

# WELCOME TO CHEM 14BL!

Take a few minutes to  
introduce yourselves to  
your neighbors before  
we get started.



# CHEM 14BL - Fall 2025

## General Information\*

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|---------------|--------------------------------------------------------------------------------------------|
| Instructor:   | <b>Chau Ngo, Ph.D.</b>                                                                     |
| Email:        | <a href="mailto:chaudngo@g.ucla.edu">chaudngo@g.ucla.edu</a>                               |
| Office:       | <b>4222B Young Hall</b>                                                                    |
| Office Hours: | <b>Tues 10 – 11AM</b><br><b>Thurs 9 – 10 AM</b>                                            |
| Lectures:     | <b>Tuesday 8 – 8:50 am CS50 (Lecture 1)</b><br><b>Tuesday 9 – 9:50 am CS50 (Lecture 2)</b> |
| Lab Rooms:    | <b>1077, 1089 and 1337 Young Hall</b>                                                      |

\*All info can also be found in the course syllabus via Bruin Learn

# Enforced Requisites for the CHEM 14BL

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To receive credit for the class, students must have the following requisites

1. **14A or 14AE** (Completed with C- or higher)

**AND**

2. **14B or 14BE** (Concurrent Enrollment OR Completed with C- or higher)

# Required Materials for CHEM 14BL

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1. Physical Laboratory Manual (Required Textbook)
  - **Chemistry Experiments for Life Science Major (5<sup>th</sup> Edition only)**
2. Laboratory Notebook with Duplicate Pages
  - **Notebook with duplicate carbon pages (50 or 100 Pages)**
3. PPE
  - **Safety Glasses/ Goggles**
  - **Flame-Resistant Blue Lab Coat**
  - **Long pants**
  - **Closed-toe shoes**

# PPE

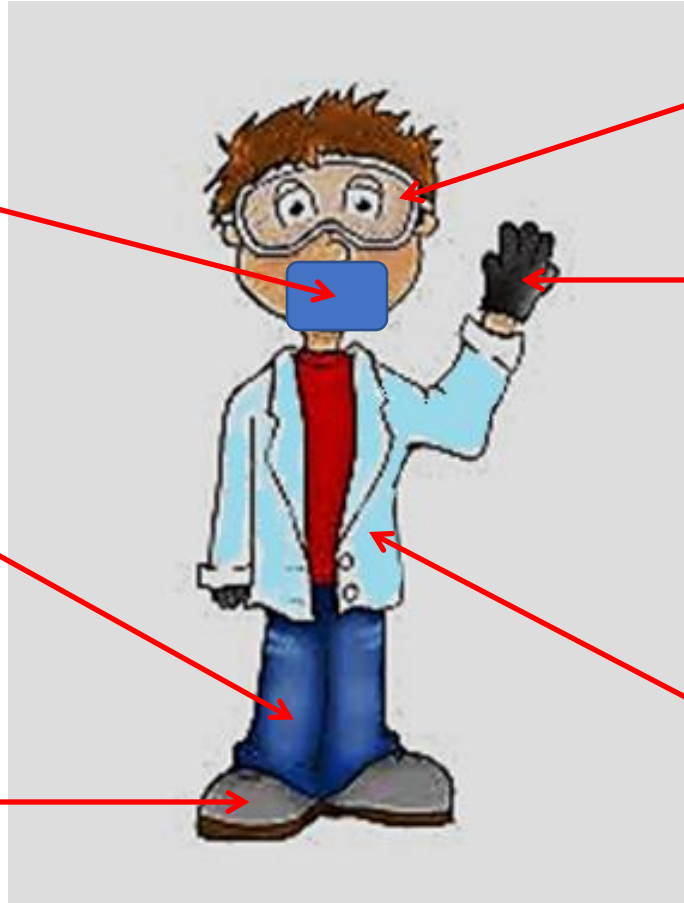
## Personal Protective Equipment

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Face Covering  
(Recommended)

Long Pants  
(ankle length)  
Without holes  
or tears

Closed-Toe  
Shoes



Safety Glasses

**Gloves**  
(will be provided  
In the lab)

Flame-resistant  
Lab Coat

# Laboratory Safety Reminder

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- A physical lab manual, a lab notebook and proper PPE are required for attending and performing experiments starting week 2.
- Failure to meet the safety requirements will result in **dismissal from the lab without make-up lab time.**
- **Repeat violation in safety policy will result in a failing grade (“F”) in the course.**

