

**Welcome to
Chemistry 101**

Laboratory Sessions

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Office Hours: See Syllabus for Zoom Access Times



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Class ALWAYS starts on time

Each lab has a briefing
Miss briefing → Can't do lab
(WCC Risk Management Policy)

Each lab is different ...
instructor reserves the right
to deny seating based on missed content

Tardiness is a safety hazard to all in the lab!




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Summary of Course Materials and Their Location

On Blackboard: (Red font indicates material found only on Blackboard)

<p>Announcements</p> <p>Course Syllabus</p> <p>Test Schedule</p> <p>Class Stats</p> <p>Outcomes</p>	<p>Practice Quizzes</p> <p>Exams</p> <p>Optional Practice Quizzes</p>	<p>Lab Hand-Outs</p> <p>Lab Hand-Ins</p> <p>Lab Calculation Summaries</p> <p>Lab Syllabus</p> <p>Lab Schedules</p> <p>Lab Safety Links</p> <p>DVD Transcripts</p>
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On Instructor Owned Media: (Blue font indicates material found only on instructor-owned media)

<p>Course Information Documents</p> <p>Outcomes</p> <p>Lecture Slides</p> <p>Lecture Notes</p> <p>Annotated Outcomes</p> <p>Flashcards</p> <p>Reading List</p> <p>Music Videos & Demos</p>	<p>Optional Practice Quizzes</p>	<p>Lab Syllabus</p> <p>Lab Hand-Outs</p> <p>Lab Hand-Ins</p> <p>Lab Calculation Summaries</p> <p>Lab Briefing Slides</p> <p>Lab Procedure Summaries</p> <p>Lab Safety Links</p> <p>Extra Background Information</p> <p>DVD Transcripts</p>
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(Black font indicates material found on both)

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No Electronics (except calculators) On Lab Bench



Protect your investment:
Keep away from flames and potential spills
Electronics on table is asking for disaster
Store electronics in personal storage area

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Dress Code (For Hands On Lab)

Skin you don't want burned or spilled upon should be covered
Statistically, most injuries during intro labs: Below the knees

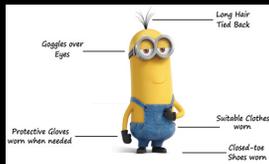
Recommendations:

- No shorts**
- No sandals**
- No exposed skin below the waist**
- Leather (not cloth) shoes**

Consider:

- Tying back long hair**
- Wearing Sturdy NATURAL FIBER old clothes**
- Synthetics stick to skin when burned**
- Cotton and "non-fuzzy" wool preferred**

Best to wear glasses, not contacts



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Required Materials

- Cem Department lab handout (Must Print)**
- Carbonless copy lab notebook (does not have to be WCC)**
- Safety goggles (Department or personal)**
- Hand-held "scientific" calculator**
- (Phone apps not acceptable)**



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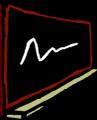
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Blackboard

Lab Handouts
 Furnished by Chemistry Department
Must Print (and read!) Before Class
 Look for Calculations Summaries and Hand-Ins
 Extra Materials in Instructor's web site

Grade book
 Continual, Running Weighted Score
 Blackboard % corresponds to Syllabus letter grade

Lab Scores Posted on Blackboard




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Behavior

Have fun with chemistry, not pranks
 Keep floors & aisles clear
 Professional labs:
 No
 Food (including gum)
 Drinks
 Cosmetics
 Smoking

'cause these can absorb lab chemicals



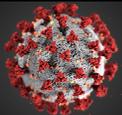
Instructor Vigorously Enforces No Food, Drink or Gum

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Masks Required In The Lab

College Requirement
Cannot do lab without mask





On Blackboard: Why I Wear A Mask

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Wear Safety Goggles When Advised In Lab





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Chemistry Department Goggles For Students

North Wall: Next to Coat Rack



Cabinet Location Cabinet: Close Up Cabinet: Open

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Respect Flames



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Before Each Class:

Read Lab experiment from Blackboard
 Prepare lab notebook: (Beginning with lab 3)

Title
Purpose
Procedure

A "To do list" ... less than a page

We will discuss lab notebook procedures in Lab 2

Can save in-lab time by doing questions ahead of class




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Lab Report Grading

Before Class

Updated Table of Contents	0.5
Title & Date	0.5
Purpose	1
Procedure	2
Data	4
Calculations	4
Results	4
Conclusion	4
Questions	5

Total = 25 points




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The "Contract"

Grading at the 101 level less rigorous
 Labs "should be" an "A" (23-25 of 25)

In exchange for
 liberal grading policy
 detailed feedback

the student is expected to complete the entire lab

If you do NOT do portions of the lab,
 I am morally obligated to remove points!





