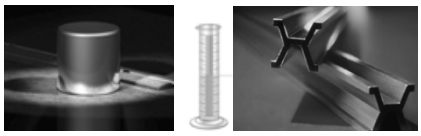
Metric Measurement [Experiment #1: Week 3]
(Course/ Lab Manual pp. 9-11; pp. 12-15 [Report Form])

http://chemconnections.org/general/chem108/calendar-108-f19.html



Doing: Lab Experiments

Metric Measurement [Experiment #1]
(Course/ Lab Manual pp. 9-11; pp. 12-15 [Report Form])



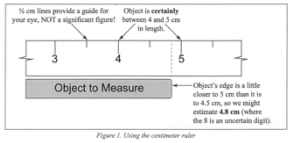
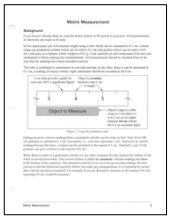


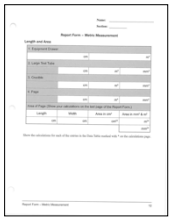
Figure 1. Using the centimeter ruler

Doing: Lab Experiments

Metric Measurement [Experiment #1]
(Course/ Lab Manual pp. 9-11; pp. 12-15 [Report Form])

http://chemconnections.org/general/chem108/calendar-108-f19.html





Collaboration is encouraged, but individual record keeping and submissions are required.

Doing: Lab Experiments (Submit before Lab)

Metric Measurement [Experiment #1]
Background & Preparation [Graded Guiding Questions]

http://chemconnections.org/general/chem108/Measurements.Units-Guide.html

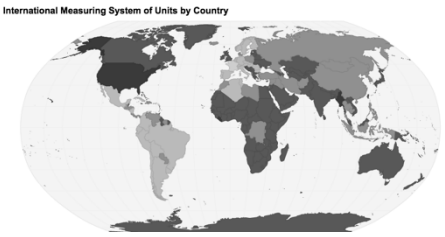
Units of Measurement

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

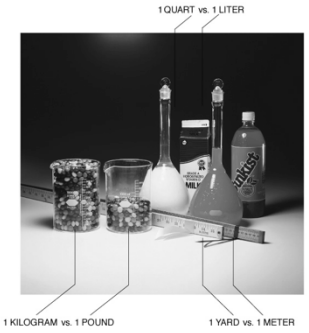
International SI units are based on the metric system, not the British units commonly used in the U.S.

Countries using "British" Units
in red



All other countries use the metric system.

"British" : 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)

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

Language describes scale (prefixes)

Shorthand Prefixes

Table: SI prefixes

Factor	Name	Symbol	Factor	Name	Symbol
10^{24}	yotta	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-" = 10^{27}

Commonly Used Prefixes in Chemistry

Metric Prefixes

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

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.*[6]
- *The heat released as heat by a person at rest every 1/60 second (~17 ms);* [7]
- *The kinetic energy of a 50 kg (110 lb) human moving at 0.43 mi/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 x 10^1 grams

Converting a Number to Scientific Notation

units are not included in the examples

$5983 = 5.983 \times 10^3$

3 2 1

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

$0.00034 = 3.4 \times 10^{-4}$

1 2 3 4

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

Powers of Ten: Scale

10^n (exponent: n; base number: 10)

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

Hearing/Viewing: Guiding Questions (GQ)

Measurements & Relative Scale

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

Answer all Guiding Questions on-line

Example: First GQ assignment

.

From the calendar links, submit responses on-line; graded weekly.

Scientific Notation & Mathematics

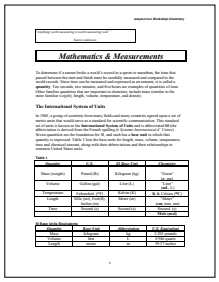
- Short Hand expression:
  Powers of Ten / Exponents of base Ten
- Count decimal places: to left (+) and to the right (-) 1,000,000,000 kg/m^3 = 1 x 10^9 kg/m^3
  0.00000018 kg/cm^3 = 1.8 x 10^{-7} kg/cm^3
- Multiplication: add exponents
- Division: subtract exponents

Doing: Lab Experiments (Read before Lab)

Metric Measurement [Experiment #1]

Background & Preparation [Reading Handout & Worksheet]

http://chemconnections.org/general/chem108/Math & Measurement-2018.pdf

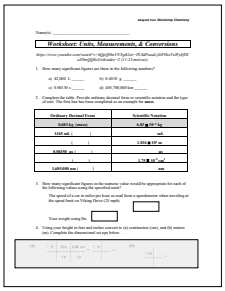


Doing: Lab Experiments (In lab)

Metric Measurement [Experiment #1]

Background & Preparation [Reading & Worksheet Handout]

http://chemconnections.org/general/chem108/Math & Measurements-WKS.f18.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?

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

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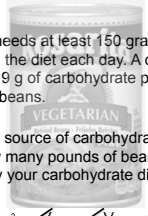
Conversion/Unit Factor Calculations



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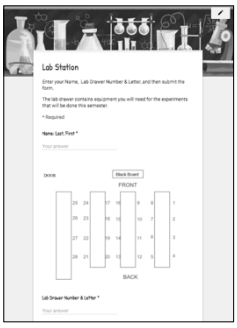
= 2.23 lb beans/day

Caution

A side effect of eating ~2 ¼ lbs of beans

Even vegetarians!

Lab Drawer Check Out



The lab drawer contains equipment you will need for the experiments that will be done this semester.

Using a smart phone or a laptop:

Connect to the Internet.

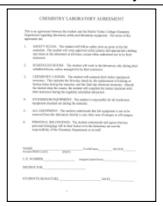
Go to:
https://goo.gl/forms/9JczWUgwvujtWekJ2

Enter your Name, Lab Drawer Number & Letter, and then submit the form.

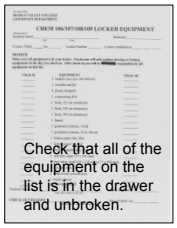
Lab Drawer Check Out

Pick up a combination lock at the front of lab.
Everyone must separately provide all of the information in each of the following 3 forms, sign and turn them in before leaving lab today.

Write down the lock's combination where you can find it; bring to lab next week



Read carefully & sign

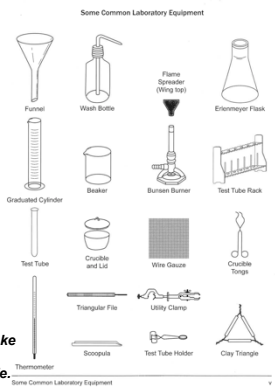


Check that all of the equipment on the list is in the drawer and unbroken.

Check Out

On the pink form note what is missing or broken. If everything is OK, sign form, note combination for your use, turn in with completed/ signed acknowledgment form and card to Dr. R.

If anything is missing or broken, take the pink form to the Chemistry Stockroom. Directions on next slide.



Missing or Broken Equipment

Go to stockroom window to replace missing or broken equipment.

Stockroom window is in the middle of this building. Turn right out of lab, walk past 2 lab rooms and look for the double glass doors. Window is in the back.

When everything is OK, sign form, note combination for your use, turn in with completed/ signed acknowledgment form and card to Dr. R.