# TV Show (CBS): The Big Bang Theory



# NFPA

## National Fire Protection Association

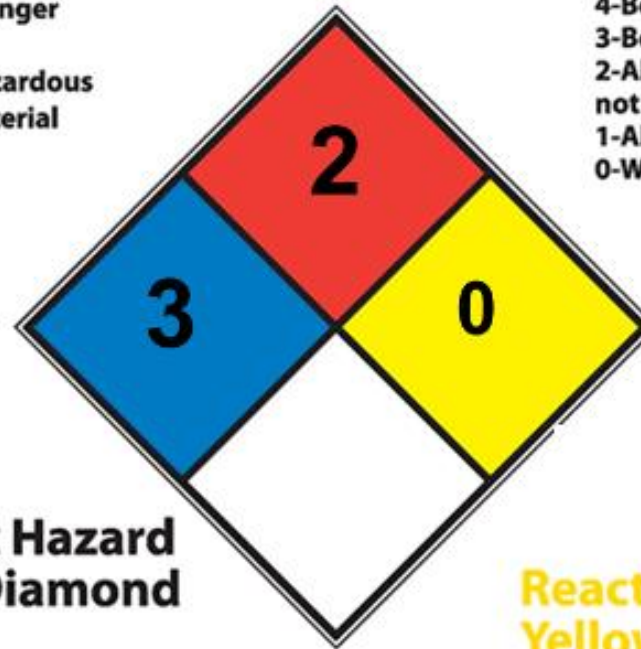
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### Health Hazard Blue Diamond

4-Deadly  
3-Extreme Danger  
2-Hazardous  
1-Slightly Hazardous  
0-Normal Material

### Fire Hazard Red Diamond

Flash Points  
4-Below 73°F  
3-Below 100°F  
2-Above 100°F  
not exceeding 200°F  
1-Above 200°F  
0-Will not burn



### Specific Hazard White Diamond

ACID - Acid  
ALK - Alkali  
COR - Corrosive  
OXY - Oxidizer  
☢ - Radioactive  
☞ - Use No Water

### Reactivity Yellow Diamond

4-May Detonate  
3-Shock & Heat  
may detonate  
2-Violent Chemical  
change  
1-Unstable if heated  
0-Stable

# Course Grade Policy

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**Read the syllabus on minimum passing grade requirement**

## **1. Pre-lab Reports**

- Weekly guidelines will be posted every Wednesday prior to the next lab session

## **2. In-lab Performance** including satisfactory lab cleanup

## **3. Post-lab Reports**

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## **4. Online Midterm**

**Oct. 30 (Noon, PST) – 31 (9 PM, PST)**

## **5. In-Person Final Exam**

**Dec. 09\_6:30 – 9:30 PM**

# CHEM 14BL is an Impacted Course

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LAST DAY TO DROP THE COURSE:

**THE FRIDAY OF THE SECOND WEEK**

**Oct. 10**

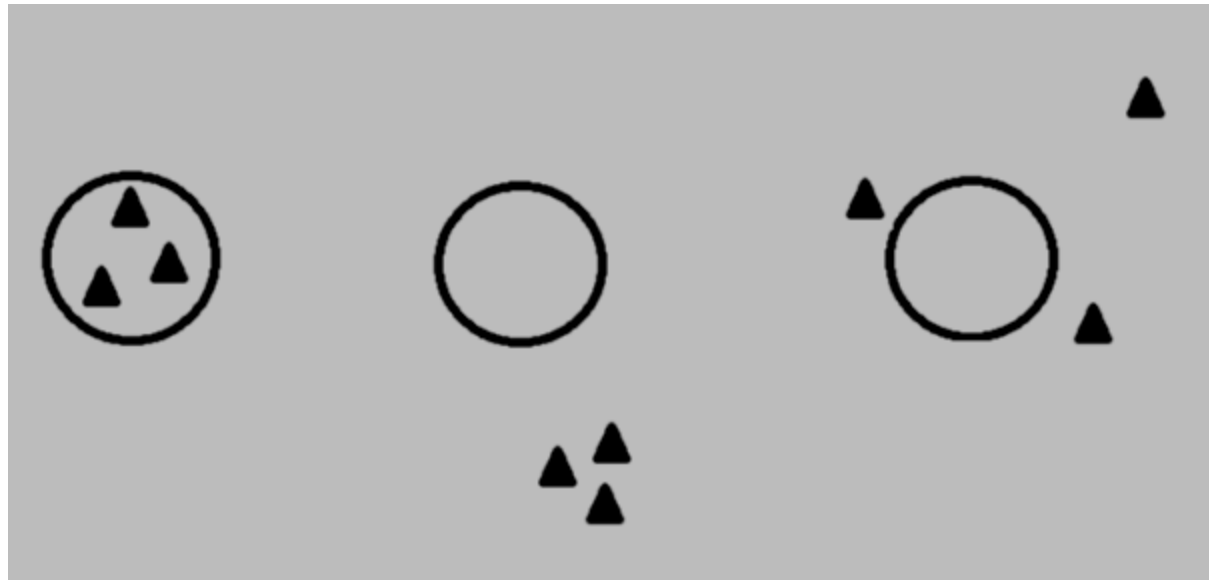
# Questions ?