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Missed Labs

There is no make-up in your assigned section
Must arrange to attend other sessions
Totally dependent on "numbers"



See Blackboard for Lab Schedules
Missed Lab = zero points
No penalty if another session is attended
Must be same week
Instructor of record grades the lab

4 Missed Labs = Course Failure (F)
More than 2 make-ups require my permission
No more than 3 make-ups allowed



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CEM 101

Lab Schedule: Daily Block View

Table in Lab Handouts Folder




	Morning	Afternoon	Evening
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Sunday			



Instructor and Time
For all sections in current semester

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CEM 101 All Lab Sections

Table in Lab Handouts Folder




	Section 1 11:00	Section 2 12:00	Section 3 1:00	Section 4 2:00	Section 5 3:00	Section 6 4:00	Section 7 5:00	Section 8 6:00	Section 9 7:00	Section 10 8:00	Section 11 9:00	Section 12 10:00
1												
2												
3												
4												
5												
6												
7												
8												
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11												
12												
13												
14												
15												

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Lab Safety Philosophy



**In the lab, as in life,
Its what is NOT known,
That poses the greatest risk**





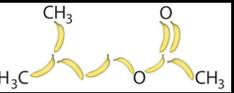
**So, best accident prevention is
Awareness of risks**



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Iso-amyl Acetate







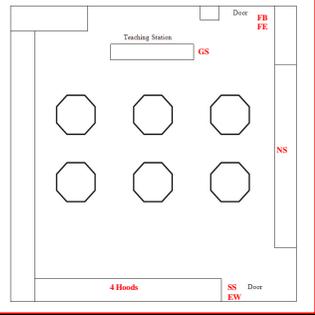
**Banana Flavor and Smell
Bee Pheromone: Attack!**




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Lab Schematic










Lab Tour (in Blackboard Lab Handouts) highlights individual locations

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There are no “stupid questions” !



**The only “dumb question”
is the one that is unanswered ‘cause it was not asked!**

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Remember

**SHIT
HAPPENS**



**So,
Things will spill,
Things will break!**

Was written by a chemist



**When something happens,
Step back
& notify the instructor**

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When Experiments Don't Work, Ask For Help!

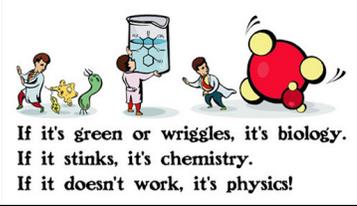


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Have a Fun Semester!



**If it's green or wriggles, it's biology.
If it stinks, it's chemistry.
If it doesn't work, it's physics!**







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The Scientific Process





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Science Uses Senses to Observe Surroundings

- Observe - watch & record
- Classify - sort
- Measure - quantify (compare)

Collected Data used to:

- Infer - conclusion based on deduction
- Predict - declare outcome in advance

Communication - share results with others
Interpret - explain observations



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Observing Is Different From Inferring/Assuming







Icebergs on Ford Lake?

Record Observations **Explain / Assume Without Enough Facts**
Conclusion dependent on how viewed

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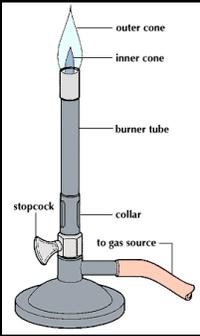
Scientific Method

- Observation** (watch, collect data)
- Hypothesis** (tentative explanation)
- Experimentation** (controlled testing)
- Revise hypothesis to fit observations
- Test** (Observe) revised hypothesis
- Repeat until **THEORY** (tested model) predicts observations
- Law** - Description (not explanation) of long-term observations
- Law** - typically a mathematical expression



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Using the Bunsen Burner



Check gas supply hose for cracks
Connect hose

Match:
Strike match before turning on the gas
Hold match flame to side of top tube
Open gas valve on desk