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Detailed course info is available via  
Bruin Learn.

Week 1: Sept. 30 – Oct. 03

## Measurements and Errors



# Measurements and Errors

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In scientific analysis, one often wants to know  
**how reliable a particular measurement is besides its value.**

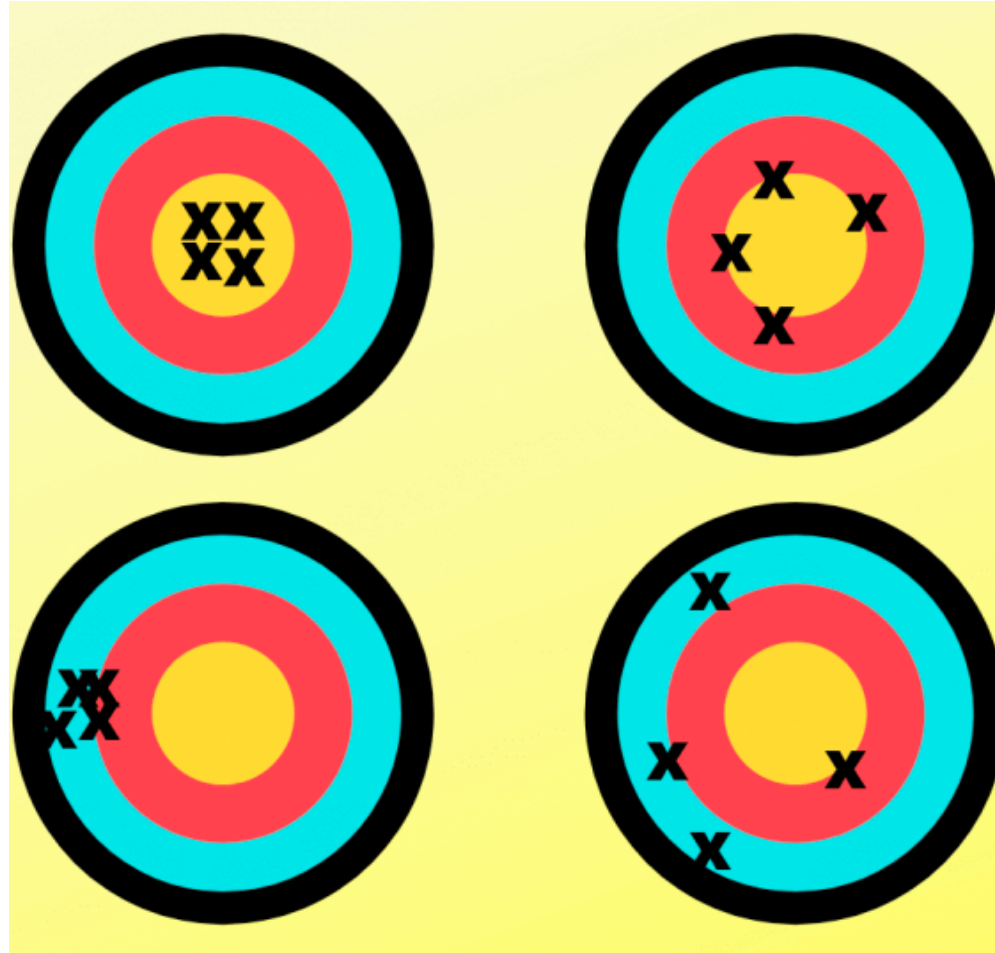


# Accuracy and Precision

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- ❖ Accuracy defines the closeness of a set of results to the *true* value.
- ❖ Precision defines the closeness of a set of results to each other (i.e. results should be “reproducible” in science)

# Accuracy and Precision

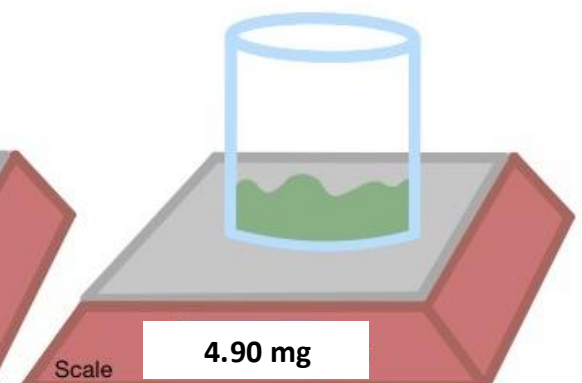
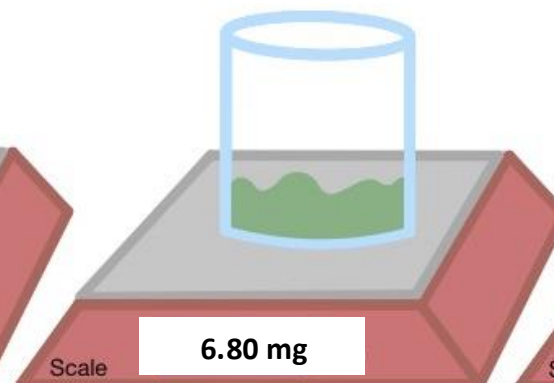
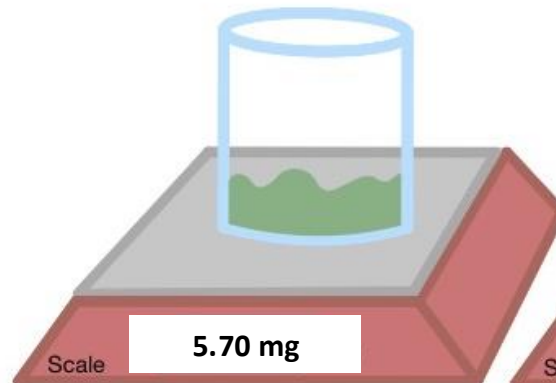
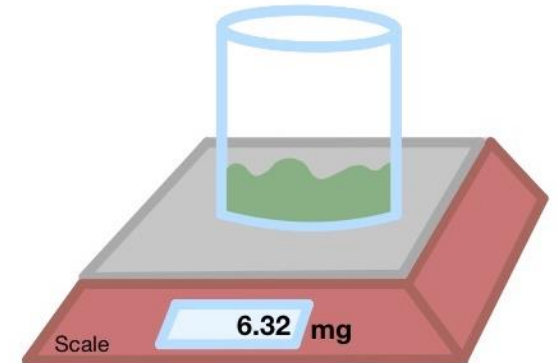
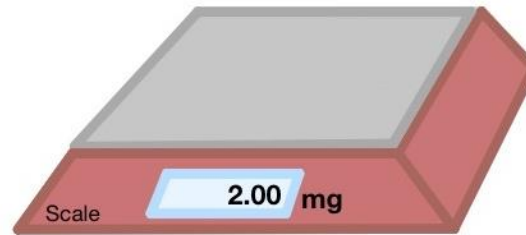


Yellow Circle = Target area

X = Experimental data

# Measurements and Errors

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# Random Error vs. Systematic Error

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***Systematic errors*** result from fundamental flaws in the design, construction, calibration, operation, or interpretation of the experiment. Systematic errors tend to occur in the same direction (i.e. all values too high or all values too low).

***Random errors*** vary arbitrarily in both sign and magnitude between successive measurements.

# Examples of Random Error & Systematic Error

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**A.** A student consistently read a melting point temperature higher than the actual melting point temperature on a melting-point apparatus.

**B.** A student used a contaminated solid compound when measuring its melting point.

How do we estimate errors in  
experiment?



# Absolute Error vs. Relative Error

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Example:  $5.0\text{cm} \pm 0.1\text{cm}$   
(i.e. Range between 4.9 and 5.1cm)

# Absolute Error vs. Relative Error

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Example:  $5.0\text{cm} \pm 0.1\text{cm}$   
(i.e. Range between 4.9 and 5.1cm)

❖ **Absolute Error:**  $\pm 0.1 \text{ cm}$

- Same unit as the measurement
- Same number of decimal places as the measurement

❖ **% Relative Error**

$$\% \text{ Relative Error} = \frac{\text{Absolute Error}}{\text{Measurement}} \times 100\%$$

❖ “ $\pm$ ” sign does **NOT** go into the calculation. It is just a symbolic representation of an error.