Striker:
Hold striker above top of burner
(traps gas within the striker cap)
Squeeze handle to generate spark
May need two hands to create spark

If flame "blows out" or you smell gas
Turn off the gas at the desk valve



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Bunsen Burner Flames

1 = "Hollywood Flame"
Not enough air – incomplete combustion

2 = air valve ~ 1/2 open

3 = air valve almost totally open

4 = air valve totally open
Enough air – complete combustion




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Combustion of Natural Gas

The "Hollywood Flame" (Incomplete Combustion)
Yellow flame ... luminous carbon



$\text{CH}_4 + \text{O}_2 \rightarrow \text{C} + 2 \text{H}_2\text{O}$ (Carbon deposit called "carbon black")

Carbon deposits on cool surfaces

Inadequate Ventilation (Air Supply)

$2 \text{CH}_4 + 3 \text{O}_2 \rightarrow 2 \text{CO} + 4 \text{H}_2\text{O}$

CO: toxic carbon monoxide

Complete Combustion (Best flame)
Enough oxygen to consume all the fuel

$\text{CH}_4 + 2 \text{O}_2 \rightarrow \text{CO}_2 + 2 \text{H}_2\text{O}$



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Nichrome Wire Color vs. Temperature

Color	No light	Reddish	Dark Red	Bright red	Yellowish Red	Yellow-White	White
Temp. (°C)	< 500	500-550	650-750	850-950	1050-1150	1250-1350	>1450

You are using **Observation of wire color**
To **Infer Temperature** in various parts of the flame



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**The temperature of any flame
Can be manipulated by
Fuel / Air ratio**

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States of Matter

Solid **Liquid** **Gas**

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States of Matter - Solid

Form	Rigid
Compressibility	Extremely Low (Exam: not compressible)
Shape	Fixed
Volume	Constant (Definite)
Particle Movement	Held in place by surroundings

Example: Ice

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States of Matter - Liquid

- Form** Fluid (Flows)
- Compressibility** Extremely Low (Exam: not compressible)
- Shape** Variable (Fills Container)
- Volume** Constant (Definite)
- Particle Movement** Some attraction, particles move freely beneath surface



Example: Water

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States of Matter - Gas (Vapor)

- Form** Fluid (Flows)
- Compressibility** Very High
- Shape** Variable (Fills Closed Container)
- Volume** Variable (Fills Closed Container)
- Particle Movement** Random, Independent

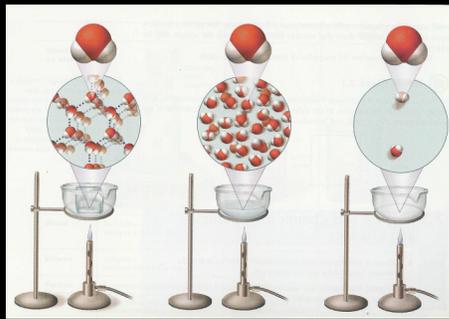


Example: Steam

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Physical Change Chemical Entity (H₂O) Unchanged



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Changing States of Matter

Requires change in energy content at molecular level

Solid \Rightarrow Liquid \Rightarrow Gas

heat (energy) must be added

Gas \Rightarrow Liquid \Rightarrow Solid

heat (energy) must be removed (lost)



During Phase Change:
Both states simultaneously exist
Temperature remains constant

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The Lab Today

Observe the Properties of the Bunsen Burner

Fill out States of Matter Exercises (can work as a group)

To save "my time" grading (g):

Blood is not a liquid (It is a "sol" ... colloidal suspension of solid in liquid)

Glass is not a solid (It is "amorphous" ... between solid and liquid)

Milk is not a liquid (It is a "sol" ... colloidal suspension of solid in liquid)

Smoke is not a gas (It is a suspension of a solid in a gas)

Rain is not gas to liquid (Bergeron Process ... water vapor \rightarrow Solid state)

Solid \rightarrow Gas (Sublimation) Dry Ice (solid Carbon Dioxide, CO_2)

Gas \rightarrow Solid (Deposition) Frost

Make sure you do questions!

Place lab report in basket on instructor's desk



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Let's Boldly Go Explore Today's Lab



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