# General Rules for Error Propagation

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## ❖ Multiplication **and/or** Division

$$C = A \times B$$

or

$$C = A \div B$$

- **A** & **B** are the experimental measurements

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### 1. Relative Error in C:

$$\frac{\Delta C}{C} = \frac{\Delta A}{A} + \frac{\Delta B}{B}$$

- where  $\Delta A$  and  $\Delta B$  are the absolute errors in the quantity A and B.
- Equation can be generalized to more than two terms.

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### 2. Absolute Error in C:

$$\Delta C = \left( \frac{\Delta A}{A} + \frac{\Delta B}{B} \right) \times C$$

- where  $\Delta A$  and  $\Delta B$  are the absolute errors in the quantity A and B.
- Equation can be generalized to more than two terms.

# Example 1: Calculate % relative error and absolute error of $(C = A \times B)$

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$$(5.00 \pm 0.02) \times (0.4000 \pm 0.0002)$$

1. Relative error:

## Example 1: (C = A × B)

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$$(5.00 \pm 0.02) \times (0.4000 \pm 0.0002)$$

2. Absolute error:

# General Rules for Error Propagation

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## ❖ Addition **and/or** Subtraction

$$C = A + B$$

or

$$C = A - B$$

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- where  $\Delta A$  and  $\Delta B$  are the absolute errors in the quantity A and B.
- Equation can be generalized to more than two terms.

# Example 1: Calculate % relative error and absolute error of $(C = A - B)$

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$$(5.05 \pm 0.02) - (0.40 \pm 0.02)$$

## 1. Relative Error:

## Example 2: (C = A - B)

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$$(5.05 \pm 0.02) - (0.40 \pm 0.02)$$

**2. Absolute Error:**

# Additional Practice Problems on Error Analysis

(Work on them on your own)





# Practice Problem #1

Determine the % relative error and absolute error for the following calculation

$$2.51 + 1.67 - 0.58$$

**Step 1:**

Check the mathematical operation in the calculation

**Addition and Subtraction**

**Step 2:**

Based on step 2, use the appropriate equation for % relative error



# Practice Problem #2

Determine the % relative error and absolute error for the following calculation

$$\frac{(0.0953M \pm 0.0001M) \times (20.23mL \pm 0.03mL)}{(10.00mL \pm 0.04mL)}$$

## Step 1:

Check the mathematical operation in the calculation

## Multiplication and Division

## Step 2:

Based on step 2, use the appropriate equation for % relative error

# Reminders for Week 1, Sept. 30 – Oct. 03

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- **Show up ON TIME to the correct enrolled or wait-listed section**
  - If you have informed me with your lab switch, please join your new lab session.
- Spots of enrolled students that are more than 15-min late to the first lab will be re-assigned to students on the waiting list.
- PPE, lab notebook and lab manual are not required in the lab during week 1

# Reminders for Week 2, Oct. 07 – 10



## Assignments that are due in lab

1. MSDS/ NFPA Exercise
2. Pre-lab assignment for the “Pipet Calibration” lab



## Check the guidelines via Bruin Learn



## Follow standard laboratory PPE safety policy

|   |                                                                                                                                |   |     |
|---|--------------------------------------------------------------------------------------------------------------------------------|---|-----|
| ⋮ | Week 2 (Oct. 07 - 10)                                                                                                          | ✓ | ⋮   |
| ⋮ | 📎 Sample Flowchart.pdf                                                                                                         | 🔴 | ✓ ⋮ |
| ⋮ | 📎 Instruction of using the Pipette Pump.pdf                                                                                    | 🟡 | ✓ ⋮ |
| ⋮ | 📎 Pipet Calibration 5th edition Lab Manual (Only posted for experiment #1).pdf                                                 | 🔴 | ✓ ⋮ |
| ⋮ | 📎 MSDS Exercise_CHEM 14BL FA25 (due at the beginning of the lab, on Oct. 07-10, depending on enrolled sections).pdf            | 🔴 | ✓ ⋮ |
| ⋮ | 📎 Prelab_Pipet Calibration_CHEM 14BL FA25 (due at the beginning of the lab, on Oct. 07-10, depending on enrolled sections).pdf | ✓ | ⋮   |